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Remarks on the Anau and Niyä Seals

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The Context of the Anau Seal

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A stamp seal with an incised design was recovered from excavations at Anau south, Turkmenistan in 2000. The combination of a seal with multiple designs in an architectural context dated to Bronze Age in Central Asia has potential importance for the study of archaeology, art history, and linguistics. The seal is a possible example of an early local symboling system in Central Asia. The relationship of this find with early seals of China may also be relevant. The discussion here was initiated by a search for comparanda of this specific find (Hiebert 2000). After describing the seal, I present the archaeological context for this find and its position in the larger context of Central Asian archaeology.

It must be stated at this point that any single artifact from an archaeological site, by itself, does not constitute interpretable data from the past. Indeed, a unique artifact such as the Anau seal must not be considered outside of its context. The seal now focuses our attention on the nature of mid-third millennium BC Central Asia and the corpus of related artifacts from other secure archaeological contexts¹.

The Anau seal

The Anau "seal" is a small square artifact, 1.3 x 1.3 cm (face dimensions) x 0.8 cm thick with a curved 0.7 cm perforated boss (Figure 1). The specific function of the artifact (e.g. signet, amulet, button, seal) is not clear from its form or material but it is most similar in form to what are generally known as stamp seals (Pittman 2001:231-

¹ This discussion was stimulated by a round table with Professor V. Mair, H. Pittman and G. Possehl of the University of Pennsylvania. I would like to thank them for their comments and suggestions concerning this topic.

2). The material is jet or lignite, a soft, fine grained semi-precious black stone. Its flat polished face was engraved in linear designs with a tool that produced a v-shaped groove. The carved stone appears to have been polished after carving and the face of the artifact has multiple scratches that show abrasion from its manufacture or from its use. The stone broke along a natural cleavage line in the raw material on its right side which obscures the edges of several engraved lines, and the lower left corner has lost several conchoidal chips which obscure the design in that corner. The incised design has traces of a red pigment or mineral embedded in, which contrast with the light brown of the typical Anau soil matrix adhering to the seal. The red substance appears primarily in the incised designs, but also in the conchoidal spalls on the lower left corner, suggesting that the spalls occurred during the manufacture or use of the object. The carving of the design is even and skillfully executed. The grooves are 0.8-0.9 mm wide and stop at approximately 0.8-0.9 mm from the intact edge.

Descriptions of the engraving and workmanship are based upon photographs (Figure 2) rather than new descriptions of the artifact itself, which is housed at the National Museum, Ashgabat. Review of stereoscopic pairs of photos of the seal's face permit a fairly detailed description (Figure 3). The description is based upon an orientation where the hole through the shank in the back of the stamp is horizontal, although the actual orientation is not known. Where the seal's face is broken, the exact relationship of the signs to each other remains ambiguous. In the lower right corner, is a "c" shaped sign. Above it is a single horizontal line. It is possible that this is a backwards "s" assuming a short vertical line (now obscured) between the two sets of lines. Above the "c" shape and horizontal line is an "hourglass" sign of two triangles joined at the vertex. To the left of these, is a double trident design. The ends of the bottom two lines are broken off where the corner of the artifact is spalled. To the left of the double trident is a vertical line. At the upper corner, the line has a small "ear" which appears to be purposely engraved, although this needs to be confirmed with closer examination. If the double trident and the vertical line to the left were connected, there would be several close analogies in ancient Chinese script. Unfortunately, the spalling

of the lower left corner of this artifact makes it impossible to securely determine the relationship of the double trident and the vertical line.

The archaeological context

Settlements belonging to the Central Asian middle Bronze Age (mid-third millennium BC - c. 2500-2200 BC) straddle the border between modern Iran and Turkmenistan, located along the northern plain of the Kopet Dag mountains and on the Iranian plateau. Urbanism in this region pre-dates and is a precursor to the distinctive Central Asian Bronze Age culture of the "BMAC" (Bactria-Margiana Archaeological Complex) located further north and east in the desert oases of the Kara Kum desert. It is through the BMAC that the Central Asian world first encountered the Andronovo nomads of the steppe, who were also in contact with the Bronze Age cultures of Xinjiang and are the most likely candidates to have had contact with early China.

The period of Bronze Age urbanism during the mid-third millennium BC in Central Asia is known as the Namazga V period (Kohl 1981). The best known of these sites are located in Turkmenistan, and several have been reported in English: Altyn depe (Masson 1981a), Namazga depe (Kohl 1984) and Anau (Pumpelly 1908). Related settlements on the Iranian plateau include Nishapur-P (Hiebert and Dyson in press), Tepe Yam along the upper Atrek river (Ricciardi 1980), and possibly even the Bronze Age city of Shahdad, in the Iranian desert of Lut (Hakemi 1997) (Figure 4). The largest of these Central Asian sites, Altyn depe, has been extensively excavated. It is well known for its elite neighborhoods, monumental ritual architecture, craft production areas, a "city" wall, and complex dense urban architecture with streets, alleyways and tightly packed dwellings (Masson 1981a).

The mid-3rd millennium BC sites of Central Asia (prior to the BMAC) have many of the classic characteristics of Near Eastern "civilization", including a high level of craft production, stratified social groups and a local form of urbanism. In Central Asia, there was no script such as Mesopotamian cuneiform or the Harappan script, both of

which were well developed by the mid-third millennium BC. However, individual signs (or designs) incised on figurines, pottery, and personal artifacts such as spindle whorls have long been highlighted as evidence of "proto-writing" (Shchetenko 1970:70) (Masson and Sarianidi 1972:136). The lack of a developed local symboling system is significant given the evidence for trade connections linking Central Asia with the "literate" societies to the south. The Anau seal is the potential first example of a series of such designs found together on one artifact.

Anau

The American-Turkmen collaborative project has been investigating the chronology, economic base and trade connections of Central Asian civilization through excavations at the site of Anau depe, near Ashgabat, Turkmenistan. Anau is a small, densely occupied Bronze Age center that produced textiles, ceramic vessels, terracotta objects, and metals in addition to other elite commodities. While small in comparison to other contemporary Central Asian sites, Anau is particularly important as it lies on a north-south route linking the Kopet Dag foothills to the Iranian plateau through the Keltichinar river valley (Figure 5). This valley allows access to the Iranian plateau along the upper Atrek river, forming part of a north-south axis which complemented the east-west axis of sites along the northern fringe of the Kopet Dag foothill plain.

Four seasons of excavations at the south mound at Anau depe, Turkmenistan have revealed a long sequence of occupation stretching from the middle of the third millennium BC to the middle of the first millennium BC (Figure 6). More than 22 architectural levels have been sampled using fine scale excavation techniques that focus on collecting sieved and flotation samples from *in situ* deposits. Our excavations have been made adjacent to the excavations of Raphael Pumpelly, who defined the Central Asian sequence in his research in 1904 (Pumpelly 1908) (Figure 7). Our program is thus a re-study which seeks to contextualize both the original 1904 and later, Soviet excavations.

Our current excavations are being carried out in two areas of the site: AS/1 and AS/2-5, adjacent to Pumpelly's "Terrace B" excavations. AS/1 (5 x 20 m) is located at the uppermost part of the south mound providing a stratigraphic sequence from the Iron Age (500 BC) through to the middle Bronze Age (2200 BC). Our fine scale excavations through these later upper strata allow us to correlate ceramic sequences with radiocarbon dates, paleoecological data and indications of trade during the critical period of "de-urbanization" at the end of the Bronze Age. The excavations at AS/2, AS/3, AS/4 and AS/5 (each 5 x 5m excavations) allow us to correlate ceramic sequences in a similar fashion during the period of urbanism (prior to the development of the BMAC). The lower layers in AS/2 where the seal was found are now below the level originally reached in 1904.

The 2000 season at Anau

The 2000 season at Anau south focused on the early Namazga V and late Namazga IV periods². Excavations were carried out in two 5 x 5 meter squares (AS/2 and AS/5) continuing research carried out in 1997, in which 5 superimposed building levels were defined for the middle Bronze Age deposits (Figure 8). The 2000 season focused on the transition to the earliest Namazga V period architecture, which appeared to be structurally more massive and more specialized in character than other architecture at the site.

² The team consisted of the following personnel: Directors: Fredrik T. Hiebert, United States; and Kakamurad Kurbansakhatov, Turkmenistan. Trench supervisors: Vladimir Zav'yalov, Russia; Lauren Zych, US; and Sten Madsen, Denmark. The team also included Naomi Miller, US (paleoethnobotanist); Katherine Moore, US (zooarchaeologist); Said Khamritolaiv, Turkmenistan (field assistant); and Batir Ashirov, (inspector from the Turkmenistan Ministry of Culture). This research is sponsored by the University of Pennsylvania Museum of Archaeology and Anthropology with support from the National Geographic Society. We would like to thank Professor C.C. Lamberg-Karlovsky, Harvard University, with whom we initiated this project, whose interest in the excavations at Anau has been unwavering.

Stratigraphy from the 2000 season

Lower Excavations, level 6: Middle Namazga V

A substantial middle Namazga V structure was excavated in the upper layers of AS/2 and AS/5. In AS/5, the southern room was excavated to the lowest floor of the building. The northern room was also excavated to the earliest floor level which had a ceramic lined drain (Figure 9). The undecorated, fast-wheel ceramics from these rooms appears to have been locally produced, based upon the ware. Both ceramics and fragments of figurines are typical of the material culture of mid-early Namazga V. Distinctive finds include fragments of fine alabaster vessels and fragments of gold leaf not typical of domestic debris. A compartmented bronze seal with a floral or geometric motif and a large and distinctive boss was found on the floor of the northern room. Several terracotta spindle whorls from these deposits were decorated with engraved symbols similar to the symbols found on the shoulders of the terracotta figurines common at Namazga V sites (Figure 10).

Lower Excavations, level 7: Early Namazga V

Early Bronze Age building levels have been excavated only in the adjacent excavation area, AS/2. These excavations revealed portions of a street and a large, well built room of a building (area 1), with an entranceway (area 2), a courtyard (area 3), and a street (area 4) (Figure 11). Slightly more than 2 m of deposit was excavated from within the building, from which were recovered artifacts, animal bones, seeds, and charred materials for radiocarbon samples. Three radiocarbon samples date this level:

Lab no.	Exc. Unit	Location	raw date	calibrated range BC
Beta 144421	AS/2 231	Area 2, 2nd const. phase	3720 +/- 70	2310-1920
Beta 144422	AS/2 270	Area 3, upper courtyard	3890 +/- 50	2480-2205
Beta 144424	AS/2 283	Area 3, upper courtyard	3700 +/- 60	2280-1920

Lower Excavations, level 8: late Namazga IV

The transition to "Namazga IV" period was noted by the latest appearance of painted pottery. Painted pottery became common in the excavations units underneath the large phase 7 building. Only the upper fill of late Namazga IV was uncovered in the 2000 season. One radiocarbon sample dates this level:

Lab no.	Exc. Unit	Location	raw date	calibrated range BC
Beta 144425	AS/2 305	Area 3, lower courtyard	4050 +/- 70	2870-2445

A possible administrative structure

The middle Namazga V building uncovered in AS/2 (lower level 7) was one of the best preserved buildings which we have found at Anau. Its walls stand more than 2 meters high and indicate multiple episodes of rebuilding. In 2000, we uncovered only one room and part of a courtyard of this building. It is from the deposits inside this building that we found a cluster of objects which appear to have administrative function – rounded clay pre-forms with imprints of fingers and textiles as well as the Anau seal from a deposit between two floors in area 1.

Area 1 and 2

Excavations in Area 1 and 2 revealed a substantial mudbrick structure with walls slightly more than two meters tall. The thick walls were constructed of standard bricks 50 x 25 x 10 cm. The floors and walls had thick mud plaster and the floor had layers of lime plaster indicating three phases of re-use of the room. The ceramics and small finds from this room are typical early Namazga V objects. Area 1 is the main part of the room, and area 2 is the area near the entrance. Area 2 had a slightly different

stratigraphic sequence due to the numerous replasterings of the threshold and stair areas. The architectural features and artifact assemblage suggest that the room served an administrative function.

