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Man and environment in Prehistoric and Protohistoric South Asia:

New Perspectives

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BREPOLS

Illustration de couverture : Sibri: Architectural remains cut by a grave.

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TOWARDS A NEW CHARACTERISATION OF THE CHALCOLITHIC IN CENTRAL ASIA

THE LITHIC INDUSTRY OF SARAZM (TAJIKISTAN): THE FIRST RESULTS OF THE TECHNOLOGICAL ANALYSIS

Frédérique Brunet, Abdurauf Razzokov

The transition from the Neolithic to the Bronze Age in Central Asia, which is usually identified with the Chalcolithic or Eneolithic, still requires a further in depth investigation. Ongoing research, including those led by F. Brunet on the neolithisation processes, which take place in Central Asia between the 10th and the 3rd millennium BCE, points towards a definition of the Chalcolithic varying according to the Neolithic societies considered.

The situation is particularly complex in the valley of the Zeravshan River, which runs from Tajikistan to the palaeomeanders which are nowadays ending in the sands of the Kyzyl-Kum desert in Uzbekistan (*fig. 1*). The archaeological material uncovered at several Chalcolithic sites of this region indeed suggests the existence of contacts with different cultures from both Central and Southern Asia, even though the coexistence of these various components at the same sites is not clearly explained out. This paper will be focused on one of these sites, the agropastoral settlement of Sarazm, dated to the Chalcolithic and Early Bronze Age (4th-3rd millennia BCE) and considered as one of the precursors of the Oxus civilisation (Francfort 1994, 416), which provides a good illustration of these contacts.

Our aim will be to reflect on the characterisation of this Chalcolithic as well as to get a better understanding of these interactions at a single site, based on the technological analysis of the knapped lithic industry recovered from the four occupation levels identified at Sarazm. This analysis started in 2011 in the framework of renewed studies of the Sarazm site by the French archaeological mission MAFAC under the direction of H.-P. Francfort (CNRS-UMR7041 ArScAn) in collaboration with A. Razzokov, and in partnership with the Archaeological Institute of the Academy of Sciences in Tajikistan and the Archaeological Basis of Sarazm and Pendjikent. A large part of this material, as well as the stone, bone and clay tools, has been already submitted to a use-wear analysis by A. Razzokov (Razzokov 1994, 2008). Thus the technological approach presented today comes as a supplement and aims both at defining and reconstructing the various knapping processes, the operational sequences and the debitage management, and at providing new characterisation elements about traditions and technical know-how of the Sarazm inhabitants; lastly, it allows us to add new data to the ongoing discussion about the potential relationship with different Central and South Asian cultures.

The Neolithisation in Central Asia: towards a definition of the Chalcolithic period

In Central Asia, four main Neolithic Societies, or societies on the way of neolithisation, can be identified since the end of the 7th millennium BCE or slightly

later:[1] the well-known agropastoral society of Jeitun in Southern Turkmenistan (Masson 1971; Harris 2010), most probably in relation to the Northern Iranian Neolithic, but characterised by original features which will be further developed in later periods (Anau, Namazga); the Hissar culture in the foothills of Southern Tajikistan (Ranov 1982; Ranov and Filimonova 2008), developed from the local Mesolithic tradition, and economy of which is apparently of pastoral type, with perhaps also some traces of agricultural practices; the Atbasar culture in the forest-steppe area of Northern Kazakhstan, which has developed from the local Mesolithic, and is continued by the Botai culture for which the domestic horse seems to be known (Zajbert 1992; Levine *et al*. 2003); and the Kel'teminar culture, certainly of local origin, in the arid region of Uzbekistan. Our research on this latter in the Kyzyl-Kum desert (Brunet 2005), in the continuation of the work done earlier, especially by A.V. Vinogradov (1968, 1981), has allowed us to define better the first phase of this culture, which occurred already at the end of the 7th millennium BCE with the emergence of a pastoral-nomadic lifestyle, as well as the more recent phase of this culture (5th-4th millennia BCE), which is contemporary with the first Chalcolithic and Early Bronze Age sites in Uzbekistan and Tajikistan; this more recent period will be under discussion here.

