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# The late prehistory of the northern Iranian Central Plateau (c. 6000–3000 BC): growth and collapse of decentralised networks

Massimo Vidale, Hassan Fazeli Nashli, and François Desset

## Zusammenfassung

Die späte Urgeschichte im nördlichen Iranischen Hochland (um 6000–3000 v. Chr.): Wachstum und Zerfall dezentraler Netzwerke

*In den letzten Jahrzehnten ist es gelungen, mittels Siedlungsuntersuchungen, stratigrafischen Ausgrabungen, Crossdating, Seriation und <sup>14</sup>C-Daten eine neue absolutchronologische Abfolge für die Fundstellen der späten Urgeschichte im nördlichen Iranischen Hochland (Qazvin, Teheran und Kashan) herauszuarbeiten (Pollard et al. 2013). Diese Abfolge vom Neolithikum bis zur Frühbronzezeit ist die bisher verlässlichste für die späte Urgeschichte im Iran. In diesem Beitrag werden wichtige Einschränkungen und Unterbrüche in den Siedlungsabläufen den Erkenntnissen zur Subsistenzwirtschaft, der materiellen Kultur und den wichtigsten archäologisch fassbaren Technologien (Metallurgie, Keramikherstellung, Perlenherstellung und Steinbearbeitung sowie administrative Abläufe) gegenübergestellt. Des Weiteren werden Regional- und Fernhandelsmuster untersucht. Der Handel mit wertvollen Exotika sowie relativ fortgeschrittene Handwerks-techniken, die möglicherweise darauf abzielten, die zunehmende Anzahl an sozialen Unterschieden zu unterstreichen, zeigen keinen Zusammenhang mit dem gleichzeitig stattfindenden Prozess politischer und demografischer Zentralisierung. Die soziale Entwicklung im zentralen Hochland, die auf dezentralen Netzwerken kleiner bäuerlicher Dörfer beruhte, welche kurz nach 3000 v. Chr. aufgelöst wurden, standen schließlich im Gegensatz zur »urbanen Revolution« des Kopet Dagh Piemont im südlichen Turkmenistan. Dort erlebten in einer weitgehend vergleichbaren Umgebung diverse zentralisierte Gemeinwesen spätestens ab 3000 v. Chr. ihre Blütezeit und überlebten als kleinere lokale Machtzentren bis um 1700 v. Chr. Ist es möglich, die Gründe für solch gegensätzliche Abläufe herauszuarbeiten?*

## 1. Introduction

Is the state an institutional apparatus that, by expressing and preserving high levels of social inequality, ultimately promotes cyclical phases of social collapse, as T. Kohler et al. 2017 argue? Inequality involves a condition of scarcity of subsistence resources for a majority of the population, while a minority exploits a food surplus (White 1959). Surplus is produced by the majority and invested in costly, highly visible and symbolic goods reserved to the elites – material wealth that exhibits and legitimates their higher status.

## Summary

*In recent decades, settlement surveys, stratigraphic excavations, cross dating, seriation, and radiocarbon dating on late prehistoric sites of the northern plains of the Iranian Central Plateau (Qazvin, Tehran and Kashan) have resulted in a new absolute chronology (Pollard et al. 2013). This sequence, from the Neolithic to the early Bronze Age, is the most reliable for late prehistoric Iran. In this paper, important constraints and discontinuities in the local settlement processes are juxtaposed with information on subsistence strategies, material culture and archaeologically-visible key technologies (metallurgy, ceramics, bead making, lithics, and administrative practices). We also discuss regional and long-distance trade patterns. Trade in valuable exotica and relatively advanced craft technologies, intended to emphasise a growing set of social distinctions, was not linked to a parallel process of political and demographic centralisation. The social evolution of the Central Plateau, based on non-centralised networks of small-sized agricultural villages which were extinguished shortly after 3000 BC, is eventually contrasted with the »urban revolution« of the Kopet Dagh piedmont of southern Turkmenistan. Here, in a largely similar environmental setting, variously centralised polities, which had flourished since at least 3000 BC, survived as smaller localised centres of power until c. 1700 BC. Can we understand the reasons behind such diverging trajectories?*

Thus, scarcity, surplus, production, distribution, and consumption – five key parameters for investigating material wealth in a prehistoric society, and therefore social inequality and the rise of state organisations – ideally provide the main archaeological lines of enquiry.

However, the factors at play, when observed through our limited archaeological lens, become slippery and somewhat unreliable. First of all, »Scarcity is not an intrinsic property of technical means. It is a relation between means and ends« (Sahlins 1972, 5). It needs to be evaluated, not only against the natural allocation of resources and the



Fig. 1 Map of the Iranian Plateau showing the late prehistoric sites discussed in the text.

Abb. 1 Karte des Iranischen Hochlands mit den im Text erwähnten spätprähistorischen Fundstellen.

overall technological background of a society, but also against its system of social practices and values, built and adopted over time. Moreover, scarcity is defined according to conditions of absence, as a rule a hard nut to crack for field archaeology.

Similar caveats hold true for surplus. If restricted to the idea of a productive threshold exceeding a biological minimum, the category does not explain the complex role of mobilised surplus resources in actual social practices and their ideological backgrounds (see, among others, Morehart 2014; Morehart/De Lucia 2015). And surplus is also archaeologically invisible, being materialised only by its destruction to create costly artifacts and rituals, or large-scale elite buildings. As for the production-distribution-consumption chain, its visibility depends on the finding of workshop locations, spatial analysis of relevant distribution and consumption *loci*, and the discovery and stratigraphic excavation of dumps – conditions that are rarely met (at least, not all together) in most archaeological projects. This often leaves wide gaps in the required data and not a few unresolved methodological issues (e.g. Tosi 1984).

While many would agree that the Neolithic transition to agriculture and large-scale animal management, reducing the mobility of hunter-gatherers, paved the way for accumulation and social inequality (Kohler et al. 2017), the speed of this process, its environmental constraints, and the eventual impact of the complex craft technologies that became apparent during the transition to the Chalcolithic period remain poorly understood.

In one of the several inspiring presentations given at the 2017 Halle conference, R. Risch et al. (cf. Risch in this volume) proposed applying M. Sahlins' ideas about prehistoric affluent societies (Sahlins 1972) to some well-known late

prehistoric and protohistoric communities of the Mediterranean world (Halaf, Greek Neolithic, Late Bronze Age Sardinia). The latter were presented as basically egalitarian, or at least as much less stratified than others revealed by archaeological studies.

In fact, these societies have a limited record of the most commonly quoted indicators of political centralisation and social stratification. For example, the evidence of large-scale enclosures, monumental centralised installations, settlement hierarchies, and sumptuous elite burials is relatively small. But at the same time, although Risch et al. consider these small-scale communities as »poor in (absolute) material terms« they see them as »rich in time for leisure and unproductive activities«; at any rate, evidently endowed with a driving economic energy and capable of supporting very skilled crafts. Below a certain threshold, material needs would remain, with necessity prevailing over concerns of material growth. Without evidence of political and/or economical centralisation, Risch et al. assume that such communities probably engaged in large-scale collaboration, establishing extensive communication networks and widely sharing technological know-how, thus accruing substantial collective benefits.

The scope of this paper is quite ambitious: to apply similar ideas to some of the most characteristic outputs of social evolution in the protohistoric societies of the northern Iranian Central Plateau from the Late Neolithic to the early Bronze Age (Fig. 1; preliminary socio-political definitions in Peasnell 2002, 164). If local, small-sized, sedentary villages laid the foundations of an efficient rural and pastoral economy from the late 6<sup>th</sup> millennium onwards, »[...] the markers of rising complexity in the Neolithic to Chalcolithic transition include intensified herding of cattle, sheep

and goat, the cultivation of barley and bread wheat using irrigation systems, the development of long-distance trade, complex ritual activities, social differentiation in mortuary practices, specialized craft areas for increasingly standardized craft production and new production techniques such as wheel-thrown ceramics« (Fazeli Nashli/Matthews forthcoming).