In its earliest phase of construction, the room had a doorway or niche near the northwest corner of the excavation. Steps below this feature functioned either as a stairway or platform (at the base of the niche). The steps were built in the form of a stepped square (a design form often associated with ritual activities in Central Asia and Iran), with a niche built into the wall (Figure 12). Internal divisions in the room suggest that it had initially been used for storage. In a second building phase, the staircase and doorway in the northwest were blocked and a new doorway was constructed in the northeast (area 2), leading to the street (area 4) (Figure 13). The new northeast doorway had a large (72 cm long) rectilinear stone as a threshold, forming two steps up from the room into the street. In the second phase of use, a mudbrick bench was constructed against the west side of the room. Ceramic fragments, bones, charcoal, figurine fragments and small ground stone objects were found on the floors of the room. During the time that the building was repaired and maintained, the doorway was re-built three times; the mudbrick steps were replaced on the inside of the room and the threshold was replastered on the street side. During each re-building the floor and walls of the room were replastered either with mud plaster or with lime plaster. In the latest phase of occupation of the room, a large plastered basin was constructed in the center of the room, suggesting that the rooms function changed in its later use.

The jet stamp seal was not located *in situ*, but came from the sieved soil from locus 221, an area of floor deposit in the northwest corner of AS/2. This object was covered in the typical light brown clayey soil matrix of Anau south, and most likely was missed due to its small size and light weight while the soil of the layer was being loosened. Several distinctive unbaked clay lumps (2.4 x 2.4 cm) were also found within the room near the southern wall. These clay lumps appear to have been pressed around the neck of a jar or rounded object. Some of the clay lumps have textile

impressions on the rounded surface (Figure 14). These artifacts are most likely sealing clay, used to identify a vessel or storage area.

Area 3: Courtyard

To the south of the area 1-2 room are series of exterior surfaces and fill which are most likely the unroofed courtyard area associated with the area 1-2 room. In contrast to the area inside of the building, the density of ceramics, bones and other archaeological materials was high in this outside area. Area 3 deposits included lenses of occupational debris such as hearth sweepings, charcoal, ash, broken ceramics and several concentrations of rounded unbaked clay lumps. More than twenty round clay lumps were found. No stamp impressions were found on them.

Area 4: Street

Area 4 forms a street, leading north-south along the west wall of the area 1-2 room. This street appears to have been a heavily used thoroughfare. It remained in use from late Namazga IV, throughout all of the phases of use of the area 1-2 room, and remained a pathway in later times. During early Namazga V, the street was re-paved several times by placing mudbrick curbs along the sides to form a gutter in the middle. When the gutter accumulated debris, new curbing would be laid upon the old surface.

Discussion

A stamp seal in Bronze Age Central Asia is not an unusual find. The function of the seals is a critical question, as outlined by Pittman (2001), in a discussion of seals from the southern Iranian site of Tepe Yahya, period IV. At that site, seals of the early part of the sequence (IVc) are clearly administrative in function based on the occurrence of multiple sealings. After a 500 year hiatus in occupation, in periods IVb and IVa "there is virtually no evidence for [the seal's] use as a tool in economic administration" (Pittman 2001:232). At Anau, the early and middle Bronze Age periods fall squarely between these periods, and it is important to consider how the seals would have been used.

The artifacts found in the room and the details of the architecture suggest a specialized function for this area of Anau south. The walls are larger than the typical Bronze Age domestic architecture at Anau south or at the larger settlement at Altyn depe. Despite the small size of Anau, the construction of the area 1-2 room is not unlike the more massive and regular architecture of the elite and ritual areas at Altyn depe (excavations 5 and 7) (Masson 1981a). Unlike domestic structures at Altyn depe, which typically did not have entrances to the street, the Area 1-2 building had an entrance directly onto the street. The particularly well constructed threshold and stone doorsill underlines this distinction at Anau. The architectural feature in the northwest corner, having a set of stairs or steps, is also unusual. The steps may be compared to architecture at the contemporary site of Hissar tepe in northern Iran. There, in the "burned building", similar architectural steps apparently served as ledges on which to place vessels or small objects (Dyson and Remsen 1989:95). Dyson suggests that the Hissar building may have served as a shrine on the basis of the ritual objects in the room (Dyson and Remsen 1989:96-97). The history and planning of the building at Anau south, with its direct access to the street, and later construction of benches and storage facilities suggests that the room had a commercial function, unlike the burned building at Hissar.

The identification of the unfired clay lumps as sealing clay is supported by the occurrence of similar (but stamped) clay lumps from early and middle Bronze Age levels at Altyn depe (Kircho 1990, Masson 1988:plate XXXVI, 4) (see figure 17). From Mesopotamia, clay sealings and unbaked clay tokens (similar in size and shape to the Anau finds) are common finds as early as the Neolithic and are considered to have been used in the administration of commodities (Akkermans and Verhoeven 1995:24). Similar items were used continuously in the greater Near East through the third millennium BC. Particularly distinctive use of stamp seals on sealing clay comes from Shahr-i Sokhta II-III (2700-2200 BC). There, both engraved stone and metal stamp seals, similar to the Anau seal, and seal impressions on clay have been found (Feroli, et al. 1979). At Hissar tepe, clay sealings are found in Period III,

contemporary with the early and middle Bronze Age Central Asia finds (Schmidt 1937: pl.XLIX). An earlier series of unbaked and unstamped clay lumps found near a lapis lazuli workshop at Hissar are considered to be label blanks or pre-forms (Tosi and Bulgarelli 1989: fig. 6) and allow us to suggest that the Anau clay objects possibly may have been similar pre-forms.

In addition to the seal described here, several other seals have been found at Anau: a round terracotta stamp (Figure 15a), closely paralleled at Hissar; a three sided seal (Figure 15b), typical of the early second millennium BMAC, and two other engraved stamp seals (Figure 15 c and d). The last two came from the 1904 excavations at terrace B, and are approximately contemporary with early Namazga V. A wide variety of stamp seals have been found in contemporary levels at Altyn depe made of bone, copper, stone, and terracotta (Figure 16). The use of some of the stamps as seals is clearly documented at Altyn depe where a series of impressions on clay have been found (Figure 17). The Bronze Age seals from Altyn have close parallels at the Iranian sites of Hissar and at Sialk. In Iran, seals with geometric designs have a much longer tradition than in Central Asia, with similar types of seals in continuous use from the 5th millennia BC (Bennett 1989).

Two stamp seals from Altyn depe, carved from alabaster or gypsum, have the same dimensions as the Anau seal (Figure 18). These are the closest analogies to the Anau seal. These have been interpreted as Indus type seals (Masson 1981b), either trade items or, more likely, local imitations of typical Indus seals.

Aside from the seal under consideration here, no other seals or beads from Central Asia have been reported to be made of jet. This may reflect the possible confusion between jet and bitumen or that jet was simply a rarely used stone. In the ancient Near East, jet was occasionally used in bead making and seals. Such jet objects are best known from the Maikop culture, between the Black and Caspian Sea. The source of

these beads is most likely in western Georgia³. Jet beads are possibly found at tell Brak, an early 3rd millennium site in northern Syria, but the description of the material is vague (Oates and Oates 1989). A jet cylinder seal, considered to be carved in the "Gawra" style, was found in a Maikop burial north of the Caucasus (Nekhaev 1986:fig.3,1). It is quite likely that there are other artifacts made of jet which are simply not recognized in Near Eastern archaeological collections⁴.

A local source of jewelry quality jet is described by Biruni (11th c. AD) as coming from mines at Tus, near Mashed (Biruni 1989:171-2). This source is within 150 km of Anau and close to the turquoise mines exploited during the Bronze Age by Central Asian cultures. Jet is a soft stone which would have cutting characteristics similar to alabaster or gypsum. Jet has electrostatic qualities (Pollard, et al. 1981:141) which make it a prized stone for modern magical amulets. One common material used to polish jet is ferric oxide (hematite or red ocher), which may account for the redness in the engraving and in the cracks in the Anau seal.

The Anau seal remains unique for its time and region in having several distinct signs on one object. Most of the signs are also found on local spindle whorls, figurines and as potter marks on pottery. The "hour-glass" motif is one of the most common marks on Central Asian and Near Eastern pottery. It is commonly found as a potter's mark, and it is included in the corpus of signs in neighboring proto-Elamite and Harappan scripts (Potts 1981:fig. 4). Backwards "s" signs, "c" signs, and straight lines are found on pottery and occasionally on whorls and on figurines. The overall corpus of signs on figurines is almost the same as that found on whorls, but different from that on pottery. The motifs on figurines and whorls are certain to have had greater significance than simple decoration given the position of such signs on the inside of some spindle whorls, where the sign on the interior of the spindle "bell" would not have been seen.

³ I would like to thank Dr. Victor Trifonov, Institute for Material Culture, St. Petersburg, for providing information on the sources of jet in the greater Near East.

⁴ Items from the collections in the Near Eastern section of the University of Pennsylvania Museum, listed under "bitumen", "stone", and "black stone," are presently under review.

The motifs are also compared with the corpus of signs in proto-Elamite and Harappan scripts (Masson and Sarianidi 1972:fig.35). Perhaps these designs were used to identify ownership, or as signs for luck. At Shahdad, multiple signs occur on pottery (Hakemi 1997:679-688). Up to 3 different signs are placed together – sometime with stamps together with incised designs (Figure 19). A single example of a linear Elamite inscription inscribed on a pot was also found at Shahdad (Hakemi 1997:183). The linear Elamite signs, however, do not correspond to the local potters marks or to the array of signs on pottery, figurines or whorls from Central Asia.

The Shahdad pottery data does not suggest a local writing system. However, it is clear that the societies of Central Asia, on the edge of literate societies to the south-east and south-west, were in contact with the southern cultures. It may be that people on the Iranian plateau and in Central Asia were experimenting with or mimicking writing systems. Most scholars agree that the two seals from Altyn are local imitations of Harappan seals, and the Anau seal appears to add one more example of how Central Asians may have been experimenting with a symbol system on the periphery of the literate world.

The one sign on the Anau seal that is not found in the design corpus of the greater Near East is the double trident. Clearly similar motifs are found only among later Chinese script (Sun, et al. 1993). Further, if the extrapolation of the connection between the vertical line and the lower middle line of the double trident is accepted, then the two elements together form a coherent Chinese sign. A stylistically close parallel can be found in a seal found at Niyā in eastern Central Asia, from the Han dynasty in the early centuries of the first millennium AD (Xinjiang catalogue 1999:fig.101, Chengyuan and Feng 1998:283-4) (Figure 20). The similarities in material, carving styles, forms of characters and even red in the engraving⁵ alerts us to the possibility that the Anau seal may be out of context.

⁵ Professor Qianshen Bai, Boston University, notes that the red pigment in the Niyā seal is not original.

Could the Anau seal actually be a Han Chinese seal which fell through a crack or a mouse hole into the Anau south deposit? Cracks in the soil occur during periodic earthquake events, and the Anau region is an active tectonic zone which experienced a devastating earthquake in the mid-20th C (Berberian and Yeats 2001) . However, the occupation at the south mound at Anau terminated in the mid-first millennium BC, and the closest early first millennium AD occupation would be a local Parthian period settlement 1.5 km to the west. Rodents do disturb archaeological sites in Central Asia, but rodents are restricted to a superficial layer, perhaps 70 cm deep, of the abandoned deposits, and are most common in fill rather than areas with intact bricks⁶. It would be unusual for them to have penetrated two meters into walls and floors which had been sealed for thousands of years.

It may be possible to partially test the age of the Anau seal through physical analysis: historic period (including Han) Chinese red pigment is generally composed of cinnabar (mercuric oxide) which would likely not be present if the red came from polishing the seal with ferric oxide⁷. Chemical identification of jet has primarily been limited to discrimination between true jet and other jet-like materials such as lignite, cannel coal and torbanite (Pollard, et al. 1981). Recent macromolecular analysis of jet has indicated that it may be possible to differentiate jet from different sources but this research is still preliminary (Watts, et al. 1999).