Indeed, the Early Bronze Age is identified in these regions in the 3rd millennium BCE. The mapping of these varied Neolithic cultures, which emerge from distinct and mostly local neolithisation processes, induces us to ask how the transition towards the Bronze age took place, since in some cases, a distinct Chalcolithic phase was well identified, but, in other cases, the Neolithic itself seems to last as late as the 3rd millennium. It is suggested that the end of these regional Neolithic cultures is as varied as their beginning and development. Thus, we wish to propose the following definitions of the Chalcolithic: a relatively short or a long development during which the local Neolithic tradition evolves through the integration of new elements, characteristic from the Early Bronze age; this transformation may result from various circumstances, in which the interaction with other Chalcolithic and Bronze Age societies may have probably played an important role (Brunet 2011). For the Hissar culture, it could be suggested that the sites dating to the latest phase of this culture are in fact Chalcolithic, based on the appearance of new elements.

The valley of Zeravshan as a "communication road"

The region under study is also the one where the situation is most complicated, namely the Zeravshan valley (*fig. 1*). The Bronze Age has been recognized and numerous discoveries have provided us with a precise picture (Guljamov *et al*. 1966; Besenval and Isakov 1989; Parzinger and Boroffka 2003; Bobomullev 1997; Anthony 2007; Kohl 2007; Razzokov 2008);[2] the Neolithic Kel'teminar culture has been identified by the work of Soviet scholars and is still under study. But, the Chalcolithic is much less well documented.

In the dryer zone of the Lower Zeravshan, as well as to the West, the Kyzyl-Kum desert, our work about the groups of the Kel'teminar culture leads us to consider the Chalcolithic as a transition phase corresponding to the most recent stage of the Kel'teminar, marked by contacts with Early Bronze Age communities characteristic from steppe areas (Brunet 2005). In the Middle

1. The bibliography regarding Neolithic societies in Central Asia is limited here to the main references. The reader will find in those publications more detailed references on this topic.
2. These sites (Zardcha-Khalifa, Muninabad, Karnab, Mushiston, Dashti-Kozy, Zaman-Baba, etc.) include settlements, burial sites and tin mining.

Zeravshan plain in Uzbekistan, moving towards East, in the direction of the foothills of Tajikistan, Kel'teminar sites seem to rarefy whereas other sites, characterised by mixed cultural features, become more frequent. Among these, the site of Zhukov in Uzbekistan (Avanesova 2013) shows a lithic industry similar to the Kel'teminar one, whereas a large part of the material culture is very close to the steppe cultures, such as Afanasevo. These mixed assemblages, part of which has been used to suggest the attribution to the Chalcolithic, have however not received a proper explanation regarding the coexistence of heterogeneous features.

Further to the East, on the Tajik territory, the proto-urban Sarazm settlement (ca. 3500-2600 BCE) is a striking illustration of this problem. Indeed, it is representative of interactions between different cultures, of both Central and Southern Asia and often from remote origin, which makes its overall interpretation problematic. As a matter of fact, the existence of relationships with cultures from varied origins is now demonstrated from Southern Turkmenistan to the Indian Ocean as well as from the Eurasian steppes as far as Siberia (see Isakov and Lyonnet 1988; Casanova 1999; Isakov 1991; Lyonnet 1996; Razzokov 2008).[3] On the other hand, the analogy with the Kel'teminar culture has only been suggested by some scholars and there is no general agreement on the subject (Lyonnet 1996, 59). Beyond these allochtonous components, the original features of the Sarazm material culture still need to be elaborated into a proper definition.

The technological study of the knapped lithic industry, which had not yet been done for this type of material at Sarazm, now completes the observations made on other types of remains (pottery, heavy stone equipment, metal, adornment) from this site, in order to shed light on this question of a local Chalcolithic and the links with many others Asian cultures. We focus here on some of the recent and preliminary results yielded since 2011 by this analysis.

The context of the knapped lithic industry of Sarazm

The site of Sarazm is located on one of the alluvial terraces of the Zeravshan River, at an altitude of 910 m. The site surface is estimated at 50 to 150 hectares depending on the scholars. Archaeological deposits are largely eroded and preserved on a maximum of 2 meters. Since the discovery of the site in 1976 by Abdullah Isakov, several excavation campaigns have taken place, under the direction of Isakov and then R. Razzokov, who is still in charge of the site, in collaboration (since the 1980s) with French and American teams.[4]

Our study included 592 pieces, i.e. the whole flintknapped lithic material of Sarazm.[5] A third of these pieces have not been marked, but for the blade debitage products, the percentage reaches over the half of the total. Nevertheless, considering the pieces for which contextual information is available, it appears that this studied assemblage came from all the trenches and soundings

3. For example, the comparative study of the pottery suggests long-distance relationships with the following sites: Ilgynly-depe, Geoksijur, Jalangach, Chong-depe, Namazga, Kara depe, and Ak depe in Turkmenistan; Tepe Hissar, Tureng Tepe, Shah Tepe, Sialk, Konar Sandal, Shahr-i Sokhta in Iran; Kavat 7 in Uzbekistan; Mundigak and Taluqan in Afghanistan; Mehrgarh, Anjira, Amri, Quetta, Togau, Kechi Beg, Sur Jangal, Kili Ghul Mohammad, Miri Qalat, Shahi-Tump, and Nundara in Pakistan.