Interestingly, many of the features mentioned could also be used to describe the earlier and contemporary settlements of the Jeitun Culture of the Kopet Dagh piedmont in southern Turkmenistan (Kohl 1984; Harris 2010). However, from c. 4000 BC onwards, the picture changed dramatically, with the social-evolutionary trajectories of the Central Plateau distinctly diverging from those of southern Turkmenia.

In southern Turkmenia, in the Namazga III or Geoksyur period (from c. 3200 BC onwards), networks of small rural settlements were centred around a few larger sites, like Altyn Depe, Ulug Depe and Namazga Depe, up to 30 ha in area and approaching early-urban size and organisation (Kircho et al. 2008; Bonora/Vidale 2013). In contrast, in the northern Central Plateau the largest contemporary sites never exceeded 5–6 ha on the present-day surface. In terms of architecture and material culture, they were scarcely distinguishable from the smaller habitational clusters, with the exception of some exceptionally large sites whose economic functions, however, may have been quite specialised.

While other regions of the Iranian highlands witnessed the expansion of the so-called »Uruk phenomenon« and the subsequent »Proto-Elamite« developments (Petrie 2013), the northern Central Plateau entirely missed the expected urban take-off. Its Chalcolithic settlement networks were completely extinguished shortly after the beginning of the 3<sup>rd</sup> millennium BC. Proto-urbanisation failed, in spite of the full, quite evident impact of western long-distance trade and its cultural models, and of the local – even if ephemeral – use of one or more forms of the Proto-Elamite script.

In contrast, in the Kopet Dagh piedmont, »urban revolutions« followed in different forms but with continuity, at least until the first half of the 2<sup>nd</sup> millennium BC.

Along the Kopet Dagh there flourished a chain of early cities, followed after 2400 BC by the sudden development of palatine states, without any apparent contact with the Uruk interaction spheres and no hint of formalised institutional writing systems.

In what follows, we try to track the roots of this historical divergence between the two areas, evaluating the apparent egalitarian or »trans-egalitarian« political forms developed by the Late Neolithic and Chalcolithic societies of the northern Central Iranian Plateau. As scarcity, surplus, production, distribution and consumption have still hardly been monitored in direct archaeological terms, we will proceed with:

- a systematic review of the geographical and ecological setting of settlements and their subsistence;
- their size ranking and patterns;
- evidence of elite buildings and ritual activities;
- and the role of the development of complex craft technologies, including administrative practices, in the local processes of social differentiation.

Our hypothesis is that the early Chalcolithic societies of the northern Iranian Plateau thrived economically and developed refined technologies without changing into centralised polities, while social differentiation was an ongoing process. But through which specific processes, and under what constraints?

## 2. Geography

The plains that are the focus of this paper (from east to west, Tehran, Kashan and Qazvin, see Fig. 1) belong to the north-western stretch of the physiographic district of the Iranian Central Plateau. This region, land-locked between the Alborz Mountains to the north, the great Kavir desert to the east and south-east, the Bakhtaran highlands to the south and south-west and the Zagros Mountains to the west, is characterised by an arid to severe semiarid climate, with temperature fluctuations from 50°C in summer to below 0°C in winter. The altitude gradually drops from approximately 1300 m a.s.l. in the west to around 500 m in the eastern, inhabitable inner basins, surrounded by sparse tamarisk woods.

Scarce precipitations (among the lowest recorded for the entire Iranian Plateau) are limited to an erratic five to six months' winter-spring season and follow a main north-west to south-east gradient (Ghorbani 2013, Chapter 1). Most of the rain therefore falls in the same cold, humid season, when its utility for cultivation is limited. Most of the water that permitted prehistoric settlement came from fossil natural reservoirs, and from minor watercourses draining the highlands.

Although some of these rivers are permanent, many are fed in spring by snow melting from peaks above 3000 m a.s.l. Endorheic streams discharge into salt marshes and limited, poorly drained wetlands, where they vaporise, forming salty mudflats. Soils developing at the fringe of the desert plains are generally immature, light-brown in colour and slightly alkaline, with a low organic-matter content.

Because of the continental climatic pattern, traditional human activities halt twice during the year, at the coldest seasonal peak in winter, and in the warmest months in summer. Water sources, moreover, are quite unreliable and irregular; occasional flash floods may be very destructive, and severe droughts, also very disastrous for human settlement, may happen within cycles of 10–11 years (Ghorbani 2013, 7–20).

Water scarcity, however, is tempered by the springs of fossil water already mentioned. They are generally scattered in the piedmont belts, where the shrub-dominated vegetational cover of the desert plains gives way to sparse covers of juniper, turpentine, and almond trees. All data confirm that such springs and seasonal streams were magnets for human settlement for millennia.

The highlands that surround the inner plains of the northern Iranian Plateau still undergo active uplift and denudation, as they did during the Holocene. In the piedmont belts, the interplay between tectonic activity and erosion forms series of wide, highly dynamic alluvial fans, similar to those shown in Fig. 2 (in central Zagros; see Bahrami et al. 2015). These, in turn, are characterised by cycles of deposi-