In sum, a coherent context for the Anau seal comes from the large array of early and middle Bronze Age Central Asian seals, the evidence for seal use, the cutting and polishing techniques, and the corpus of signs and designs known on whorls, pottery marks and figurines.

⁶ I would like to thank Dr. Katherine Moore, University of Pennsylvania Museum of Archaeology and Anthropology, who has studied both the prehistoric and contemporary fauna of the region, and kindly supplied the information concerning bioturbation at tell sites in Central Asia.

⁷ Thanks are due to R. Ma, University of Pennsylvania, who provided invaluable assistance with the Chinese literature on seals and suggested testing the reddish pigment in the engraved designs for its chemical composition.

Chronology of Eurasian interaction

The calibrated radiocarbon dates associated with the Anau seal from the excavations at Anau south average 2300 BC. This is the first set of consistent radiocarbon dates published for the early Namazga V period.

The Namazga V material culture demonstrates interaction with its contemporary neighbors through trade. In particular, finely made items from the Indus civilization have been found in mid-third millennium BC layers at Altyn depe (Masson 1981b). Central Asian ritual objects have been found *in situ* from mid-third millennium sites on the Iranian plateau at Hissar tepe (Schmidt 1937:p.l.XI,LXII,LIX,LVII). Mesopotamian finds have been found in Central Asia from mid-third millennium BC contexts from Altyn depe (Masson 1968). Central Asian artifacts from the mid-third millennium BC have been found in the Royal tombs from Ur (Zettler and Horne 1998:149-152), and Susa (Amiet 1986). Typically Central Asian "Namazga V" type objects from the royal cemetery at Ur have traditionally been dated to c. 2500 BC, but this "middle" chronology has been recently been criticized as too old. A "low chronology" as advocated by Reade (Reade 2001) fits well with the calibrated radiocarbon chronology being developed at Anau for Central Asian urbanism and elite goods production. Thus, we see the vibrant urban society in southern Central Asia as part of a mid-third millennium "great Khorassan road" (linked east-west across northern Iran) which connected the cities and resources of northern Iran and Central Asia with Mesopotamia and western Iran.

Connections with the northern steppe world or with northern desert oases of Central Asia do not appear to have developed during the mid-third millennium BC (Hiebert 2002). It is only during the later part of the third millennium BC that a series of northern desert oases were first occupied – as evidenced in the BMAC (Sarianidi 1977, Sarianidi 1990, Sarianidi 1998a). These oases include the northern sites in modern Uzbekistan, southern Bactrian sites in modern Afghanistan, and Margiana in modern Turkmenistan. The oasis sites have closely comparable material remains to the

Namazga V Kopet Dag culture, including similar use of stone, metal and similar ceramic technology. The oasis sites can be distinguished from the Kopet Dag sites on the basis of distinctive local styles.

The chronology of the BMAC oases and Kopet Dag urban sites has been examined to understand the development of interaction between these areas. The following chronology is based upon research in Margiana and the Kopet Dag (Hiebert 1994, Masson and Kircho 1999, Udeumuradov 1993), although other potential chronological schemes should also be considered (Salvatori 1998, Sarianidi 1998a, Shchetenko 2000):

- 1) late Namazga IV/early Namazga V period urban settlements were located primarily along the foothills of the Kopet Dag.
- 2) during the late Namazga V period, the urban sites located along the Kopet Dag continued to grow in population despite limitation on the potential to increase arable lands (Miller 1999). At this time the first large scale settlements were established in the desert oases of Bactria and Margiana (Hiebert 1993). It is doubtful that this represents a straightforward colonization from the Kopet Dag urban sites (Masson 1989), but migrant populations clearly contributed to the late third millennium BMAC cultures.
- 3) In the subsequent Namazga VI period, the BMAC expanded in the desert oases and interacted with Eurasian steppe nomads for the first time, during the time when Kopet Dag sites were greatly reduced in size and complexity.

Ironically, a development of the experimental use of symbols along the Kopet Dag in the mid-third millennium as suggested by the Anau and Altyn depe seals is not seen in the BMAC. No developed local form of writing or script has been found in the extensive excavations in Bactria (Askarov and Abdullaev 1983) or Margiana (Sarianidi 2002). On the other hand, highly developed bronze and stone seals with a wide variety of geometric and zoomorphic images are characteristic of the BMAC (Sarianidi 1998b). The occurrence of bullae from Gonur north attests to their continued use as administrative devices marked on clay tags (Baker 2002). Enormous

planned settlements of the BMAC are known from the desert oases, and the distinctive BMAC artifacts are widely distributed far outside of Central Asia. It is notable that at this time the Central Asian sites show the first concrete evidence of interaction with the Andronovo nomadic world to the north (Hiebert and Moore, nd) and possible links to Xinjiang and the east (Li 1999). The earliest known Shang dynasty stamp seals from Anyang (Tsien 1962:54) may be compared with the stamp seals of the BMAC. These are neither stone nor engraved but are cast bronze seals of the compartmented type, similar in size and shape to BMAC compartmented seals. Recent exploration along the southern rim of the Tarim basin have revealed pre-historic agricultural oases located far in the desert at abandoned river deltas oases of Bronze and Iron Age cultures which had social and economic interaction with Andronovo nomads (Chen and Hiebert 1995, Li 1999). It is possible that Bronze Age precursors at oases dotting the Taklamakan desert may have been a link between western Central Asia and areas east in the second millennium BC.

Further fine-scale excavations in Central Asia, at sites such as Anau south, will allow us to better understand the relationship between symbols, signs and designs across Eurasia, providing us with a glimpse into the interregional exchange systems of Central Asia in the mid-third millennium BC. Additional excavations in Central Asia will undoubtedly reveal other examples of administrative devices such as seals and sealings, which were in use at the dawn of large scale interaction between the oases of Central Asia and the wider arena of the nomadic steppe and northeast Asian world.

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Bibliography

- Akkermans, P. M. M. G. and M. Verhoeven
1995 The burnt village at late Neolithic Sab Abyad. *American Journal of Archaeology* 99(1):5-32.
- Amiet, P.
1986 *L'Age des Echanges Inter-iraneans*. Notes et Documents des Musee de France, Paris.
- Askarov, A. A. and B. N. Abdullaev
1983 *Dzharkutan*. Fan, Tashkent.
- Baker, E.
2002 *Bullae and the Economic Administration of the Bronze Age Civilization of Central Asia*. Undergraduate thesis, University of Pennsylvania.
- Bennett, L.
1989 The seals of Tappeh Hesar, 1931-1932. In *Tappeh Hesar: Reports of the Restudy Project, 1976*, edited by R. H. Dyson and S. M. Howard, pp. 127-130. Casa Editrice Le Lettere, Firenze.
- Berberian, M. and R. S. Yeats
2001 Contribution of archaeological data to studies of earthquake history in the Iranian plateau. *Journal of Structural Geology* (23):563-584.
- Biruni
1989 *The Book Most Comprehensive in Knowledge on Precious Stones*. Translated by Hakim, Mohammad Said. Pakistan Hijra Council, Islamabad.
- Chen, K. T. and F. Hiebert
1995 The late prehistory of Xinjiang in relation to its neighbors. *Journal of World Prehistory* 9(2):243-300.
- Dyson Jr., R. H. and W. C. Remsen
1989 Observations on architecture and stratigraphy at Tappeh Hesar. In *Tappeh Hesar: Reports of the Restudy Project, 1976*, edited by R. Dyson and S. Howard, pp. 69-110. Casa Editrice Le Lettre, Firenze.
- Feroli, P., E. Fiandra and S. Tusa
1979 Stamp seals and the functional analysis of their sealings at Shahr-i Sokhta. In *South Asian Archaeology 1975*, edited by J. E. v. Lohvizen-deLeeww, pp. 7-26. Brill, Leiden.

- Hakemi, A.
1997 *Shahdad : archaeological excavations of a Bronze Age center in Iran*. IsMEO, Rome.
- Hiebert, F.
1993 Chronology of Margiana and radiocarbon dates. In *Information Bulletin*, edited by F. Hiebert, pp. 136-148. vol. 19. UNESCO, Moscow.
- Hiebert, F.
1994 *Origins of the Bronze Age Oasis Civilizations of Central Asia*. Bulletin of the American School of Prehistoric Research 42. Peabody Museum of Archaeology and Ethnology, Cambridge, MA.
- Hiebert, F.
2000 Discovery of a Bronze Age stamp seal from Anau, Turkmenistan. *Expedition* 42(3):48.
- Hiebert, F.
2002 Bronze Age interaction between the Eurasian steppe and Central Asia. In *Ancient Interactions: East and West in Eurasia*, edited by K. Boyle, C. Renfrew and M. Levine, pp. 237-248. McDonald Institute for Archaeological Research, Cambridge.
- Hiebert, F. and R. H. Dyson
in press Prehistoric Nishapur and the frontier between Central Asia and Iran. *Iranica Antiqua* 2002(37):111-147.
- Hiebert, F. and Moore, K.
in press Nomadic interaction with oasis towns of the Bronze Age. *Current Anthropology*.
- Kircho, L. B.
1990 Drevneishie pechati i ikh ottiski iz Altyn-depe. *Sovetskaya Arkheologiya* 3:176-183.
- Kohl, P.
1981 The Namazga civilization: an overview. In *The Bronze Age Civilization of Central Asia: Recent Soviet Discoveries*, edited by P. Kohl, pp. vii-xxxviii. M.E. Sharpe, Armonk, NY.
- Kohl, P. L.
1984 *Central Asia: Paleolithic Beginnings to the Iron Age*. Editions Recherche sur les Civilisations, Paris.

- Li, S.
1999 A discussion of Sino-Western cultural contacts and exchange in the second millennium B.C. based upon recent archaeological discoveries. *Sino-Platonic Papers* 97(December 1999):1-29.
- Ma, C. and F. Yue
1998 *Xinjiang Weiwu'er Zizhiqu si lu kao gu zhen pin*. Shanghai yi wen chu ban she, Shanghai.
- Masson, V. M.
1968 Urban revolution in Southern Turkmenia. *Antiquity* XLII:178-187.
- Masson, V. M.
1981a *Altyn-depe*. Trudi Iu.T.A.K.E. XVIII. Nauka, Moscow.
- Masson, V. M.
1981b Seals of a proto-Indian type from Altyn-depe. In *The Bronze Age Civilization of Central Asia: Recent Soviet Discoveries*, edited by P. L. Kohl, pp. 149-162. M.E. Sharpe, Armonk, NY.
- Masson, V. M.
1988 *Altyn depe*. Translated by H. Michels, University Museum, University of Pennsylvania, Philadelphia.
- Masson, V. M.
1989 *Pervie Tsvilizatsii*. Nauka, Leningrad.
- Masson, V. M. and L. B. Kircho
1999 Izuchenie kul'turnoi transformatsii rannezemledel'cheskikh obshchestv: po materialam novikh raskopok na Altyn-depe i Ilgynly-depe. *Rossiiskaya Arkheologiya* 1999(2):61-76.
- Masson, V. M. and V. I. Sarianidi
1972 *Central Asia: Turkmenia Before the Achaemenids*. Praeger, New York.
- Miller, N.
1999 Agricultural development in western Central Asia in the Chalcolithic and Bronze Ages. *Vegetation History and Archaeobotany* 8:13-19.
- Nekhaev, A. A.
1986 Pogrebenie Maikopskoi kul'turi iz kurgana u sela Krasnogvardeiskoe. *Sovetskaya Arkheologiya* 1986(1):244-248.
- Oates, D. and J. Oates
1989 Akkadian buildings at Tell Brak. *Iraq* 51:193-212.