4. We do not present here in detail the site, nor the history of research, since it is treated in another paper (Mutin B. *et al*., this volume).

5. This study did not include the few tools made from agate and cornelian pebbles, nor the pebble tools from non-siliceous rocks.

excavated since 1976 at Sarazm; there are also random surface finds (12% of the marked pieces). Thus, the spatial distribution of the documented finds suggests that this collection covers the whole occupation of the Sarazm site (as we know it today). It is also possible to notice that the studied lithic assemblage covers all the periods of occupation: four (maybe five) main successive periods, which have been defined at Sarazm, covering a time span from ca. 3500 BCE to 2600 BCE (Isakov and Lyonnet 1988; Besenval and Isakov 1989; Lyonnet 1996); the last period might even be extended to the end of the 3rd millennium. This framework relies mainly on the relative chronology derived from the study of pottery and archaeological structures. It appears that the proportion of marked pieces varies according to the period, but it is important to note that this distribution is similar for other materials, such as the pottery sherds. In any case, this chronological distribution should be considered with caution since the attribution to one or more periods concerns only a part of the trenches. The study of potential refitting might allow us to shed light on the spatial and chronological relationships between the different trenches.

Beyond the recognition of allochtonous elements in the knapped lithic industry, and of the definition of the technical identity of the Sarazm knappers, this technological study aims at reconstructing and characterising the operational sequences or "chaînes opératoires" implemented on the Sarazm site, as well as the aims of the production, the technical know-how and traditions, and the exploitation strategies and management of raw materials. That is why we took into account each element linked to the knapping phases: core, preparation or rejuvenation flakes, debitage products, tools and débris. The study will indeed continue allowing us to complete or refine the preliminary results presented here.

The lithic raw material economy

At least fifteen different raw materials have been identified. They include mainly flint and chalcedony rather homogenous and fine grained, which were used mainly for flakes, blades and bladelet debitages; to these we should add some metamorphic rocks more or less fine grained and rock crystal used both for these debitages and for the fashioning of leaf-shaped points, and more rarely chert and quartzite sandstone used mainly for bifacial pieces. We note that the very good quality of raw material has been selected for the blade and bladelet debitage; flake debitage, leaf-shaped points and bifacial pieces show a greater variety of raw materials.

The origin of all these raw materials remains difficult to determine, unlike the provenance of semiprecious stones and metals which have been intensively investigated in Tajikistan (Besenval 1987, 452-455; Besenval and Isakov 1989, 18; Razzokov 2008, 11-15). Nevertheless, rock crystal outcrops and sources of chalcedony are known at a few hundred kilometers from Sarazm and the metamorphic rocks are characteristic from the uplands and mountainous parts of Tajikistan (Razzokov 2008, 15-17). It is also possible that quartz and sandstone come from sources located around the site, although no source corresponding exactly to the rocks used at Sarazm has been found. As to the other raw materials, there are arguments to suggest the following hypotheses. The presence on the site of tested nodules, and partially prepared cores, or pieces derived from the initial core preparation, indicates a local origin for the raw material considered; we can assume that is also the case for the expedient debitages. On the contrary raw materials attested on the site exclusively in the form of finished products or only by one or two pieces raise the question of their origin. Of course, it is important to stress the lack of data about the on-site activities of knapping or fashioning, since the excavated areas remain limited compared to the

total site surface. Lastly, some raw materials are markers of particular cultures or regions; it may be the case, at Sarazm, of two of them (see below).

It is thus obvious that the supply of raw materials at Sarazm is a varied one, mostly local, but the hypothesis about the presence of several allochtonous rocks is almost certain; and it still needs to investigate the acquisition strategies.