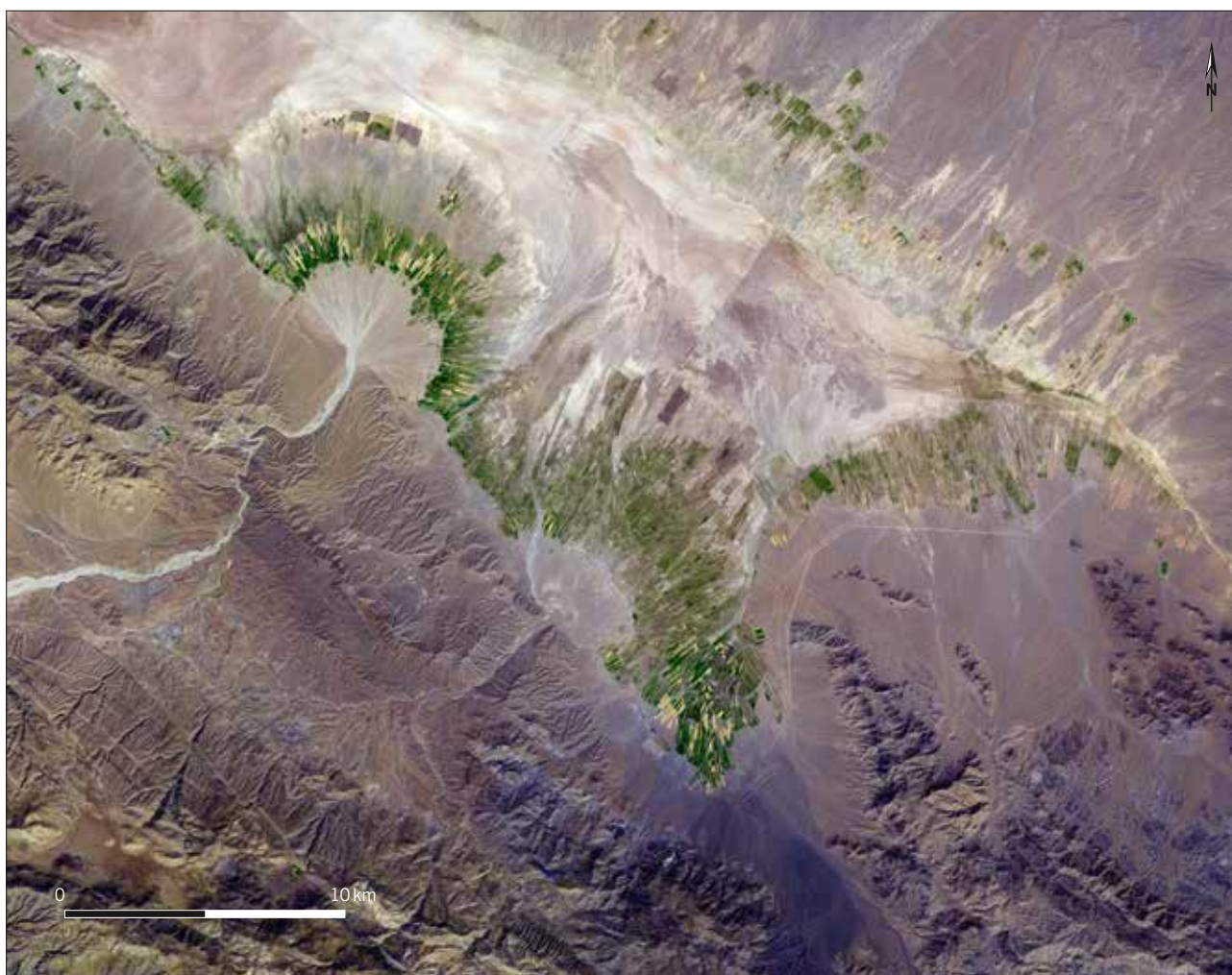


Fig. 2 Satellite view of alluvial fans formed by endorheic streams in the southern Zagros Mountains.

Abb. 2 Satellitenaufnahme von Schwemmfächern, die durch endorheische Flüsse im südlichen Zagros-Gebirge entstanden sind.

tion of fresh fine sediments in the low-energy facies at the edges of the active fans, and of sterile beds of pebbles, gravels, and sands in the fans' cores (Fig. 3). Tectonic movements shift the location of fans and create new fans across and above older ones, rapidly destroying important agricultural plots, and possibly also destroying and relocating springs of fossil water. Thus, together with frequent local seismic events (see below), the geomorphological instability of the cultivable alluvial fans may frequently cause previous agricultural investments to be lost and disrupt human settlement in general.

Geomorphological processes have serious implications for the visibility of ancient sites on the present alluvial surface, and therefore for our reconstruction of settlement dynamics. At Zagheh, the virgin soil was found 6 m below the current surface, and the uppermost levels and surface of the mound, dating from the 5<sup>th</sup> millennium BC, were 0.5 m above the present surface. Similarly, at Sagzabad, about 5 m of alluvium seem to have been deposited since the 3<sup>rd</sup> millennium BC. Rates of alluviation are not constant over time, and may have been affected by sporadic tectonic events causing rapid uplifts and, together with the greater moisture hypothesised for the 5<sup>th</sup> and 4<sup>th</sup> millennia BC, consequent

phases of faster erosion/sedimentation. In general, from the 2<sup>nd</sup> millennium BC onwards, local alluviation slowed down considerably.

In the early Holocene, as far as we presently know, most of the earliest known Neolithic communities flourished towards the west, in the inner Zagros valleys. In fact, as remarked by M. Berberian et al. (2014, 2): »[...] The Zagros, the Alborz and the Kopet Dagh fold-and-thrust mountain belts all have high annual rainfall, abundant arable lands, large braided perennial rivers, and numerous karstic and/or fault springs [...] each of these belts supported numerous ancient settlements from the early Neolithic period onwards [...] (These), in the semi-arid to arid parts of the tectonically active Central Iranian plateau, were located on limited arable lands with fault-controlled secure water supplies along a number of mountain-bordering reverse and strike-slip faults, which were suitable for use as passageways through the mountains during prehistory«.

In this way, the piedmont strips of the south-western edges of the central arid plains were easily linked to the more ecologically favoured valleys of the Zagros hinterlands.

### 3. Evolution of settlement patterns: the Late Neolithic

In the inner plains of the Iranian Central Plateau, as already stated, there is no evidence for pre-ceramic Early Neolithic settlements, with the exception of the site of Sang-i Chakhmaq in the east of the south-central Alborz<sup>1</sup> and Qaleh Asgar in the Damavand region (probably dating back to the early 7<sup>th</sup> millennium BC, Biglari 2012).

As few settlements of the later Neolithic have been reached with vertical trenches, the size and spatial organisation of the earliest villages of the region are still unknown. In the western Zagros, early Neolithic settlement networks were formed of small sites (0.5–1.5 ha), often grouped in small discrete clusters. Locations depended on water sources and on a range of other key factors such as easy access to oak-pistachio woodlands and grasslands, and outcrops of medium-quality chert. Here, penning of goats and sheep for dung seems to have played a major role in the development of sedentism from c. 8000 BC onwards (Matthews/Fazeli Nashli 2013).

More sites like Sang-i Chakhmaq (Tsuneki 2014), which document a gradual transition from hunting-gathering to fully established productive economies during the 7<sup>th</sup> millennium BC, will probably be discovered in future.

However, according to existing data, the Central Plateau was occupied only from around c. 6300 BC, by small villages established near river banks or permanent springs that watered artificially limited stretches of cultivated land. While hunting of wild sheep and goats remained important, domesticated goats, sheep, and later cattle, allowed the secondary production of milk and possibly wool, within a network of contacts with nearby groups (Fazeli Nashli et al. 2013a; Matthews/Fazeli 2013, 144; previous remarks in Davis 1984). Unfortunately, so far, the local development of milk, curd and butter technologies has not been studied by archaeometric means, for example by using GC-MS to search for the markers of lipids absorbed in ceramics. A high degree of connectivity is witnessed by the similarity of the pottery of various Late Neolithic sites (Fazeli Nashli et al. 2013, 115).

#### 3.1. The Transitional Chalcolithic

The Chalcolithic era (late 6<sup>th</sup>, 5<sup>th</sup>, and 4<sup>th</sup> millennia BC) across the Plateau are generally characterised by modest-sized villages, the great majority apparently hamlets of less than 1 ha in area, while the larger settlements extended to a maximum of 6–7 ha. Craft production becomes very evident in the excavated contexts. As stated in Fazeli Nashli et al. (2013, 116): »Specialisation and centralisation of ceramic production is one of the main characteristics of the Transitional Chalcolithic period«. Other Chalcolithic sites were probably just small pastoral camp-sites, like those identified in the western-central Zagros (Abdi et al. 2002).

The number of sites of every kind dramatically increased in the early and middle phases of the Chalcolithic era. In the Qazvin plains, according to new chronological evidence,