- Pollard, A. M., G. D. Bussell and D. C. Baird
1981 The analytical investigation of early Bronze Age jet and jet-like material from the Devizes museum. *Archaeometry* 23(2):139-167.
- Pumpelly, R. (editor)
1908 *Explorations in Turkestan, Expedition of 1904*. Carnegie Institute of Washington, Washington.
- Reade, J.
2001 Assyrian king-lists, the royal tombs at Ur, and Indus origins. *Journal of Near Eastern Studies* 60(1):1-29.
- Ricciardi, R. V.
1980 Archaeological survey in the Upper Atrek Valley (Khorassan, Iran): Preliminary report. *Mesopotamia* XV:51-72.
- Salvatori, S.
1998 The Bronze age in Margiana. In *The Archaeological Map of the Murghab Delta Preliminary Reports 1990-95*, edited by A. Gubaev, G. Koshelenko and M. Tosi, pp. 57-66. Reports and Memoires, series minor III. Istituto Italiano per L'Africa e L'Oriente, Roma.
- Sarianidi, V. I.
1977 *Drevnie Zemledel'tsi Afganistana*. Nauka, Moscow.
- Sarianidi, V. I.
1990 *Drevnosti Strani Margush*. Ylym, Ashkhabad.
- Sarianidi, V. I.
1998a *Margiana and Protozoroastrianism*. Kapon editions, Athens.
- Sarianidi, V. I.
1998b *Myths of Ancient Bactria and Margiana on its Seals and Amulets*. Pentagraphic Ltd., Moscow.
- Sarianidi, V. I.
2002 *Murgash : ancient Oriental Kingdom in the Old Delta of Murghab river*. Turkmendowlethabarlary, Ashgabat.
- Schmidt, E. F.
1937 *Excavations at Tepe Hissar Damghan*. The University Museum, Philadelphia.
- Shchetenko, A. I.
2000 K probleme periodizatsii kul'turi Namazga VI. In *V Chest Iubileya V.M. Massona*. vol. 127-141. IIMK, St. Petersburg.

- Shchetenko, A. Y.
1970 Raskopki melkikh poselenii epokhi bronzi. *Karakumskie Drevnosti* III:33-50.
- Sun, W., S. Tang and X. Zhuang
1993 *Liang Han guan yin hui kao*. Shanghai shu hua chu ban she, Shanghai.
- Tosi, M. and G. M. Bulgarelli
1989 The stratigraphic sequence of squares DF 88/89 on south hill, Tappeh Hesar. In *Tappeh Hesar: Reports of the Restudy Project, 1976*, edited by R. H. Dyson and S. M. Howard, pp. 35-53. Casa Editrice Le Lettere, Firenze.
- Tsien, T.-H.
1962 *Written on Bamboo and Silk: The Beginnings of Chinese Books and Inscriptions*. The University of Chicago Press, Chicago.
- Udeumuradov, B. N.
1993 *Altyn-depe i Margiana: Svyazi, khronologiya, Proiskhozhdenie*. Ylym, Ashkhabad.
- Watts, S., A. M. Pollard and G. A. Wolff
1999 The organic geochemistry of jet: pyrolysis-gas chromatography / mass spectrometry (Py-GCMS) applied to identifying jet and similar black lithic materials - preliminary results. *Journal of Archaeological Science* 26:923-933.
- Xinjiang catalogue
1999 *Xinjiang wen wu gu ji da guan*. Xinjiang mei shu she ying chu ban she, Urumchi.
- Zettler, R. and L. Horne (editors)
1998 *Treasures from the Royal Cemetery of Ur*. University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia.