The "chaînes opératoires" and the management of the debitage blanks: an overview

In the whole collection, six distinct "chaines opératoires" have been identified (*figs. 2-4*); these are, by decreasing order: CO1–a flake production resulting from three methods in order to obtain various flake shapes (about 25%, periods 1-4); CO2–a production of narrow and relatively short blanks, such as bladelets and microblades (about 18%, periods 1-4); CO3–a production of long products, often large, such as blades and to a lesser extent bladelets (about 10%, periods 1-4); CO4–the fashioning of various types of small leaf-shaped points and arrowheads (about 5%, especially periods 1-3); CO5–the fashioning of big bifacial pieces (about 4%, especially periods 2-4); CO6–the fashioning of original objects that some scholars interpret as an artistic expression (about 1%, especially trench 5). Not all these chaînes opératoires are closed and separated processes; we note the re-use of bladelet cores for the production of flakes (CO2>CO1), the re-use of flakes from the core preparation (CO2 and CO3->CO1), and the possible re-use of blades for the fashioning of leaf-shaped points (CO2 and CO3->CO4). There are also some pebble tools (1%) but we won't deal with them here.

About 38% of debitage blanks are modified by a retouch; the majority of the blades and a large part of the flakes were selected for this purpose which is not the case of the bladelets (*figs. 2-3*). Only five tool concepts were identified, according to the type of the retouch. First, the scrapers, which are predominant on each type of blanks; it is a rectilinear straight, short, semi-abrupt or low retouch. The extent of this retouch is total or partial on one or the two edges of the blank, in order to modify the active part of the tool or the part inserted in the handle. Usually, this tool concept is associated with another one: an end scraper or sometimes a notch. Second, we note some partial denticulates and notches located in one edge of the blade or the flake; it is a semi-abrupt retouch and its extent remains short. Third, several end scrapers were also found on blades and flakes; in this latter case, it is a semi-peripheral retouch. Fourth, few perforators on microblades, bladelets and flakes are noticed too. Lastly, we observed on bladelets and flakes, angle single burins on unretouched debitage surface. Some cores were modified by a retouch; in the most cases, it is a scraper, a denticulate or a perforator. It is worth mentioning that many flakes show several stages of retouching, some of which aiming at shortening the blank. Moreover, a large part of the flakes are splintered pieces.

Reconstruction of the chaînes opératoires[6]

The first chaîne opératoire (CO1) is a local production, which aims at producing flakes of various forms, from a raw material of good to medium quality (*fig. 2*). The technique used is

6. We propose to have a closer look at the chaînes opératoires, even if the detailed reconstruction of the chronology of technical gesture cannot be presented here exhaustively.

direct percussion using both hard and soft hammers. The cores are made from small pebbles or big flakes (by-products) resulting from the shaping-out of the blades cores of the second and third chaînes opératoires. The knapper has made a debitage quite organized, in which the obtention of the flakes follows a method adapted to the morphology of the flakes he wishes to obtain: discoid or centripetal recurrent flaking method for circular or quadrangular shaped flakes; unipolar or orthogonal core reduction method for elongated flakes or points. We observe either un-prepared cores for expedient flakes, according to the technical possibilities offered by the nodule, be it flakes or small pebbles (raw material often of medium quality); these cores are usually quickly exhausted and produce only a small number of flakes. The removal of the flakes was made preferentially on one face. In some cases the debitage proceeds on one more surface, in the case of the discoid cores, or on several other smaller surfaces in order to remove the last flakes. The rejuvenation phases are not frequent, and the size of the blocks is usually small, so that the core is discarded when the debitage potential is exhausted. Lastly, some bladelet cores are re-used, and often exhausted through an expedient exploitation, in order to recover elongated flakes by using the ridges of the previous bladelets on the cores. Flakes modified by retouch include all tool concepts defined before.

The second chaîne opératoire (CO2) aims at producing small blanks, narrow (width: 5-9 mm), and relatively short; these are bladelets, obtained from small prismatic single-platform cores by indirect percussion,[7] and by pressure for the smaller products (*fig. 3*). Different technological arguments, such as the raw materials used for this debitage, the existence of rejuvenation stages (documented by core-rejuvenation flakes, partial crests, etc.), lead us to suggest that debitage activities took place on the site. A few flakes resulting from preparation stage of cores were re-used for expedient production of irregular microblades. All the blanks produced and modified by retouch document the complete set of tool concepts defined before. Some very regular microblades, made up from the same raw material, have been removed from "bullet-cores" by pressure with a short hand crutch in a sitting position; such kind of microcores (two pieces) is known among the assemblage but unfortunately without any stratigraphic context. This debitage involves specific and complex technical skills ranging from the preparation of the core to the removal of the products, thus suggesting the existence of another chaîne opératoire; at the present time, the number of pieces is too limited to corroborate this assumption. This kind of debitage is particularly well-known for Mesolithic and Neolithic in Central Asia (Brunet 2003, 2012).