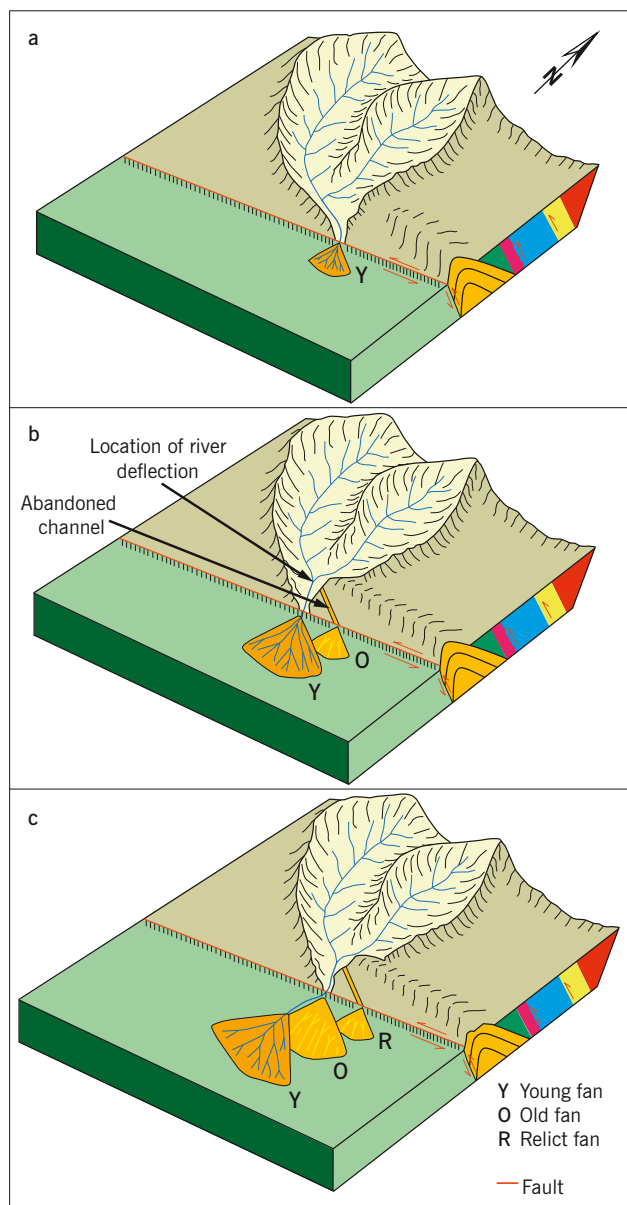


Fig. 3 Schematic illustration of the dynamics of fan formation and erosion on the Iranian Plateau.

Abb. 3 Schematische Darstellung der Schwemmfächerbildung und Erosion im Iranischen Hochland.

the number of sites increased threefold from the Late Neolithic (c. 6000–5200 BC) to the Transitional Chalcolithic (c. 5200–4700 BC), to drop again in the Early Chalcolithic (4300–4000 BC) and the following cultural stages (Fazeli et al. 2005; Fazeli Nashli et al. 2009). In the words of E. Henriksen 2011 (1991): »In the arable mountain valleys and lowland plains [...] the number of villages increased substantially (in many areas strikingly so) at the end of the Early and especially in the Middle Chalcolithic; then, in the Late Chalcolithic the trend was abruptly reversed, and the number of permanent settlements had dropped precipitously by the end of the era«.

<sup>1</sup> Inhabited between the late 8<sup>th</sup> and early 7<sup>th</sup> millennia BC, see Fazeli Nashli et al. 2013;

Matthews/Fazeli Nashli 2013, 201–255; Roustaei et al. 2015.



Fig. 4 An aerial view of the mounds of Tepe Ozbaki, a key Chalcolithic site close to the Tehran plains. Irrigated agriculture, construction of roads and canals, and industrial development threaten the preservation of prehistoric mounds.

Abb. 4 Luftaufnahme der Hügel des Tepe Ozbaki, einer wichtigen kupferzeitlichen Fundstelle nahe der Ebene um Teheran. Die Erhaltung der prähistorischen Hügel wird durch die Bewässerungslandwirtschaft, den Straßen- und Kanalisationsbau sowie durch industrielle Erschließungsprojekte bedroht.

In the plains of the northern Central Plateau and in marginal areas, as we have seen, sites followed the occurrence of springs and the easiest communication routes. The villages of the 5<sup>th</sup> millennium BC had strong links with the communities of south-western Iran and with the Dalma Culture across the Zagros passes. Villages ranged from less than 1 ha to a maximum of 6–7 ha (Fazeli Nashli et al. 2013, 109), most being less than 5 ha. Among the larger sites are the above-mentioned eastern settlements of Sang-i Chakhmaq and Tappeh Pahlavan, extending to about 6 ha (Thornton 2013; Kharanaghi 2016).

The pattern confirms the absence of larger agglomerations of settled farming populations, as well as of more

clearly established size hierarchies. The cultural deposits are often not very substantial, and although most sites have multiple phases of occupation, villages frequently shifted location. Important habitation gaps were recorded in the Chalcolithic sequences (Fazeli Nashli et al. 2013, 126), as well as at the threshold between their end and the Early Bronze Age.

In the Qazvin plains, the list of Transitional Chalcolithic sites includes the tepes of Ozbaki (Fig. 4), Ebrahimabad, Ismailabad, Kamalabad, Qare Kobad, Mahmodian, Zagheh 2 and Zahir Tape. In the Kashan area, Tepe Sialk, originally excavated by R. Ghirshman (1938/39) and recently by teams of Iranian archaeologists<sup>2</sup> remains the key site (Fig. 5a–b).

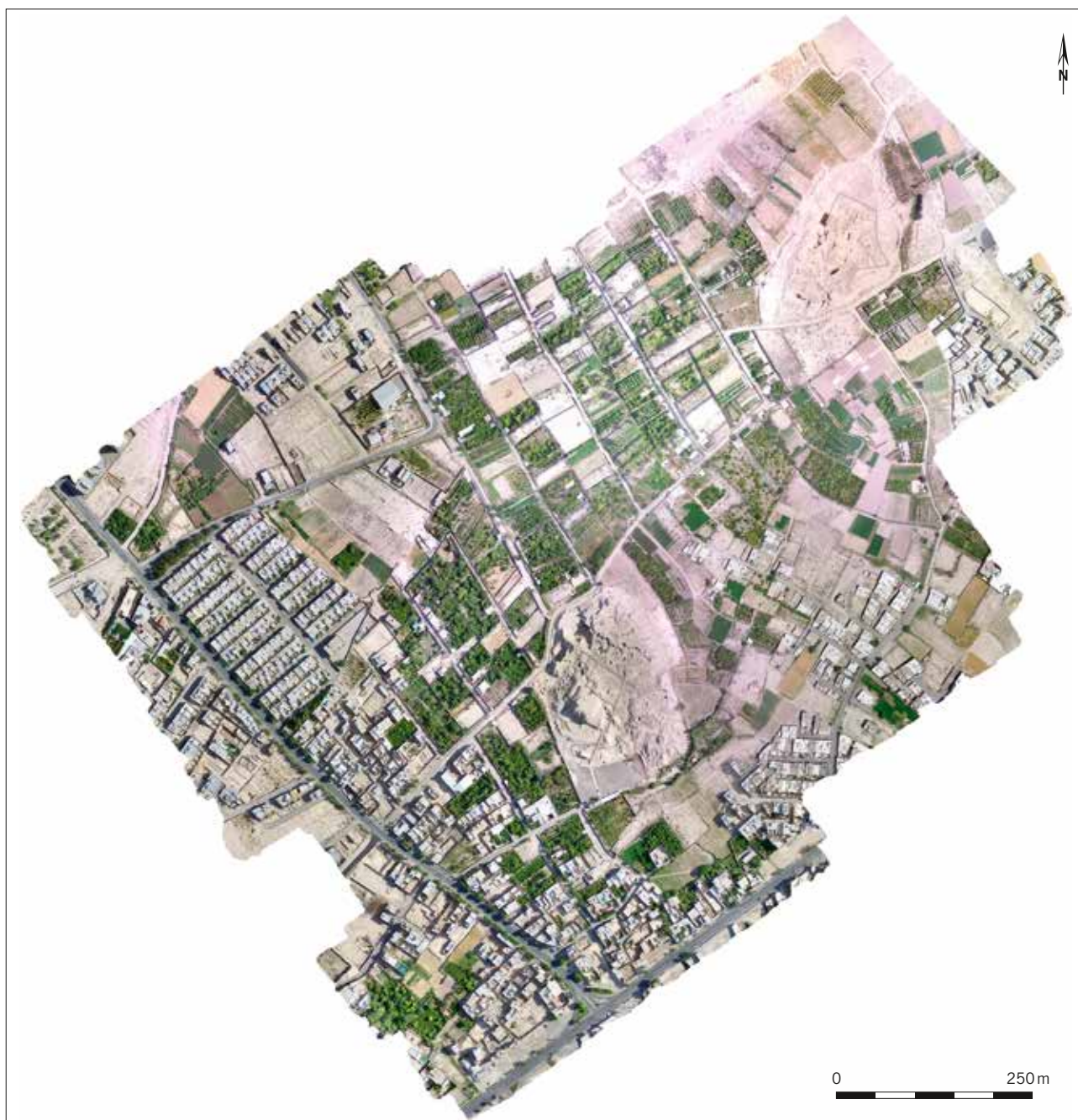


Fig. 5a General aerial view of the mound complex of Tepe Sialk (North and South) in Kashan. The central excavated mound is Sialk South.