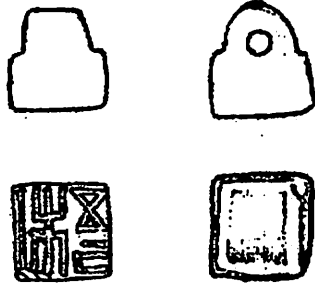


Figure 1 Scale drawing of the Anau seal

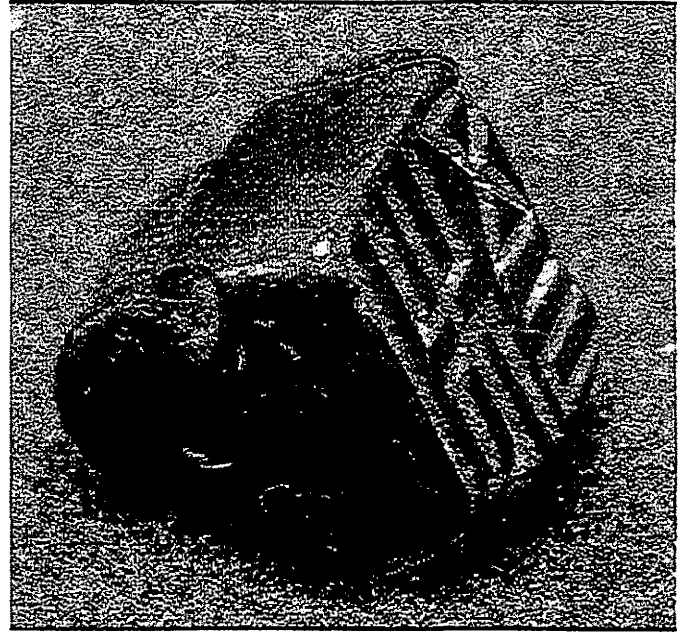


Figure 2 Photo of the Anau seal

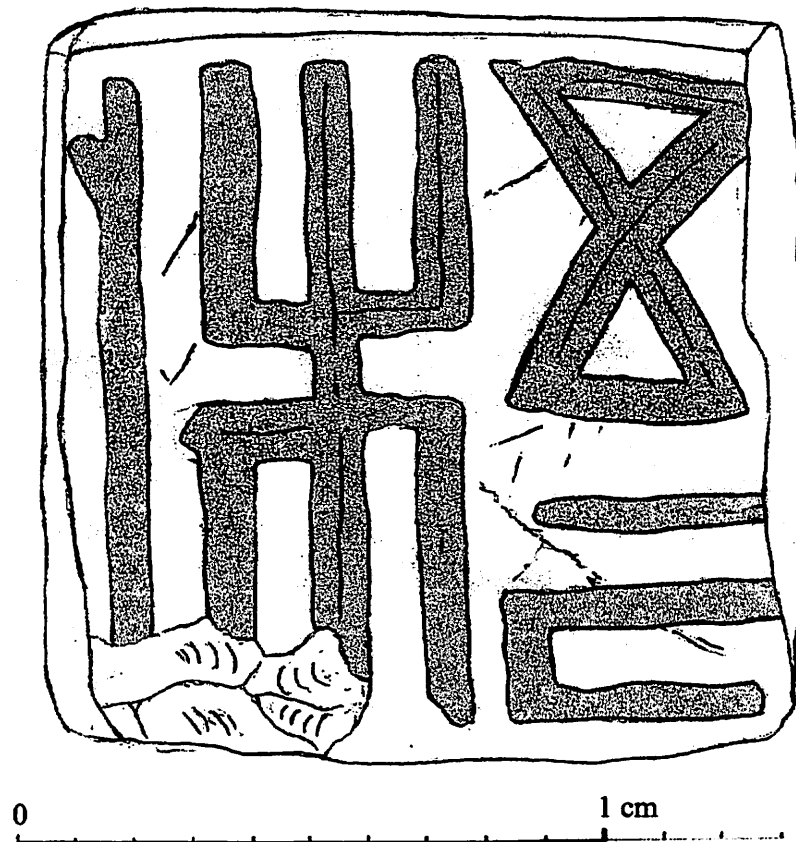


Figure 3 Drawing of the face of the Anau seal

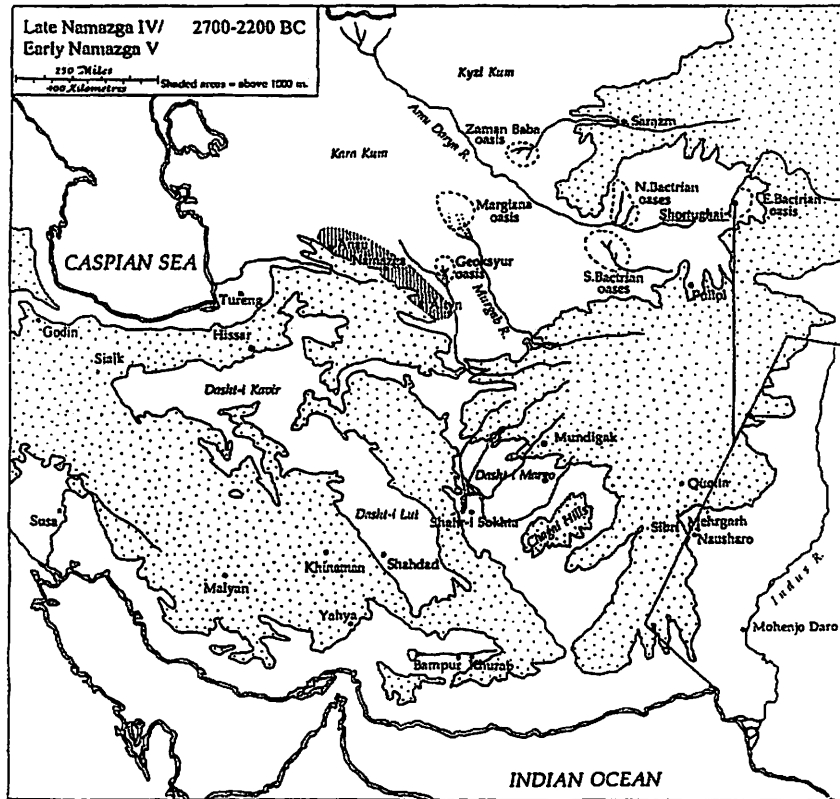


Figure 4 Sites mentioned in the text

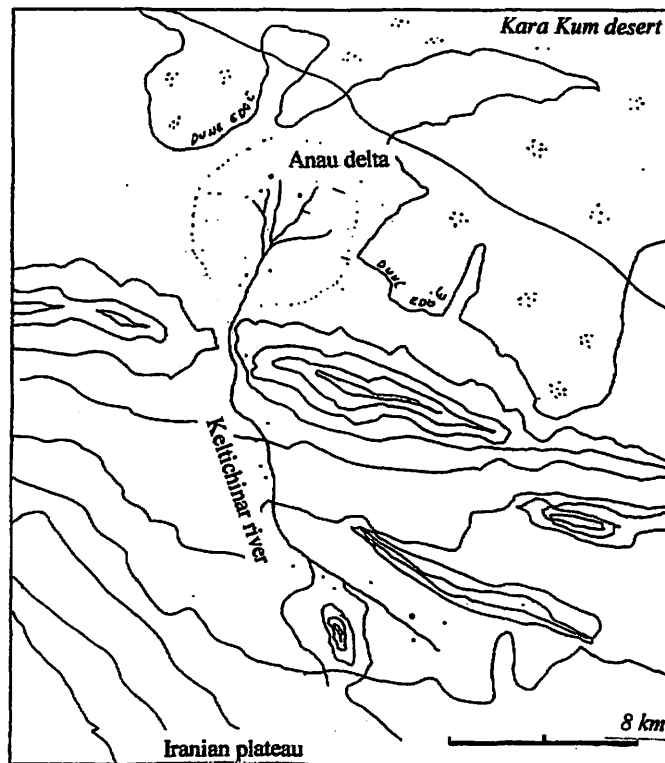


Figure 5 Map of the Keltichinar valley

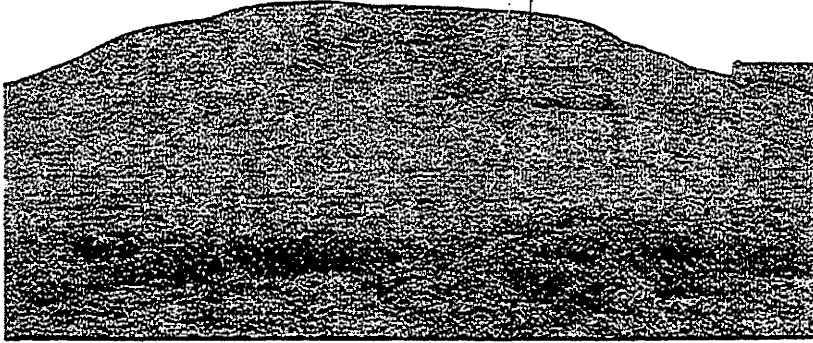


Figure 6 Photo of the site of Anau south

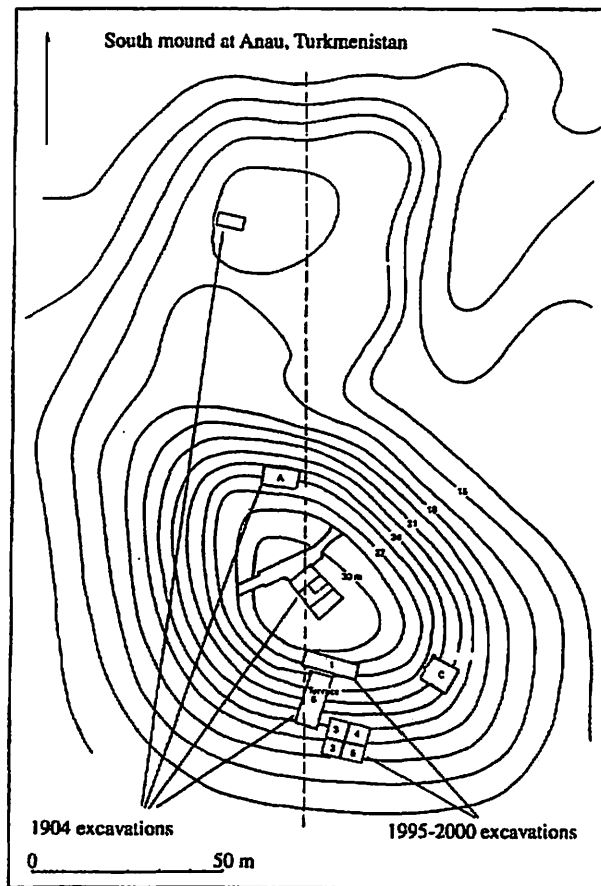


Figure 7 Plan of Anau south

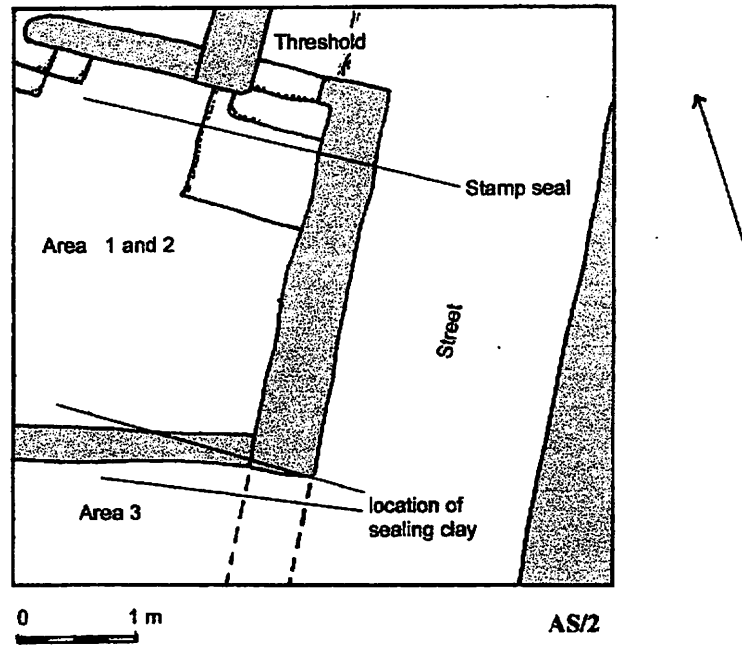


Figure 8 Top plan of AS/2

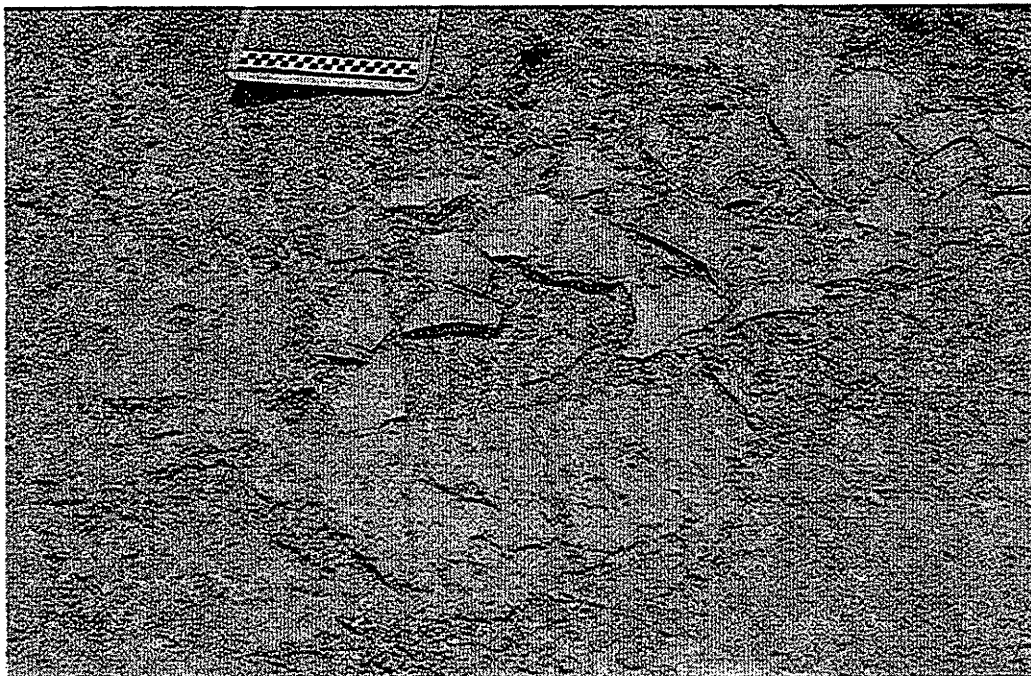


Figure 9 Photo of AS/5 drain

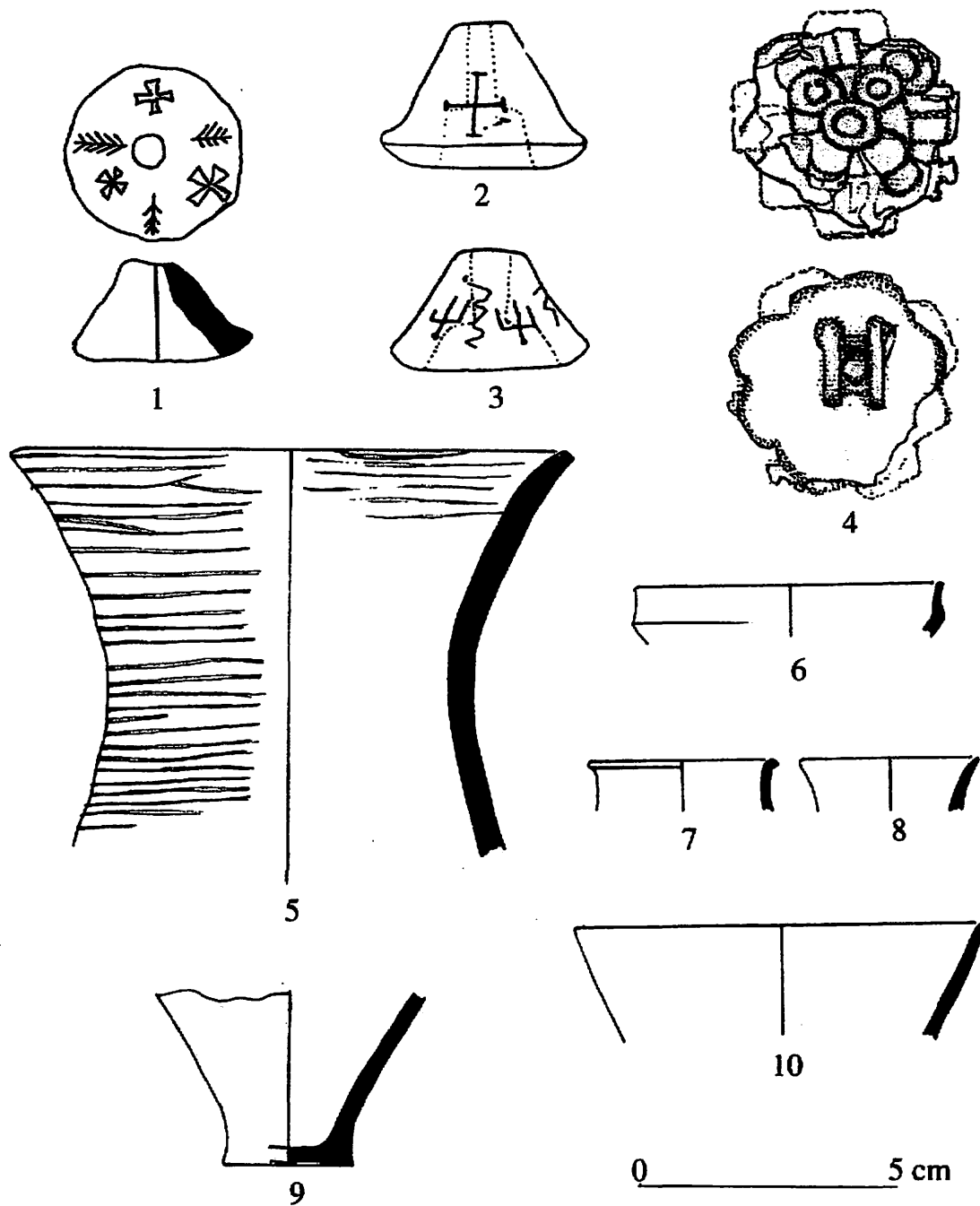


Figure 10 AS/5 finds Finds from middle Bronze Age levels 1, 4-10 - AS/5, 2,3 Terrace B
 1-3, terracotta whorls; 4, bronze compartmented seal
 5-10, fine wheel-made local ceramics