The third chaîne opératoire (CO3) aims at producing large and long blanks, either blades (width: 13-15 mm)[8] or bladelets (width: 10-12 mm), by pressure and by indirect percussion (*fig. 3*). They have been removed by mostly unipolar core reduction method and mainly with a regular knapping rhythm after a shaping-out of the core with at least two crests (frontal and postero-lateral). The use of the indirect percussion technique shows original characteristics in order to produce thick and large products, and the skills are sufficiently mastered so that the knapper took some risks. This production leaves open the problem of the working place: cores are absent, and we have mainly the finished products. Thus, these phases of the process might have taken place outside the excavated areas, or even outside the site. However, the presence of semi-cortical flakes made up from one of the raw materials used for this debitage induces us

7. In some cases, a few bladelets were removed too from an opposite, secondary platform.

8. Two blades, from the surface collection, show a width ranging from 20 to 28 mm; we might thus question their integration in this chaîne opératoire, since their removal requires a specific technical know-how.

to think that the source of this material is not too far away from the site. Due to the technical skills required by such a debitage, the hypothesis of a specialized knapping area—not to mention the possibility of specialized knappers—should be considered. On the blanks obtained from this debitage, the knappers aim at producing one type of tools: scrapers, simple or double, mostly associated to an end scraper.

The fourth chaîne opératoire (CO4) corresponds to the fashioning of small leaf-shaped points and arrowheads (length ranging from 45 to 75 mm), made on different raw materials (flint, chalcedony, metamorphic rocks, quartzite sandstone, rock crystal) of good and very good quality (*fig. 4*). Their shapes vary, but we note the recurrence of a pointed extremity and a straight or rounded base, sometimes also slightly pointed; tanged or shouldered points are completely missing. The retouch is either semi-abrupt and slightly scaled, or, in the case of plane points, low or parallel, thus creating a slight denticulation of the edge, further reinforced by a short low retouch. This retouch is covering and, in most cases, made by pressure. In some cases, it seems associated to a heat treatment. For half of these pieces, whose raw materials are the same as those used in the other chaînes opératoires, blades or flakes might have been used as blanks. This would point towards a local fabrication manufacturing of these pieces.[9] The other half of these leaf-shaped points are made up from new raw materials; we can hypothesize that they were made either outside the excavated area, or outside the site.

The fifth chaîne opératoire (CO5) includes very long and wide bifacial pieces (at least 160 mm), sometimes of quadrangular shape, with rounded extremities, fashioned by the same technique; in one single case, it is a narrow plano-convex bipoint (*fig. 4*). The retouch is covering and well-made (semi-abrupt or low and parallel), through many successive stages; it is made in most cases by pressure. Fashioning pieces of this size and regularity, some of them very thin, from a raw material sometimes very grained, namely quartzite sandstone, requires mastery. Almost all of them are broken, thus incomplete; it would be important to determine if the break happened during the fashioning, which is a frequent accident when the know-how is insufficiently mastered or, if it was the result of using the piece.[10] Another remarkable feature of these pieces is the raw material: as a matter of fact, it is specific to this production and it is attested exclusively by these finished products. This raises again the question of the origin of the pieces, as well as of localization of the manufacturing area.

Last but not least, five amazing pieces made up from the same raw material as some leaf-shaped points (a black metamorphic fine-grained rock) have been described by scholars as "horns" (Razzokov 2008, 74), referring to the shape of argali horns; they correspond to the sixth chaîne opératoire (CO6) (*fig. 4*). We will not discuss here the value, certainly not functional, of these pieces; the microwear study did not allow identifying traces of use (Razzokov 2008, 75). We only wish to stress that the technique used to fashion these pieces, i.e. a covering semi-abrupt retouch made by pressure in order to create a biconvex shape as well as a short denticulated retouch very regular on the edges, was used intentionally in order to obtain a particularly realistic morphology, if this is indeed a representation of argali horns. Thus we can properly speak of flint sculpture.

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9. The lack of flake resulting from the fashioning of these pieces in the assemblage results mainly of the non-systematic sieving of sediments.

10. The study of broken parts, with the naked eye, does not show diagnostic traces.

Local vs allochtonous productions: Sarazm as a craft or trading centre?