Abb. 5a Luftaufnahme des Hügelkomplexes des Tepe Sialk (Nord und Süd) in Kashan. Der ausgegrabene Hügel in der Bildmitte ist Sialk Süd.

In the Tehran plains, today heavily impacted by agriculture and modern settlement, surveys also revealed an intensive Transitional Chalcolithic and Chalcolithic occupation, always in the form of scattered small settlements. The sites are Cheshmeh Ali, Tepe Pardis, Medikhani, Kara Tepe Shar-yar, Mafinabad, Poeinak, Mortezaگرد, and Sadeghabadi. Some, including Tepe Pardis, turned out to be crucial for the archaeological reconstruction of local sequences and the study of a rapid intensification of craft production (see below). However, ongoing destruction by road building

and expanding residential constructions does not allow a detailed diachronical reconstruction of settlement dynamics (Coningham et al. 2004).

Similar population trends were also observed outside the northern Central Plateau. In the valley of Sarfirouzabad, in the heart of the Zagros and at the western edge of our study area, researchers observed by the means of satellite imagery and GIS spatial analyses » [...] a sudden abrupt increase in the settlements during the Chalcolithic period, so that about 77% of the prehistoric sites of the area (totally 122 sites)

<sup>2</sup> Among others, Shahmirzadi 2002; Shahmirzadi 2003; Shahmirzadi 2004; Nezafati/Pernicka

2005; Shahmirzadi 2005; Berberian et al. 2012; Kourampas et al. 2013; Pollard et al. 2013.





Fig. 5b (left page) Enlarged aerial view of the Sialk South mound; the excavated trenches are clearly visible.

Abb. 5b (left page) Vergrößerte Luftaufnahme des Hügels Sialk Süd mit den deutlich sichtbaren Grabungsflächen.

have been occupied by the Chalcolithic peoples« (Niknami/Askarpour 2015, 137).

Many sites, here, seem to have been less than 1 ha. Another important feature of this demographic expansion, besides a clear focus on favourable fertile lands, river banks, and natural communication tracks, were settlements in previously uninhabited areas. These *loci* are interpreted as small pastoralist campsites.

### 3.2. The later Chalcolithic networks

In the 4<sup>th</sup> millennium, the number of sites decreased, suggesting a growing dependence upon shifting pastoralism (a similar picture emerges from preliminary surveys in the Abharroud basin, Alibaigi et al. 2012). The intense and discontinuous tectonic movement, discussed above, and the associated alluvial processes may have deeply affected the surface record of the ancient settlement dynamics. Similarly, »[...] in the Māhīdāšt, one of the broadest and richest stretches of arable level land in the Zagros, alluviation has added as much as 10 m to the late prehistoric land surface, and many Chalcolithic sites are undoubtedly still buried« (Henrickson 2011).

While the number of villages decreased, the functional organisation of the sites changed as well, including the rise of important craft neighbourhoods. In fact »The level of socio-economic differentiation established during the fifth millennium BC became more complex during the fourth millennium BC through the production of metal and ceramics in workshops at Tepe Ghabristan, which were spread across an area nearly 4 ha in size.« (Fazeli Nashli et al. 2013, 116).

The so-called Sagzabad cluster includes Tepe Zagheh (surface area 1.5 ha), Tepe Ghabrestan (2–4 ha), and Sagzabad (14 ha) (Fazeli/Abbasnejad Seresti 2005; Schmidt/Fazeli 2007, 39; Quigley et al. 2011) which were occupied in turn, one after the other, with a gap of several centuries in the 3<sup>rd</sup> millennium BC.

In the Qazvin and Tehran plains, in the Late Chalcolithic (mid 4<sup>th</sup> millennium BC) the number of settlements shows a moderate growth (Fazeli 2004, Fig. 2; Fazeli Nashli et al. 2013), followed by a general and fast abandonment of the plains, where irrigated agriculture was (and still is) crucial.

In contrast, a few small sites survived on the stony hillslopes, more suitable for dry farming and grazing (cf. Tepe Ismailabad and Tepe Shizar, Fazeli Nashli et al. 2013, 112). Tepe Ghabrestan reached a size of approximately 15 ha, to be suddenly abandoned around 3550 BC. Life at Tepe Sag-

zabad started again only in the middle Bronze age c. 1700 BC (Fazeli Nashli et al. 2013, 111–113).

In the final centuries of the same millennium only a limited number of sites, like Tepe Ghabrestan, apparently grew and/or survived to become large centres, in general with a limited vertical stratification. This happened at Tepe Sofalin (approx. 20 ha, Hessari/Akbari 2007; Hessari 2011; Dahl et al. 2012) and Meymanatabad Tepe (greater than 25 ha, Zoshk et al. 2015). Both sites were apparently abandoned at the beginning of the 3<sup>rd</sup> millennium BC.

Between c. 3700 and 3400 BC the connections between the Central Plains networks, the Zagros hinterland and Mesopotamia were strongly intensified (Alizadeh et al. 2015). The extensive craft occupations at Arisman (Chegini et al. 2000; Stöllner 2005; Helwing 2011; Vatandoust et al. 2011) include domestic constructions, extensive slag heaps and copper-smelting furnaces, a vast array of metallurgical indicators, pottery-making sites, and perhaps charcoal-burning pits. There is also evidence of local bead-making activities. The abnormal size of this strongly eroded site, approx. 6000 x 500 m, is explained by the continuous shifting of temporary craft installations and decentralised residential blocks across several centuries. Wind, fuel, and water from springs seem to have been the main exploited local resources (Helwing 2011). Industrial processes included grinding the copper ore with heavy stone tools, smelting in crucibles, re-cycling metal-rich slag, and casting ingots and finished objects. Among the main products at Arisman is a type of axe common at Susa, hinting at long-distance distribution (Matthews/Fazeli 2004).

Tepe Shoghali in the Varamin plain, approximately 40 km south-east of Tehran, has been reported as a large site<sup>3</sup> with evidence of rows of furnaces, slag, ore-processing tools, litharge cakes and fragments, silver-rich lead ingots, and crucibles, pointing to significant production of silver from an argenteriferous ore during the late 4<sup>th</sup> and early 3<sup>rd</sup> millennium BC (Shahmirzadi 2003; Nezafati/Pernicka 2012; Nezafati/Hessari 2017). The long occupation (c. 4100–3100 BC) is probably due to the same dynamics of occupation and repeated horizontal shifting of minor craft units as seen at Arisman.

Even Tepe Sofalin (Dahl et al. 2012) is still a poorly understood site. Judging from its surface, it was a residential area with evidence of domestic and administrative functions, perhaps also occupied by pastoral nomad groups. Its surface is covered by ceramic waste material and slag, and littered by a peculiar coarse lithic waste (including rough flakes and bifaces used in one or more unknown technologies: personal observations by M. Vidale on the site). Calibrated radiocarbon dates (68 % probability 2σ) suggest an occupation in the last two centuries of the 4<sup>th</sup> millennium BC. As noted for Arisman, Sofalin's total surface occupation might be due to a long period of separate, intermittent or even seasonal episodes, rather than to permanent settlement (Fazeli Nashli et al. 2013, 106).