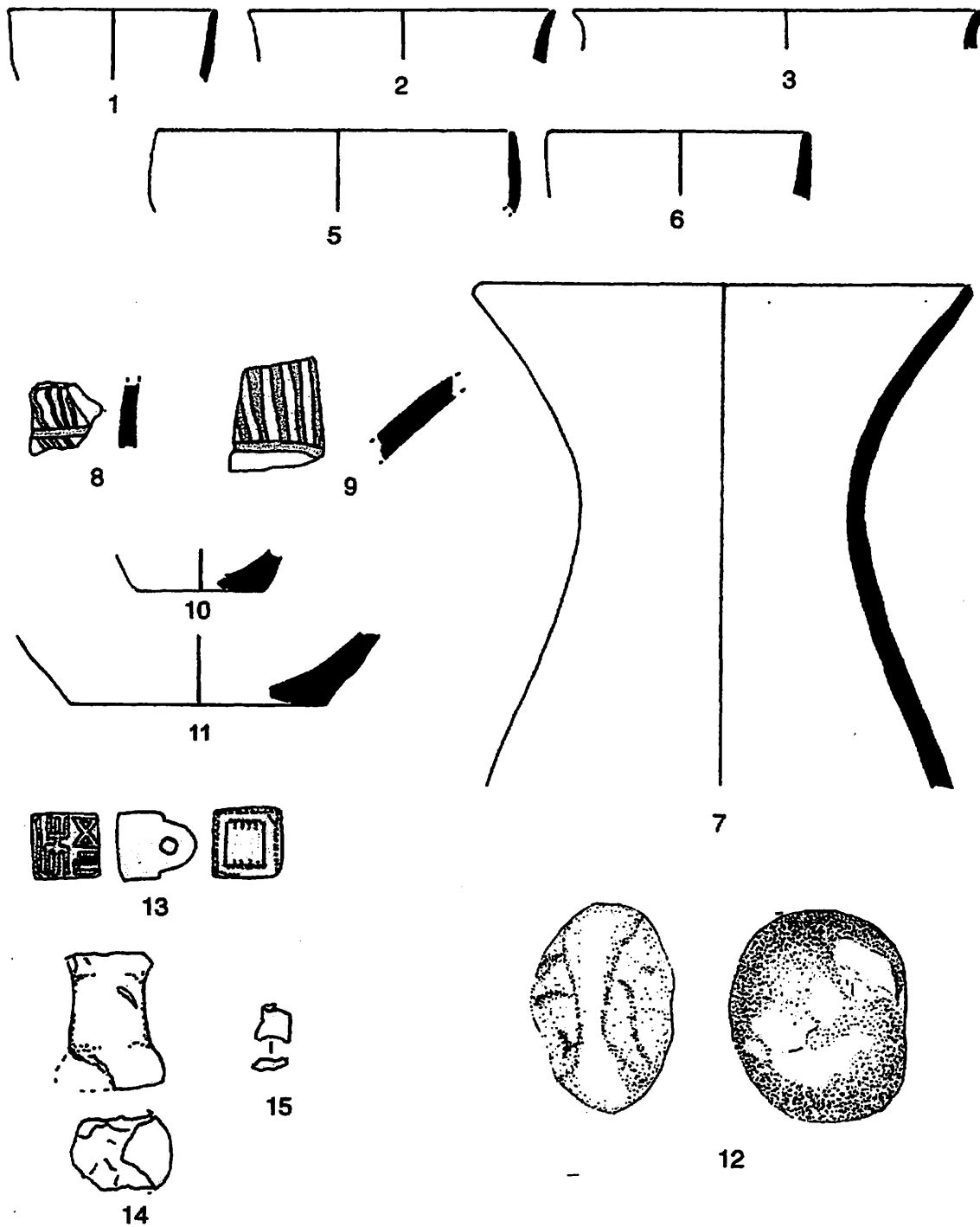


Figure 11 AS/2 finds
(locus 221)

1-7, 10, 11, fine wheel made local ceramics; 8-9, fine wheel made ceramic sherds painted in the late Namazga IV tradition; 12, stone polisher; 13, jet stamp seal; terracotta figure; 15, bronze or copper fragment.



Figure 12 Photo of niche

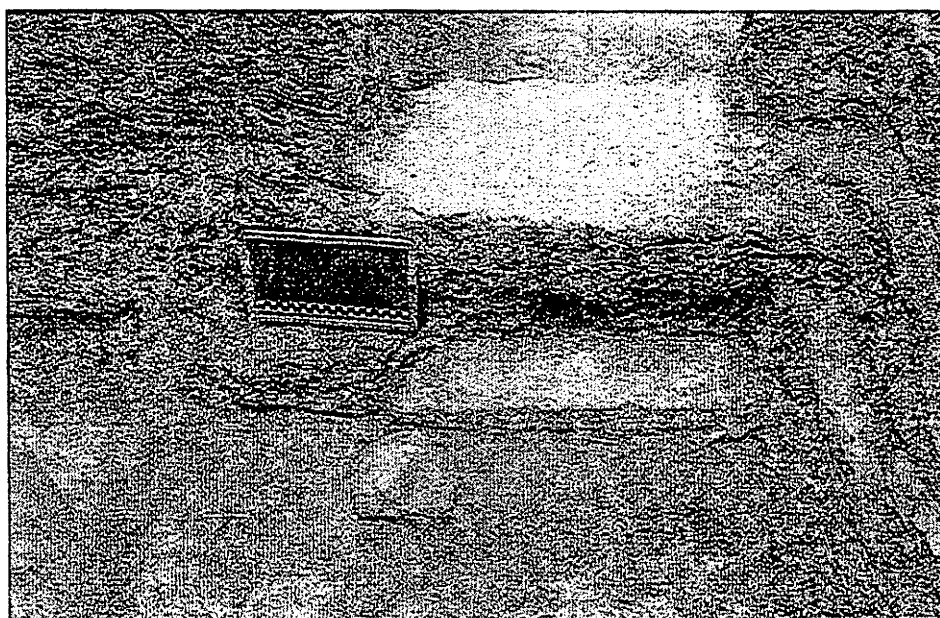


Figure 13 Photo of the threshold

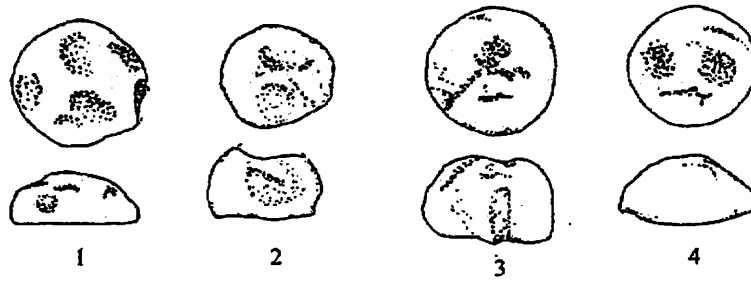
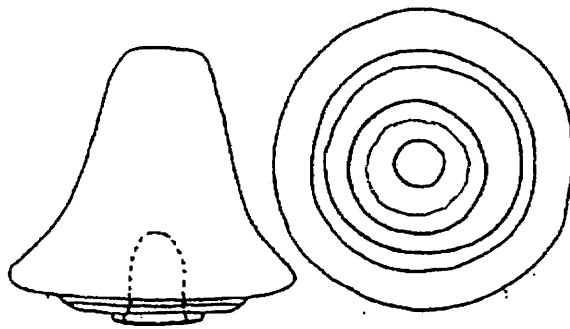


Figure 14 Clay lumps from AS/2



A. 1904 excavations, SK 73, terracotta



B. 1904 excavations, 401, steatite



C. 1904 excavations SK 170, turquoise

D. 1904 excavations, SK 105, alabaster

E. 2000 excavations AS/2 221, jet

Figure 15 Seals from Anau



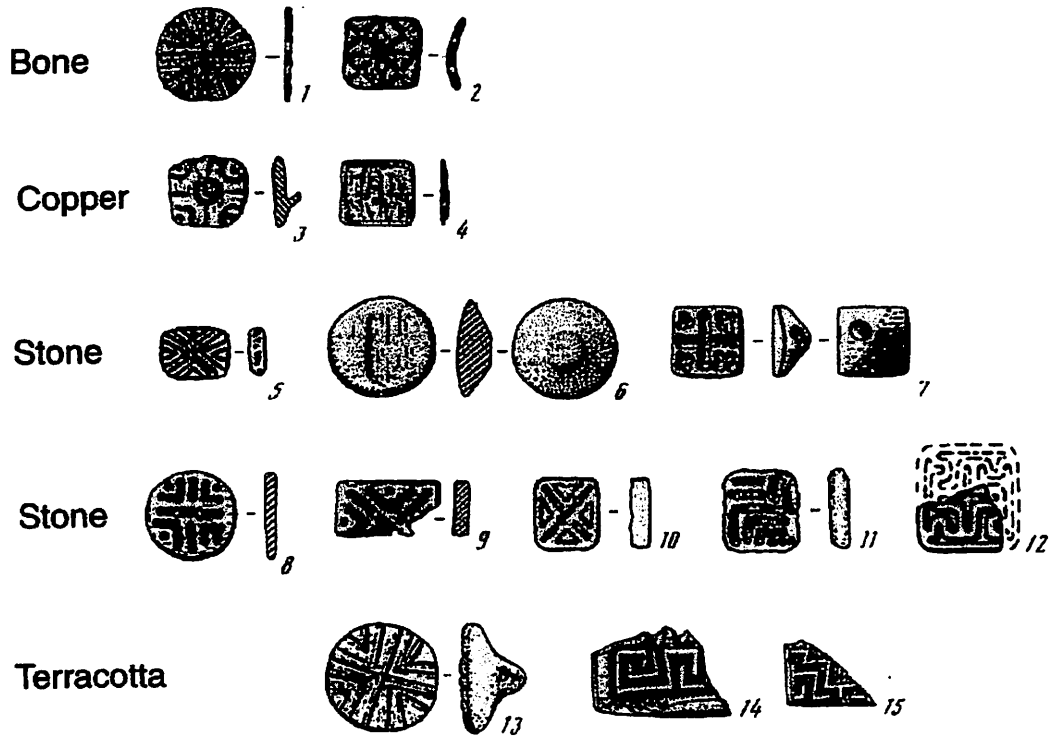


Figure 16 Seals from Altyn depe .

0 5 cm

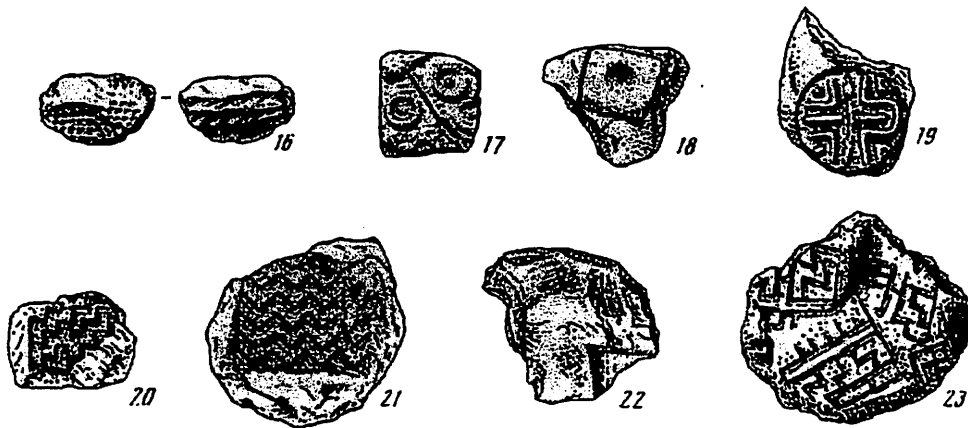


Figure 17 Sealings from Altyn depe

Adapted from: Masson, V. M. and L. B. Kircho
 1999 Izuchenie kul'turnoi transformatsii rannezemledel'cheskikh obshchestv: po materialam novikh raskopok na Altyn-depe i Ilgynly-depe. *Rossiiskaya Arkheologiya* 1999(2):figure 4.

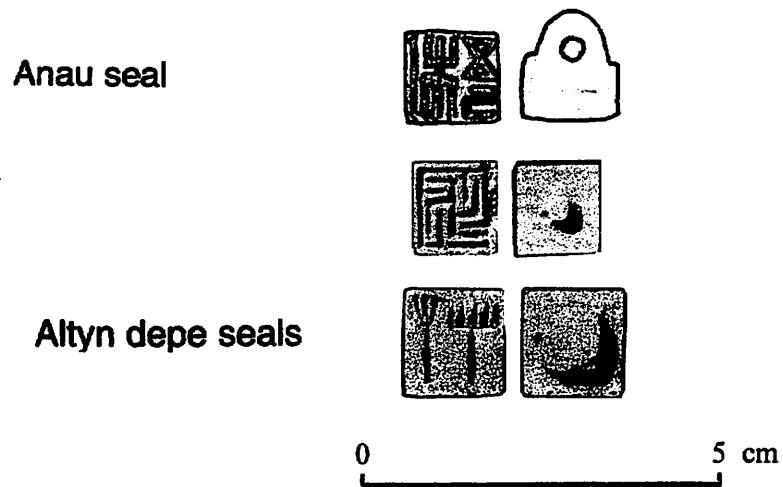
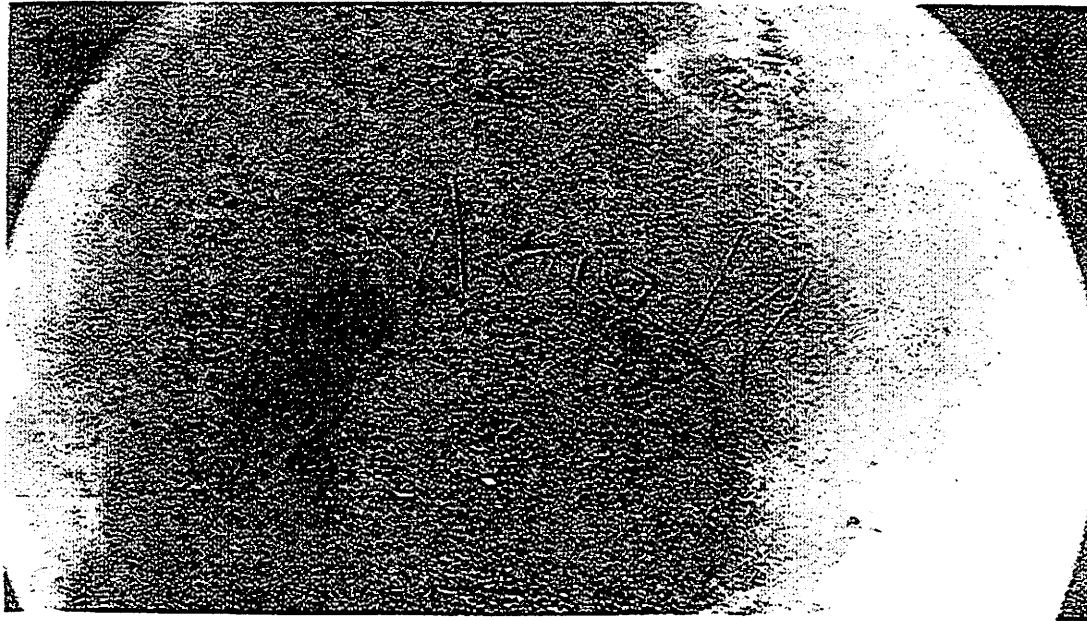