This preliminary technological analysis of the Sarazm lithic industry already allows the identification of several local productions. First of all, this is the production of flakes (CO1) as well as of bladelets and microblades (CO2). The small number of microblades and more generally of very small pieces, as well as the absence of microliths, retouching and fashioning flakes, might be explained out either by the non-systematic sieving of sediments, or by the ignorance of the working areas where these operations took place. We hope indeed to fill in this lacuna in a near future. Blade and bladelet debitage by pressure and indirect percussion (CO3) might also have taken place at the site or in the neighborhood. Part of the leaf-shaped points (CO4), namely those made on blanks from chaînes opératoires 1 to 3, might also have been fashioned on the spot. Finally, the "horns" (CO6) might also be made locally, all the more since the retouch technique used is similar to the one documented by several leaf-shaped points.

The existence of chaînes opératoires whose main steps could have taken place in several distinct locations, as well as the presence of different technical know-how, might be considered. For example, in the case of the blade debitage (CO3), which requires a high level of skill, we can suggest: the shaping out of the cores and the debitage in one specific area, maybe a workshop; the use or transformation of the blanks in a domestic area, as demonstrated by the excavation record. Even if the productions considered here are the result of the activity of different knappers, the homogenous character of the tool concepts and the retouch style on all blanks removed from these productions, point towards the expression of one and the same tradition in this specific sphere. It might suggest a discrepancy between domestic areas and specific working areas.

The results already obtained are intriguing. The presence of a debitage of flakes, as well as the presence of leaf-shaped points and bifacial pieces fit well with what have been observed previously at other Chalcolithic sites, or even on Early Bronze Age sites in Central Asia. However, Sarazm is clearly a different case, since the blade and microblade debitages remain important and indicate a high level of technical skill. It is also important to keep in mind that in Central Asia these types of production are characteristic of Neolithic, even more ancient cultures, and are generally completely missing or very little attested at Chalcolithic and EBA Central Asian sites. Sarazm would thus illustrate the continuation or survival of an ancient technical tradition in its lithic industry. Whether this is a tradition peculiar to the Sarazm inhabitants remains an open question. Further field work might confirm these hypotheses. Moreover, precising the find context of these productions might help us better determining their chronology and understanding if these chaînes opératoires, which document a different technical know-how, are contemporary or not.[11]

Part of the answer to the questions might lie with the local socio-economic context of Sarazm, since the knapped lithic industry sheds light on a peculiarity of it. Indeed, the use-wear analysis (Razzokov 2008, 104-118)[12] attests that the flint artifacts were used mainly for hunting and butchering activities and for other animal material working (fur, leather, bone). Moreover, almost all the leaf-shaped points and the blades and bladelets were used, as well as a large part of bifacial pieces, which may explain the significance of these productions at Sarazm.

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11. Indeed, when the excavation where the piece was found can be identified, the chronological attribution remains problematic since the dating of each occupation level or archaeological structure differs according to scholars or is missing.

12. This analysis was based on the pieces from sectors 2, 3, 4, 5, 6, and 9 and on the surface finds.

Among the preliminary results of this technological study, an important point is the analogy —which needs to be further investigated— shown by several pieces of the Sarazm assemblage with cultures of Neolithic to Bronze Age sites located in the steppe to arid zones of Central Asia, both in the West, in Uzbekistan, and in the North, in Kazakhstan. Thus it comes as no surprise if the stronger elements of theses analogies are related to the leaf-shaped points and bifacial pieces, which are particularly well represented in the Eurasian steppes from the Eneolithic to the Bronze Age. We will only present two suggestions.

The first one is represented by a white flint leaf-shaped point (*fig. 4*). It is perfectly identical, morphologically but also for the technique and raw material used, to those fashioned in the Neolithic Kel'teminar culture during its most recent phase (Vinogradov 1968; Brunet 2005, 93, 98). This result supports the hypothesis of links with this culture suggested by some scholars based on the presence of some rare pottery sherds (Lyonnet 1996, 59). But, unlike these sherds, this lithic point is really typical of Kel'teminar. So, the question is how this piece came to Sarazm: was it imported by means of trade or exchanges? Or, did it arrive on the site along with bearers of the Kel'teminar culture, whose presence has been recognized not far from Sarazm and all along the Zeravshan valley?[13]

The second case we would like to mention is the bifacial pieces made of grey quartzite sandstone found at Sarazm (*fig. 4*). They are similar to those found in great number at several sites of the Southern and North-Western Kazakhstan,[14] as well as on the plateau of the Ustjurt, where they are associated to blade and bladelet debitage performed on the same raw material; one could even see an analogy between these pieces and those from Siberia. We would not go as far as suggesting that this might be an indication of contacts with Afanasevo groups. Nevertheless, these pieces show a connection between Sarazm and the steppe area. We can only regret the fact that the majority of these pieces cannot be securely attributed to a precise occupation period at Sarazm, in particular with the most ancient period of the site,[15] to the exception of three pieces which seem to have been attributed to the two first periods.