3 Others evaluate the extent of the site to a few ha. It is important to note that such estimates of the extent of the sites are often due to very superficial assessments, which do not take

account of the complex geoarchaeological dynamics mentioned above; at present there is little scientific basis for taking such estimates as reliable or representing the impor-

tance of one settlement phase *versus* another. Moreover, occupations sometimes have different functional features and therefore are hardly comparable.



10cm

**Fig. 6 (left page)** A black-on-buff cup and a beaker, at the National Museum of Iran, Tehran, point to an enduring fascination with and probably economic relevance of hunting of wild mountain animals in the Middle and Late Chalcolithic. Both from Sialk South, Late Chalcolithic (c. 3700–3400 BC).

**Abb. 6 (linke Seite)** Tasse und Becher aus hellgrundiger Keramik mit schwarzer Bemalung im Nationalmuseum von Iran, Teheran. Sie bezeugen eine nachhaltige und wohl auch wirtschaftlich relevante Faszination für die Jagd auf Wildtiere in den Bergregionen der mittleren und späten Kupferzeit. Funde vom Hügel Sialk Süd, späte Kupferzeit (um 3700–3400 v. Chr.).

A recent re-evaluation of the chronology of the extensive craft activity areas of Tepe Hissar (Thornton 2014), in the Damghan area, places the intensification of bead making and copper-lead-silver processing in the same chronological and cultural milieu (even though the consequences of western interference are considered to have had less impact here).

Later, as stated by H. Fazeli et al. 2004 »[...] there is no archaeological information from 2900 to 2100 BC in the Qazvin, Tehran, Kashan, and Qom plains« (Tab. 1).

#### 4. Subsistence

The study of environmental and climate changes during the Holocene across the different regions of the Iranian Plateau is still incomplete. In general, scholars agree that in the Transitional Chalcolithic and Chalcolithic eras (c. 5200–3300 BC), the Plateau, which had experienced a climatic optimum since the middle Holocene, received higher rainfall, which supported stable agricultural investments (Schmidt et al. 2011; Helwing 2013; Maghsoudi et al. 2014). In greater detail, »The dominance of pistachio until 7200 yr BP is hence taken to indicate a dry early Holocene climate with moderate temperatures. The increase of oak pollen in the mid-Holocene is attributed to higher moisture availability [...]. Multi-proxy climate data from nearby lakes in northwest Iran suggest a transition from arid early Holocene conditions to more humid middle Holocene conditions from ca. 7550–6750 yr BP, coinciding with the settlement of Zagheh« (Schmidt et al. 2011, 585).

The surfaces of the earliest human-affected locations of the Central Plateau reflect the transition from a semi-arid, scarcely impacted landscape to a more humid and populated region, where nucleated sedentary settlements began producing larger and larger amounts of man-made debris (like decayed mud bricks, ash, bones and broken artifacts).

##### 4.1. Faunal evidence and animal penning

On the whole, »[...] the Transitional Chalcolithic on the north Central Plateau was a period of significant socio-economic development, particularly in terms of the organisation of production. Zooarchaeological evidence suggests that there was an intensification of agriculture, particularly in the exploitation of domesticated cattle, pig, sheep and goat [...]« (Wong et al. 2010, 23).

The West Tappeh of Sang-i Chakhmaq, one of the earliest occupations (eastern margin of the Plateau, c. 7200–6600 cal BC) shows a subsistence based upon hunting wild capriovines, wild boars, deer, gazelle, and wetland birds. Some of the capriovines may have been domesticated, while the domestication of cattle seems to be a later Chalcolithic innovation (Roustaei et al. 2015).

In the lowermost levels of Tepe Sialk, soil micromorphology points to »[...] a landscape of dispersed, relatively short-lived settlements of extensive, slash-and-burn farmers and/or herders« marked by scatters of micro-charcoal bits of uncertain origin, followed by lenses of trampled herbivore dung (stabling enclosures) and by burned floors largely due to the use of animal dung as fuel (Kourampas et al. 2013). The majority of the mammal remains of Tepe Sialk belong to herbivores: sheep (*Ovis aries*) and goat (*Capra hircus*), cattle (*Bos taurus*), equids (*Equus* sp.), gazelle (*Gazella* sp.), and deer (*Dama dama*). Less frequent were the remains of pigs, predators, hares, and small rodents (Gręzak, unpubl.).

*Ovis aries* and *Capra hircus*, the domesticated caprids, are in general the most common *taxa*, followed by cattle; another element of subsistence was the exploitation of wild animals. At Tepe Pardis, a small sample confirmed that »[...] sheep and goat are the dominant species [...] and this fits very well with herding as a dominant subsistence practice, possibly linking with long distance transhumant activity« (Coningham et al. 2006, 45). In the Qazvin plains, faunal remains belong mostly to domestic capriovines and bovids, while much lesser assemblages of wild herbivores include gazelle, hemione, wild sheep, and ibex. Birds bones and microfaunal remains were not collected systematically, thus their actual contribution to the diet is unknown. In a rough count, percentages of domestic capriovines vary from approximately 65–75 % of the total assemblages at Zagheh, Ghabrestan, and Ebrahimabad to around 60 % at Chahar Boneh; at Ebrahimabad cattle came second (12 %) followed by hemiones (10 %) (Mashkour et al. 1999; Fazeli Nashli et al. 2009). At Ebrahimabad, above virgin soil, were found layers of capriovine dung left by penned animals, containing alfalfa grains and cereal husks.

M. Mashkour et al. (1999) found that in the course of the Chalcolithic occupations, both bovids and hemiones became more frequent in the Sagzabad cluster (for instance, at Tappeh Sang-i Chakhmaq, where bovid bones were increasingly used for making tools, Thornton 2013). At the same time, gazelles decreased. Wild boars, almost absent in the Transitional Chalcolithic layers, became slowly more common in the following stages.

On the whole, the importance of hunting increased through time: at Sagzabad (after 2000 BC), around 40 % of the finds belong to wild species (Fig. 6). We witness a growing exploitation of animals living in the arid steppes and highland areas, and, in later periods, in shrubby woodlands near watercourses and ponds<sup>4</sup>; while the botanical landscapes identified in excavations show both the intensified cultivation of cereal crops (Fig. 7) and an easy access to pastoral grazing grounds.

4 The faunal remains of the 6<sup>th</sup> millennia BC at Sang-i Chakhmaq (Mashkour et al. 2014) show an independent, parallel trend in a dif-

ferent context and period, suggesting that a growing importance of hunting reflects a gradual economic integration of the hinter-

lands with the economy of the settled communities.