Figure 18 "Harappan" seals from Altyn
Adapted from: Masson, V.M. 1988 *Altyn depe*. Translated by H. Michels, University Museum,
University of Pennsylvania: plate XXII, 1a, 1b



Obj. No. 0271

Figure 19 Shahdad pot marks

Adapted from:
Hakemi, A.

1997 *Shahdad : archaeological excavations of a Bronze Age center in Iran*. IsMEO, Rome: page 193



Figure 20 Jet seal from Niyä

Remarks on the Anau and Niyä Seals

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Introduction

On May 31, 2000 Dr. Fredrik Hiebert came upon a small stone seal made of jet in the back dirt from his excavations at Anau in Turkestan (Hiebert 2000). It was encrusted in clay and by all indications it had just come from a relatively large well constructed room that had been uncovered in his efforts to examine a larger structure. It was found by his colleague, Dr. Kakamurad Kurbansakhatov, (Institute of History, Turkmenistan) from the sieving debris from unit 221 from the second rebuilding of a large room, excavation unit AS/2 (see Hiebert, this issue) and therefore should be considered an *in situ* find (Mair 2001, pp. 25-6). It bears five markings (Beeston and Davies 2001; Flam 2001; Hughes 2001; Wilford 2001): a "squared off" 2, with a rectilinear hourglass or '8' below it (taking the 2 as arbitrarily in the upper left quadrant, as Mair did (p. 10)), and to the right of these a squared double trident, three tines up and three down and on the right margin to this a vertical line, parallel with the tines, that shows a small divergent line emerging from the near the "bottom" at an angle of roughly 40 degrees. There has been some chipping at the edges of the seal that has extended into the margins of these symbols, but nevertheless their similarity to Chinese "small seal" characters is striking (Mair, pp. 1, 9, 10, 16). Such characters date from the Qin reforms of roughly 100 AD/CE (Mair, p. 34). The Anau seal, however, seems firmly dated at 2,300 BC/BCE (Mair, p. 7). Furthermore, it is more than 3,300 miles from Anau to Beijing (near the center of the old Qin kingdom). The only match to the Anau seal is a small jet seal of almost identical shape from Niyä (near modern Minfeng) along the

southern Silk Road in Xinjiang (Mair, pp. viii, ix, 19-22). Although the Niyä seal is *incerti sedis* it has generally been assumed to be from the Western Han dynasty (Mair, p. 22), when the Han people first established an empire in Eastern Turkestan. The Niyä seal too shows small seal characters, so that it must have followed Qin reforms, or so the canonical reasoning goes, and cannot therefore be earlier than the late Western Han period. The two seals are therefore presumed to be nearly 2,300 years apart in time and roughly 2,000 miles apart.

Given this reckoning the Anau seal is a perfect example of what science terms an anomaly: an incontrovertible datum that cannot be made to fit an established paradigm. An anomaly is noise in an accepted vision of the world. In this case the Anau seal simply does not fit into the accepted vision of eastern Eurasian history. As Mair so well understands (pp. 33-4) its anomalous date and distance are seemingly irreconcilable with the "natural" evolution of Chinese logographic writing. This evolution starts in the late Shang dynasty (1200-1045 BC/BCE) with oracle bone incisions, and then proceeds through bronze inscriptions, to big seal forms, and then to little seal forms (Mair, p. 33). It is as though the Anau seal had been dropped back in time by a late Han time traveler. Others will surely seek to confine the anomaly to the stratigraphy of the Anau site, invoking long vanished rodents as agents of "intrusion," that is, of archaeological noise, despite the fact that no rodent burrows were evident (Mair, p. 41). Others, to flirt with slander, might be tempted to suggest a hoax on the part of one of Dr. Hiebert's colleagues or workmen. Such a hoax in itself would be almost as extraordinary, virtually as anomalous, as the find itself for it would require that someone with minimal or no motivation would have been able to find on a local market the only other instance apart from Niyä of such a minute lignite seal, and one encrusted in the local clay as well, and that this perpetrator would have had the intellectual grasp to realize what far-reaching questions such a find would raise. Having critically perused the evidence given in Mair (2001) I concur with him (p. 38) "that the Anau seal must really date to 2,300 BCE." The Anau seal is an extraordinary find and will force us to change many of our ideas regarding Eurasian civilization, not least of which will be our understanding of the origin and evolution of Chinese writing, as Mair notes (p. 38). To begin the process of

paradigm shift two things must be done. The first is to eliminate the possibility that the Anau and Niyä seals resemble one another through pure chance. The second is to offer a new paradigm along with suggestions for further work that will support it. I now address these in turn.

Comparing Scripts

Over the past two years I have been sporadically working on a mathematical measure of the likelihood of two scripts using the same or similar symbols for the same or similar sounds. The principle is a relatively simple one of measuring the probability of two independent events (Applebaum 1996): the coincidence of two shapes. My technique involves four parts: a grid for placement (parts may go outside the grid, just as 'y' goes "below the line"), graphic primitives or "graphemes" for the shapes (the two together provide the geometry of the symbol), connectedness of the primitives (their topology, how they intersect in nodes and how they branch), and what I call the "vector" (the strategy for writing or incising the symbol). The vector is in part a function of medium, but it is crucial because it is the chief factor driving change in a symbol over time. An understanding of the vectors of a script (from studying details of incised marks or pigment densities in writing) can lend insight into how symbols have changed with time. Such insight is needed to compare graphic elements that have changed. In this study of graphic elements the vector can provide an analogue to sound laws between scripts. Furthermore, two scripts may be related without their representing the same sounds. If sound values are known, however, then they add an extra factor in calculating the probability that the two scripts are cognate at least in part. Two scripts may have a common source and yet represent very different sound systems, requiring the loss of some symbols, the addition of novel ones or the otiose use of some for clusters or diphthongs (compare the Greek use of extra Phoenician symbols for /ps/, /dz/, and /ks/).

More specifically, I start with a square onto which a symbol would be drawn. It is usually sufficient to divide this square into 9 equal zones: 4 corner zones, 4 mid-edge zones, and a center. Then a set of graphic elements are identified from the two scripts,

for example, the six graphemes: long line, short line, open curve, circle, square, and dot. Then the probability of two symbols resembling one another would consist of the probability, "P", of starting place ($P(\text{start}) = 1/9$), and of a path ($P(\text{path})$)(from $1/3$ for a corner to as little as $1/9$ for the center) and basic grapheme ($P(\text{grapheme}) = 1/6$) being identical ($1/9 \times (\text{from } 1/3 \text{ to } 1/9) \times 1/6$, because these would be independent probabilities. Then the probability if a curve or hook "sprouted" off of a line, one would have $P(\text{sprouting}) = 1/6$. This is then added to the previous product because the curve or hook would be a dependent probability, that is, it is an elaboration of or appendage to the line, and so on.

As a matter of further complication, an analysis would also draw a distinction between stylistic devices and "graphemic" ones, that is, between lines that do not matter and those that do, taking note of the fact that the stylistic devices (non-graphemic) might also serve to trace origins. For example, the South Asian scripts used for Oriya, Tamil, Telugu, Kannada, Malayalam, Sinhalese, Burmese, and Chieng Mai (Lao writing of northern Thailand), all use a curl-like base wherein small loops, matters of small breaks in a curve, or the order or sector at which curves are connected all have perceptual significance (just as a phoneme has perceptual significance in the midst of speech acoustics). One might argue that they are derived from a common model simply on the basis of their style, which seems to be the case, while their graphemic content might arise from independent invention. By contrast, one can point to the Armenian and Georgian scripts, where the former uses chiefly square shapes and the latter predominantly round ones to give very different scripts (because of different vectors), and yet the connectedness of these elements, that is the nodes and the branchings from these nodes, whether straight or curved, seem to be the basis for the graphemes. The grid, the starts, the paths, and the topology are all similar, but the vectors have created very different shapes, straight lines in one and curves in the other. These first four factors alone suggest that the scripts are related, albeit distantly, which they are, despite diverging styles. This relationship is evident when one compares the older forms of the two systems where the styles match as well.

The Chinese system, starting with oracle bones and then ranging on to bronzes, then to big seals, and then to small seals, strongly suggest another form of “nodal” system where an original schematic picture retains its contours, and topology (realized by nodes). As the logographs evolved, efficient means for drawing them led to vector changes. These changes in the vector have driven the evolution of this writing system. For example, the set of hands in *diǎn* “standards, rule, law,” holding a bound set of tablets or a “book” later join to make a base line in the bronze and subsequent forms. The late cursive forms take these trends to an extreme, so that both the original hands become a horizontal line with two dashes beneath (the wrists), while the book is represented by three intersecting loops. In the seals in question the topology of the grain sign seems to be preserved whether it is written in its seal form or in its form of an X imposed over an I: both show nodes with three branches up and three branches down. This is to be expected since the execution of these symbols, by incision into soft lignite, has not changed. Therefore, no vector change is at work to drive changes in the symbols.

Finally, for some scripts orientation and direction of the symbols are not particularly important, as with Phoenician and early European scripts derived from it. For others, it is everything, as with the Cree and Inuit scripts devised in the 19th century. Even with “late European” in the form of Latin-based writing, orientation has evolved to become critical for miniscules: q, p, b, and d. I shall take up the issue of significance again when I discuss Mair’s tentative decipherment (pp. 27-30).

Whether or not two scripts are related should therefore be mathematically demonstrable.

The Seals

Unfortunately, neither the Anau nor the Niyā seals is amenable to such an analysis simply because there are not enough symbols to establish either a spatial grid or an inventory of graphemes. To plot pictograms on a grid is to indulge mathematically in infinite variability. To calculate probabilities then yields infinitely small numbers. When more such seals are found, then such an analysis as I propose here will be feasible. In the meantime, Mair has actually hit upon the answer (pp. 21-2). The only one feasible

analysis for a pictorial or schematic logographic system of the sort that the seals seem to represent is to take an inventory of the symbols used in what seems to be a salient tradition, in this case that of the older Chinese symbol inventory, and use this as a set of choice. For example, if there are 1,000 (or more generally S) such symbols, of which the seal symbols constitute a part, then the chances of finding any one of this group in a seal or other text is $1/1,000$ ($1/S$).

For example, if there are three symbols, as in the Anau seal, then we can assume that their occurrence is an independent fact, that is that any symbol's occurrence is an independent probability. If we compare this text to another that shares two of the symbols, we again assume independence. Therefore the chances of two of these, the "ji" ('record') and the "he" ('grain') (Mair, p. 29) of the Anau seal matching two from the Niyä seal is $(1/1,000) \times (1/1,000)$ (or $1/S \times 1/S$), or one one-millionth due to pure chance ($1/S^2$). This argument is as mathematically sound as it is simple. There are only two complications that must be born in mind.