On the other hand, analogies with the world of Southern Asia which are clearly identified on the basis of the Sarazm ceramic material but remain to date uncertain if we look specifically at the knapped lithic industry. However, one element in this material, namely the leaf-shaped points with covering retouch, might confirm these analogies. Several of these, made from various raw materials have been recovered from some Chalcolithic and Early Bronze Age sites in Southern Turkmenistan (cf. Jalangash, Geoksijur, Altyn-depe; Sarianidi 1965; Korobkova 1969; Skakun 2003; Masson *et al*. 2008), Afghanistan (cf. Mundigak; Casal 1961) Iran (cf. Shahr-i Sokhta; Lamberg-Karlovsky and Tosi 1973; Salvatori and Vidale 1997), Balochistan and Pakistan (cf. Rehman Dheri; Khan 1979). Even if finds from these sites do show morphological similarities with the Sarazm points, obviously a close technological analysis would allow us to formulate a new characterisation for these finds, and help us to elucidate the potential links between Sarazm

13. For example, at the site of Zhukov in Uzbekistan. We owe special thanks to Nona Avanesova for inviting F. Brunet to examine the lithic material from this site; this preliminary examination allowed us to affirm the presence of many Kel'teminar features in this lithic industry.

14. Observations made by F. Brunet based on the technological study of lithic material from different sites in Kazakhstan, with the permission of Prof. Dr Z. Tajmagambetov (Al-Farabi National University KazNu, Almaty, Kazakhstan). We express all our gratitude to him for this possibility.

15. Indeed, the tomb of the circular funerary enclosure in trench 4 (Period I) is attributed to the Chalcolithic Afanasevo culture.

and Southern Asia lithic material. Indeed, the fashioning by pressure retouch was not usually used in the Indo-Iranian borderlands. Moreover, some of these points are apparently allochtonous, such as those from the site of Mehrgarh (Lechevallier 2003, 128, 148); but, at this site, the red jaspoid flint (used at Sarazm for many large bifacial points) is used for other stone productions.[16] We thus intend to continue this line of investigation.

Finally, no link can be recognized either, in the present state of research, with the Neolithic Hissar culture in Tajikistan, to the exception of a shared use of some metamorphic rocks.

Conclusion and perspectives

Among the most important craft activities at Sarazm, both for the number and the variety of pieces produced, stone working is crucial, for the fabrication of semi-precious stones adornment, for ground stone implements, as well as for knapped industry. The stone is such an important raw material at Sarazm that even artistic pieces are made up from flint. A part of stone working activities seems to have taken place in a domestic context. Nevertheless, the results of the present study show that there might be specific knapping areas linked to certain types of blade and bladelet productions. The same kind of hypothesis had already been formulated for metallurgical activities at this site.

The study of knapped lithic industry shows a more restricted network of relationships than the pottery, as well as privileged links with the Eurasian steppes. These long distance links can be understood in different ways: importation of blanks, travelling craftsmen, exchange of raw materials and finished products. The hypothesis of Sarazm as a centre for the exploitation of mineral resources, in particular for the production and control of metals, or as a trading centre, is reinforced by this study.

It also brought to our knowledge new characterisation elements about traditions and technical know-how and contributes to a definition of the technical identity of the Sarazm inhabitants, a question that seems to receive no clear answer on the basis of the ceramic material. Indeed, there are true local traditions identified through more than one production type at the site of Sarazm, even though the production area of some of them still awaits to be discovered by excavations. Among the various productions identified, the importance of blade, bladelet and microblade productions would attest the continuation of an ancient tradition. The presence of a Kel'teminar leaf-shaped point in this industry seems to further strengthen this hypothesis even if it is difficult to understand if this site saw the coexistence of different groups, for reasons still unknown, or was contact areas. Sarazm is in fact one of the rare sites in this valley that contribute to answering these questions.

Further investigations should aim at identifying or confirming the sources of raw materials, as well as at surveying the region in order to localize potential intermediary sites between Sarazm and other major sites. As to the research on the site itself, further excavations will hopefully bring to light new data on the relative chronology of the productions already identified as well as refine our understanding of the internal organization of the production activities.

16. Vincent Marcon (CNRS-UMR 7055, Nanterre), personal communication.

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Fig. 1—The Zeravshan Valley, Tajikistan and Uzbekistan: location of the main Neolithic and Chalcolithic sites.