Chronology cal BC	Label	Type sites and phases	Main ceramic types and productions	Other features
7000–6200 BC	Neolithic	Sang-i Chakhmaq	Reddish-brown chaff-tempered wares, with burnished and red-slipped surfaces	Subsistence based on hunting wild caprines, pig, and birds, with incipient morphological change of domesticated goat (sheep?). Gathering of wild plants, experiments with many types of cereals. Emphasis on barley and different types of wheat. Multi-roomed and special single-roomed houses with gypsum-plastered floors
6200–5200 BC	Late or Ceramic Neolithic	Tepe Sialk I Chahar Boneh Ebrahimabad	Simple buff and red chaff-tempered soft-ware painted like baskets; Sialk I buff ware; later, Djeitun-like ceramics. Sequential slab construction. In the late centuries designs get more complex	Domesticated barley, wheat, and small legumes; domestic sheep/goats and cattle, hunted gazelles and equids, wild boars. Ashy occupations with lightly-framed huts but later use of mud brick walling.
5200–4600 BC	Early Transitional Chalcolithic	Tepe Zagheh Ebrahimabad Tepe Pardis Cheshmeh Ali Tepe Sialk II	Fine red slipped (Sialk II) and polished ware with dark painted designs. 5 different classes of ceramics on record. Ceramic potting tools at Tepe Pardis and Zagheh. Slab construction, coiling, moulding and incipient wheel-throwing.	Settlement networks show no major changes, but the edges of the Central Plateau deserts get densely populated. Canal at Tepe Pardis for artificial irrigation. Single and multi-roomed architecture. Mud bricks and pisé houses (single and multiple rooms architecture). Giant jars for storage. Herding of sheep and goats, perhaps secondary products (milk and wool?). Increase of spindle whorls. Permanent ceramic workshops at Zagheh and Pardis. Painted Building, at Zagheh, rich graves with exotica (long- and local-distance trade) possibly expressing upper social ranks.
4600–4300 BC	Late Transitional Chalcolithic		Clays pastes get finer and finer, perhaps for improving rotation	
4300–4000 BC	Early Chalcolithic	Tepe Sialk III 1–3 Tepe Ghabrestan I Ozbaki Cheshmeh Ali Ismaïlabad	Black-on-buff wares fired in vertical kilns with perforated floor grids, Bakun Wares, Dalma Wares	Increase in number and hierarchical size differentiation of settlements. Larger houses may imply growing social differences. Metallurgical workshops at Ghabrestan, Arisman and Sialk.
4000–3700 BC	Middle Chalcolithic	Tepe Sialk III 4–5 Tepe Ghabrestan II Tepe Hissar I Ozbaki Chakmak Tepe	Black-on Buff, varieties of red burnished, finely painted wares, and grey wares	Different craft areas at Tepe Hissar, interaction with the societies of northwestern Iran, monumental buildings in Qamra Tepe  Arsenical copper weapons and tools from the central northern Plateau exported to Susa.
3700–3400 BC	Late Chalcolithic	Tepe Ghabrestan III–IV Tepe Sialk III 6–7 Arisman B Meymanatabad	Buff wares, grey wares, diffusion of Middle-to-Late Uruk types (tall spouted jars, flowerpots, and bevelled rim bowls)	Several sites in the central Zagros indicate strong relationships with the Central Plateau
3400–2900 BC (?)	»Proto-Elamite« (?) to Early Bronze Age I	Tepe Sialk IV Tepe Sofalin Arisman area C Tepe Shogali	Diffusion of Middle-to-Late Uruk types (tall spouted jars, flowerpots, and bevelled rim bowls), Later »Proto-Elamite« cultural materials, Kura-Araxes pottery	General collapse, abandonment of most settlement networks. Large industrial areas forming at specialised sites (lithics at Sofalin, copper, lead, and silver at Arisman). Proto-Elamite tablets at Sofalin, Ozbaki, and Sialk.

Tab. 1 The cultural and settlement sequence of the northern Iranian Central Plateau.

Tab. 1 Kultur- und Siedlungsabfolge im nördlichen Iranischen Hochland.



Fig. 7 In this Late Chalcolithic potsherd (3700–3400 BC) on display at the Archaeological Museum of Tehran, a group of farmers seem to be harvesting cereals and removing the husks with a fan-shaped tool, while apparently storing the seeds in a tall communal bin.

Abb. 7 Dieses Keramikfragment aus der späten Kupferzeit im Archäologischen Museum in Teheran (3700–3400 v. Chr.) zeigt eine Gruppe von Bauern bei der Getreideernte, beim Entfernen der Spreu mit einem fächerartigen Gerät und bei der Lagerung der Getreidekörner in einem hohen Gemeinschaftsbehälter.

Davis (1984), commenting on faunal collections from prehistoric digs in Israel and in the Kermanshah area of western Iran, identified in the Chalcolithic sequences a slow growth of the average survival ages of capriovines, eventually ascribing the evidence to a growing use of milk derivatives and wool. Later, scholars hypothesised that the same process was taking place in the contemporary northern Ubaid Mesopotamian sites (Sudo 2010); and the same shift was proposed for the post-Neolithic economies of the prehistoric mounded settlements of the Balkans (after Greenfield 1984). More recent identification of organic residues from milk and derivatives in mid-Holocene sherds from the Levant, the Near East, and Neolithic sub-Saharan Africa (Evershed et al. 2008; Dunne et al. 2012) strongly support the hypothesis that in Chalcolithic Iran, milk and derivatives of capriovines were abundantly in use. Obviously, this hypothesis

is of the outmost relevance for the general archaeological framework of southern Eurasia, and urgently needs to be tested by various archaeometric means.

#### 4.2. Botanical evidence and early irrigation practices

In the first occupations of Tepe Sialk, there are traces of human tracks and indirect evidence of irrigation with artificial canals (Kourampas et al. 2013).

In the Qazvin plains, the earliest settlements are Chahar Boneh and Ebrahimabad. The former is considered a seasonal camp site, while Ebrahimabad was a permanent settlement (Fazeli Nashli et al. 2009, 16). In the earliest levels of the Late Neolithic occupations at Chahar Boneh and Ebrahimabad were found *Triticum dicoccum*, *Triticum free*

threshing, *Triticum* hexaploid rachis, hulled two-rowed *Hordeum*, *Hordeum vulgare* (and its rachis), six-row barley, and small legumes like lens, *Vicia*, *Pisum*, sometimes stored in large amounts (see Fig. 7). Wild species included Gramineae, Chenopodiaceae, large Compositae, *Crucifera*, *Aegilops*, Cyperaceae, *Medicago*, *Fumaria*, *Rubiaceae*, *Lithospermum* and *Vicia lathyroides*.

The rich botanical landscape described laid the foundation for the agriculture of the following periods. Transitional Chalcolithic sites, like Neolithic ones, were located along riverbanks, meadows and stretches of fertile alluvial land. They show a fully developed agricultural economy, and a complete range of equipment for agricultural and rural activities, including the processing of textile fibres. There are vessels for cooking and storage, flint sickle blades, heavy stone tools for grinding and pounding, hearths and ovens of various kinds, and spindle whorls (Fazeli Nashli/Matthews forthcoming).

At Sang-i Chakhmaq, unsystematic recovery from the Transitional Chalcolithic layers (East Tappeh) indicates an equally wide range of early domesticated cereals. Varieties of barley, noted for their salt-resistance, account for more than 80 % of the total sample, suggesting that these were the basic staple products. Wild species, including fruits, are quite rare (Fuller 2014).

The picture should be evaluated against the background of the hypothesis of multiple centres of domestication of cereals and other species, including the Zagros valleys and the northern edge of the Iranian Plateau (Harris 2010; Riehl et al. 2012).

The discovery of an artificial canal and a linked system of artificial water distribution at Tepe Pardis (Coningham et al. 2006; Gillmore et al. 2009; Gillmore et al. 2011) places what has been called the »commodification of water« within the taskscapes of the Transitional Chalcolithic (Gebel 2010, 4). Canalisation would embed social symbolic power (through the consolidation of the communal identity through joint water ownership, water-sharing agreements or institutions, and management of maintenance). On the opposite side of the Kopet Dagh, artificial irrigation was practiced at least from the late 7<sup>th</sup> millennium BC (Harris/Gosden 1996; Bonora/Vidale 2013). In the northern Central Plateau, following this crucial technological innovation »[...] productive milieus were maintained and ruled by artificial water conditions, and artificial water conditions determine productive milieus [...]. Water storage of its various kinds and water-based land use are the key socio-economic sectors in which new water techniques influenced, triggered and protected new modes and structures of sedentary life.« (Gebel 2010, 4).