The first complication is that symbols seem to some extent to show archetypal forms: circle, circle with dot in center, vertical line, X, ranked slashes, and square, to note a few. Thus, the symbol "wu" ('five') (Mair, p. 2) is an X (or "t," which originally is an X "stood upright"), the simplest way of making a node. With this topology and a vector necessary to execute the figure with a continuous stroke, one automatically obtains an "hourglass." The hourglass occurs in Iberian inscriptions (Nakanishi 1980, p. 27), while both X and the hourglass occur in South Arabic script (Nakanishi, p. 43). I would expect both forms to be modestly frequent across the world. Accordingly, their occurrence is not as helpful in calculating probabilities as one might wish. Conversely, complex symbols are highly useful because the chances of their random duplication are miniscule.

The second complication is due to the fact that the sequence of words in a language is not random, so the sequence of symbols used to represent it should not be random either. Given an official seal showing "he," 'grain,' one should have a certain likelihood of also finding a notation expressing its officiality, "ji," as well as its number, "wu," (Mair, pp.

28-9). Simple multiplication of probabilities would have to be replaced by multiplication of expectation values. The result would be slightly higher (that is, more likely) than $1/S^2$, but still very small. Since we neither know what else was stored at Anau or Niyā nor what languages were used (and therefore the order of words), such expectation values cannot now be calculated. A calculation assuming purely random selection is nonetheless an excellent approximation.

Grain and the Details

Odd details, such as the notch on the long dash next to the "double trident," can be highly significant if the chances of notching a line are low, as they would be in a carefully crafted seal. This notch led Mair (p. 16) to the notion that the symbol may once have been continuous and that it is the sign for grain, "he." A similar small detail enabled Steven Roger Fisher (1997, p. 188) to decipher the Easter Island *rongo-rongo* boards. Fischer was aided by some reasonable assumptions about what the boards contained, just as Mair has for the seals. Mair notes the problem posed by the analogous sign on the Niyā seal (p. 30), where, however, continuity of the double trident and the "notched line" is excluded. I would suggest that although the Anau seal is chipped, it is not chipped enough to have lost a curve connecting the double trident and the notched line. I think it shows an earlier discontinuous version of what is shown at Niyā, which has both the dropping center stalk and a long side line with a notch. The double trident at Anau is "wood" or "plant," and the notched line stands for cut or harvested grain, head down on stalk. I would suggest that at semi-arid Anau stores of lumber might have been reckoned along with stores of grain and that the vertical line was a discriminating "diacritic" to contrast grain with lumber. The function of this diacritic persisted at Niyā, but in China was later subsumed into the double trident to yield a sense of grain alone. This development would have been more likely in the forested east. Contrary to his own cautious disclaimer (p. 30) Mair has in fact deciphered both seals without determining the languages used in either one! Such a success is possible, of course, with logographic writing systems because they represent the concepts of a culture rather than words of a specific language. The logographic system was capable of just such versatile multi-

lingual readings over a vast area and through a gulf of time. This versatility, as with the Chinese system, would have served to maintain its use through centuries and even millennia.

Cognate Scripts

From what I know of scripts Mair is absolutely correct in seeing a new and independent writing tradition at Anau because of the careful form of the seal signs (p. 43). Most peculiar is its lack of links to scripts or symbol inventories to the west and south. This suggests some political or cultural competition with the north and east showing room for the Anau system to spread. The Anau script is well developed. Therefore, earlier versions should come to light. This is a crucial fact, as I shall now show.

A New Paradigm, an Early IE Civilization

Mair rightly worries over the distance in time and space between Anau and Niyä - China on the other. I agree with his assessment of Hiebert's claim: that the Anau seal was found *in situ* (pp. 24-6). As Mair notes (pp. 41), photos of the site show no signs of intrusion from higher levels. If the Anau date is correct, if the Niyä seal is authentic, and if the Chinese writing development is indeed organic, then there is only one explanation for these otherwise wholly anomalous facts: that ancient China was the easternmost and latest outlier of a Central Asian culture that originated around the Oxus or the zone of the Bactria-Margiana archaeological complex (BMAC) and eventually came to extend from the Oxus to the Yangtze. A parallel pattern, on a much smaller scale, is that of Minoan Crete, which was the last outlier over a span of more than a millennium of Gimbutas' Old European Danubian based civilization (Gimbutas 1991, pp. 118-34).

The Anau seal shows an earlier form of what is found on the Niyä one, and the Anau system is clearly highly developed, as Mair states. Therefore what Hiebert has found is actually a late version of a widespread tradition. I confidently predict that Anau correlates of the Chinese oracle bones, bronzes, big seal, and small seal logographs, in this sequence, will be found lower down at Anau and at corresponding horizons across

the region. In other words by 2,300 BCE Anau was already old and its influence was to creep eastward (and perhaps northward) wave by wave over the next 2,400 years, washing up against what was to become China as the bearers of BMAC expanded eastward either directly or through cultural influence. The Qin reforms that took the big seal logographs over to those of the small seal type (Mair, p. 34), dated to the first century of the Christian era, in this new paradigm would therefore be an importation of innovations that had occurred far to the west and at a much earlier date. The Niyā seal could then likely be older than small seal logographs in proportion to its closeness to Anau. Since it is roughly a third closer, one might expect it to be a third older than the late Western Han, that is, it might be roughly 700 BCE. Furthermore, it need not be a Han artifact at all, but a local form that antedated Han expansion into the eastern area of the Silk Road by five or six hundred years. I predict that cognates of the Niyā seal will be found at pre-Western Han levels in Eastern Turkestan, perhaps within the span from 1,200 to 600 BCE.

The hypothesized delay in transmission would suggest a loose chain of states spanning the zone from Anau to the heartland of China rather than a consolidated empire wherein innovations would have been promulgated much more quickly. This is the only explanation for this intriguing and otherwise wholly anomalous constellation of facts. The search for the predecessors to the Anau symbols, that is for the BMAC correlates to the oracle bones, the bronzes, and the big seal symbols, and their intervening forms as they spread eastward (and perhaps in other directions, such as north where they would have little competition from other scripts) should become the new Holy Grail of Central Asian archaeology.

Language(s)

The languages of the seals will remain unknown until more is found, especially until some extended texts are found. Nonetheless, I would see here early Indo-Iranians or less likely a Tokharian - "Twastrian" first wave eastern IE group, Twastrians being on the heels of the Tokharians (Colarusso 1998), who formed some sort of political unity or

empire and who brought various stages of this writing, along with much else, with them as they expanded eastward.

I would ignore the Sino-Caucasian hypothesis, alluded to but not endorsed by Mair, (p. 45). It is based on shallow similarities, half of which (the Caucasian ones) are based upon a misreading of what is a very complex linguistic area (Colarusso 1998). There is no single Caucasian linguistic family as such. Caucasianists may now agree that the Northwest and the Northeast families are distantly related to one another, and probably to Indo-European (Colarusso in press;1997), but that neither shows convincing links to the South Caucasian family. The only family that might be an alternative to some branch of IE at Anau is an "extended" Sino-Tibetan based upon a distant link to Yeniseyan (Kott, Kett, Baykot, etc.), to the north of Anau. The only scenario I could imagine for a non-Indo-European Bronze Age civilization would be for an early peripheral group to have adopted Indo-European ways and to have come down into the steppes. Later versions of this sort of intrusion, however, notably the Huns, Onoghurs, Avars, Magyars, and Kitai, have always been linguistically transient, with the sole exception of the Turks. BMAC seems to have had lasting effects.

Adhering to the new Indo-European paradigm I would go so far as to say that early Sinitic civilization may be viewed as an eastern outlier of a larger Indo-European steppe culture minus the language, which left only loans in Chinese rather than replacing it or creolizing with it, as Indo-European did with other local tongues. These local tongues themselves might have been southern extensions of Yenisey - Sino - Tibetan, or of Uralic (Finno - Ugric plus Samoyedic and perhaps also Yukaghir) or of Altaic (Hunnic, Turkic, Mongolic, and Tungusic).

Summary

Given all the considerations raised by the tiny seal from Anau, I would postulate that an Indo-European civilization, most likely Indo-Iranian, arose in response to other Bronze Age cultures to its south and southwest. That it developed an early logographic writing system for tracking the trade of the ancient Silk Road, upon which it thrived and across

which its influence spread. We have unwittingly been gazing upon its oldest written elements in their late and removed manifestations as found in China. Our understanding of the histories of Chinese and of Central Asia will never be the same, but will henceforth be shaped by a sense of ancient unity far more profound than most of us ever expected. I am confident that more Anau-like seals will be found in Central Asia. Perhaps the best place to start looking for them will be in the mounds of dirt left at archaeological excavations by Soviet backhoes. The discovery of this seal by Hiebert is vivid vindication of the microscopic Western archaeological technique in the face of the more dramatic macroscopic Soviet one. Further micro-archaeological efforts will provide in due time the intellectual "critical mass" necessary to drive a paradigm shift throughout the scholarly community of Central Asian and Sinitic specialists. In the mean time, we shall simply have to settle for logic.

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Bibliography

Applebaum, David. 1996. *Probability and Information*, Cambridge: Cambridge University Press.

Beeston, Richard and Emily Davies. 2001. "First word from Asia's lost civilization," *The Times* (London), 15 May.

Colarusso, John. in press. More Pontic, Further Etymologies between Indo-European and Northwest Caucasian, in Dee Ann Holisky and Kevin Tuite (eds.), *A Festschrift for Howard Aronson, NSL. 10, Linguistic Studies in the Non-Slavic Languages of the Commonwealth of Independent States and the Baltic Republics*, Leiden: John Benjamins, (30 pages)

_____, 1998. "Languages of the Dead," in Victor H. Mair (ed.), *The Bronze Age and Early Iron Age Peoples of Eastern Central Asia. Journal of Indo-European Studies*, Monograph 26 (2 volumes), Institute for the Study of Man, Washington, D.C. and The University of Pennsylvania Museum Publications, Philadelphia. Pages 431- 447.

_____, 1997. "Phyletic Links between Proto-Indo-European and Proto-Northwest Caucasian", *The Journal of Indo-European Studies*, 25.1-2: 119-151. [Reprint of an article in Howard I. Aronson (ed.), *The Non-Slavic Languages of the USSR, Linguistic Studies: New Series*, University of Chicago: Chicago Linguistic Society, 1992, pp. 19-54].

Fischer, Steven Roger. 1997. *Glyph Breaker*. New York: Springer Verlag, Copernicus.

Flam, Faye. 2001. "Missing civilization?" *The Philadelphia Inquirer*. 30 April.

Gimbutas, Marija. 1991. *The Kurgan Culture and the Indo-Europeanization of Europe, Journal of Indo-European Studies*, Monograph No. 18, edited by Miriam Robins Dexter and Karlene Jones-Bley. Washington, D.C.: Institute for the Study of Man.

Hiebert, Fredrik. 2001. "Unique Bronze Age stamp seal found in Central Asia," *Expedition* 42/3. p. 48.

Hughes, Samuel. 2001. "The Stamp Seal Mystery," *The Pennsylvania Gazette*, vol. 100, no. 2, November/December. Pp. 34-40.

Mair, Victor. 2001. *Notes on the Anau Inscription. Sino-Platonic Papers*, no. 112. Philadelphia, Pennsylvania: Department of Asian and Middle Eastern Studies, University of Pennsylvania.

John Colarusso, "Remarks on the Anau and Niyä Seals," *Sino-Platonic Papers*, 124 (August, 2002)

Nakanishi, Akira. 1980. *Writing Systems of the World*. Rutland, Vermont: Charles E. Tuttle Co.

Wilford, John Noble. 2001. "In Ruin, Symbols on a Stone Hint at a Lost Asian Culture," *The New York Times*, 13 May.

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