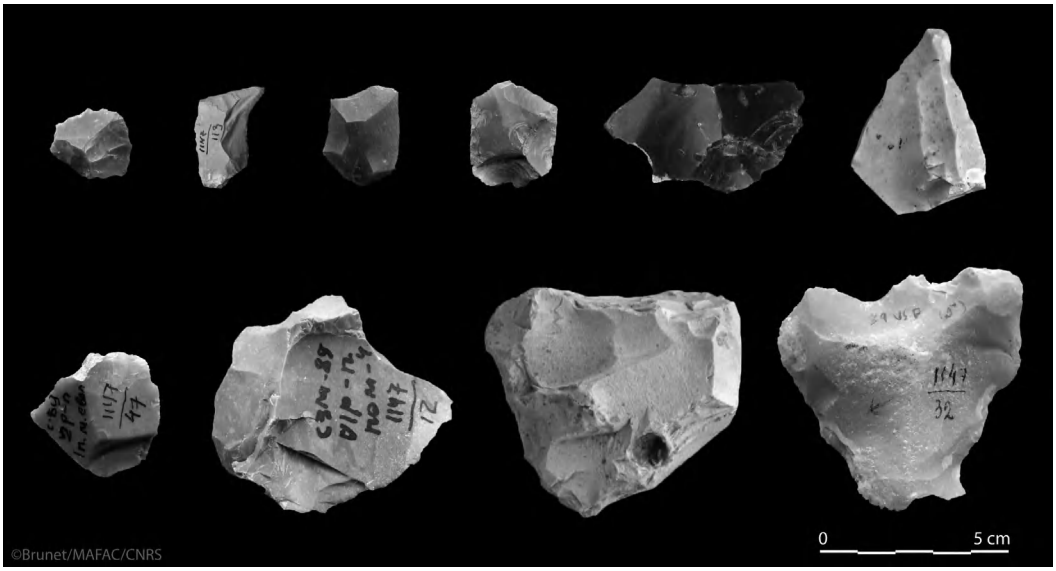

Fig. 2—The knapped lithic industry of Sarazm, the CO1: unretouched and retouched flakes; cores.

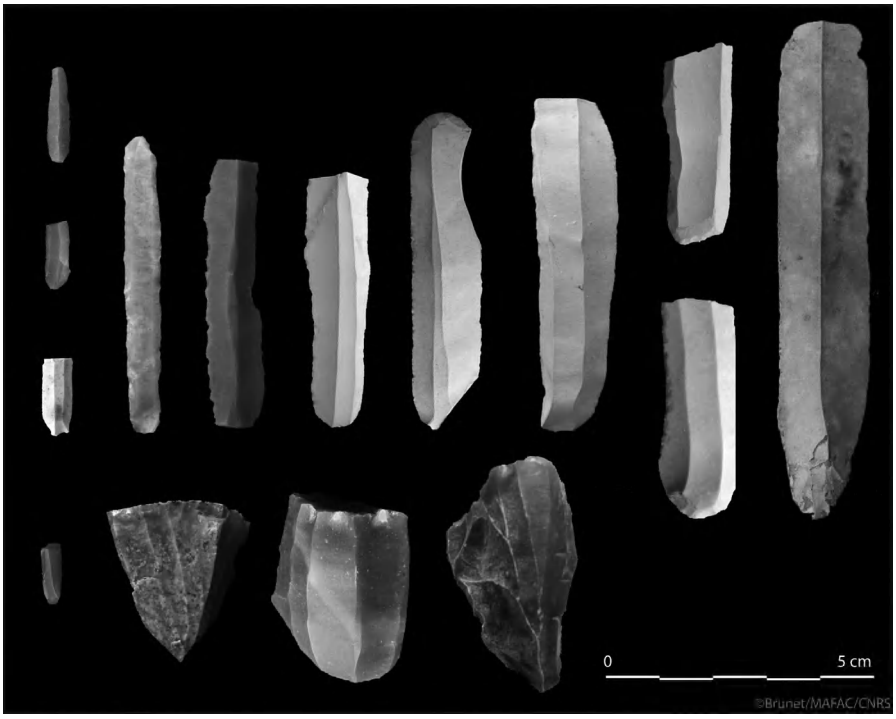

Fig. 3—The knapped lithic industry of Sarazm, the CO2, and CO3: unretouched and retouched blades, bladelets and microblades; cores.

Fig. 4—The knapped lithic industry of Sarazm, the CO4, CO5, and CO6: leaf-shaped points and arrowheads; bifacial pieces; the "ibex horn".