By c. 4000 BC, in the Middle Chalcolithic, artificial irrigation devices were widespread across the Plateau (Henrickson 2011).

## 5. The evidence of crafts

As recently as 2011, E. Henrickson stated that »There are almost no archaeological data for craft production other than ceramics in Chalcolithic Persia.« Things have changed very fast, and a range of advanced craft skills, as well as the complexity of their general record, started to emerge from what had been hastily considered a »simple« material culture. At least for some sites and regions, metallurgy and ceramics have been studied in some detail, while lithic industries and their most technically demanding and highly-developed branch, bead making, have been only cursorily dealt with. A preliminary review of the available information on the craft industries and activity areas so far on record in the study area invites a series of important questions. Was there any village-level specialisation in craft production, and if yes, how were the villages linked? What levels of technological complexity were at play? What relationship was there between technological complexity, settlement patterns, and demography? And what was the role, in the emerging picture, of regional and long-distance trade networks?

### 5.1. Ceramic industries

The pottery vessels of the Late Neolithic horizon were non-standardised, made in the context of individual households, and built with sequential slab techniques. They reflect limited skills and perhaps little task specialisation (Fazeli Nashli et al. 2014). However, some trends towards village specialisation in pottery-making may have been active from the early 6<sup>th</sup> millennium BC, judging from the rows of kilns discovered in Layer III at Sang-i Chakhmaq, East Tepe (Tsuneki 2014, 7). Fazeli Nashli et al. (2010) concluded that the base materials used for the chaff-tempered soft wares of the latest Neolithic horizons at Tepe Pardis were exactly the same as those used for the more refined red-slipped and burnished wares of the following Transitional Chalcolithic (Cheshmeh Ali-like ceramics). Therefore, the change was strictly due to the invention of better firing processes and to changes in the quality and scale of production (Fig. 8). At Sialk, the contemporary technical transition seems to have involved not only a further rise in the firing temperature of ceramics but also a purposeful shift to more calcareous clays.

Both at Zagheh and at Tepe Pardis, pottery-making was performed in restricted, marginal areas of the settlement. At least five different ceramic classes were made for different demands. At Pardis, Trenches III and IV exposed part of a row of houses-cum-pottery workshops, equipped with multi-roomed kilns, whose precise function is still poorly understood (Fig. 9)<sup>5</sup>. Tepe Pardis was interpreted as a specialised manufacturing centre, perhaps producing pots all

5 A comparably substantial take-off in the aesthetic standards, firing technology and organisation of production, with the appearance of specialised enclaves inhabited by profes-

sional potters, equipped with permanent manufacturing facilities, also seems to have taken place, in the same general period, in other macro-regions of southern Eurasia,

such as southern Anatolia (at Hacilar: Mel-laart 1970) and the Balkans (Spataro 2018).

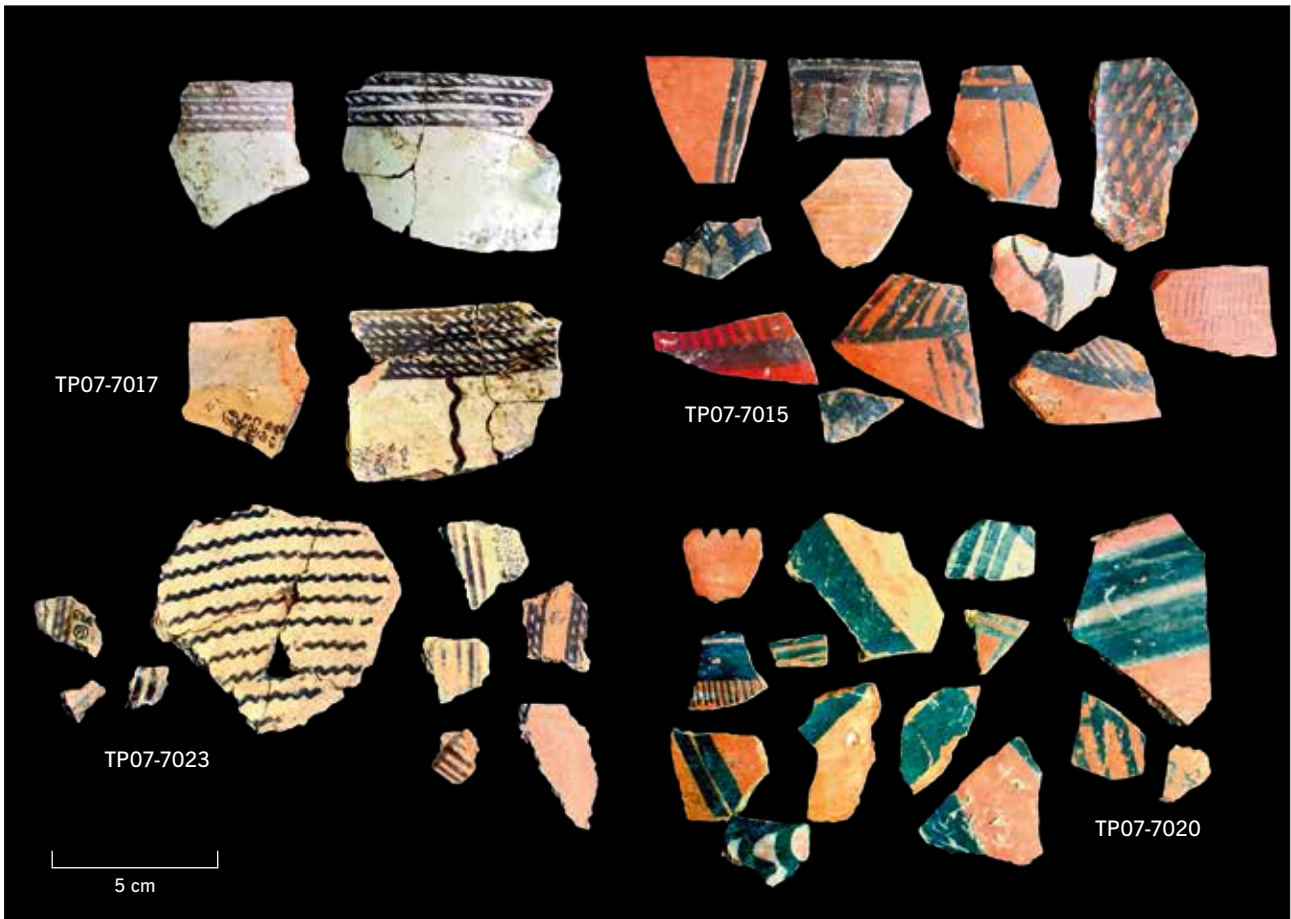


Fig. 8 A sample of Late Neolithic black-on-buff sherds from the lowermost levels of Tepe Pardis, on the left (second half of the 6<sup>th</sup> millennium BC) compared with the black-on-red pottery of the layer immediately above, on the right (Transitional Chalcolithic, c. 5200 BC). Archaeometric studies ascribe this evident change to the introduction of advanced firing techniques with special multi-chambered high-temperature kilns.

Abb. 8 Eine Auswahl spätneolithischer Fragmente hellgrundiger Keramik mit schwarzer Bemalung aus den untersten Schichten des Tepe Pardis (zweite Hälfte des 6. Jahrtausends v. Chr.) links, im Vergleich zu rotgrundiger Keramik mit schwarzer Bemalung aus der direkt darüberliegenden Schicht (Übergangskupferzeit, um 5200 v. Chr.) rechts. Archäometrische Untersuchungen haben gezeigt, dass dieser offensichtliche Unterschied mit neuen Brenntechniken in speziellen Hochtemperaturöfen mit mehreren Brennkammern erzielt wurde.

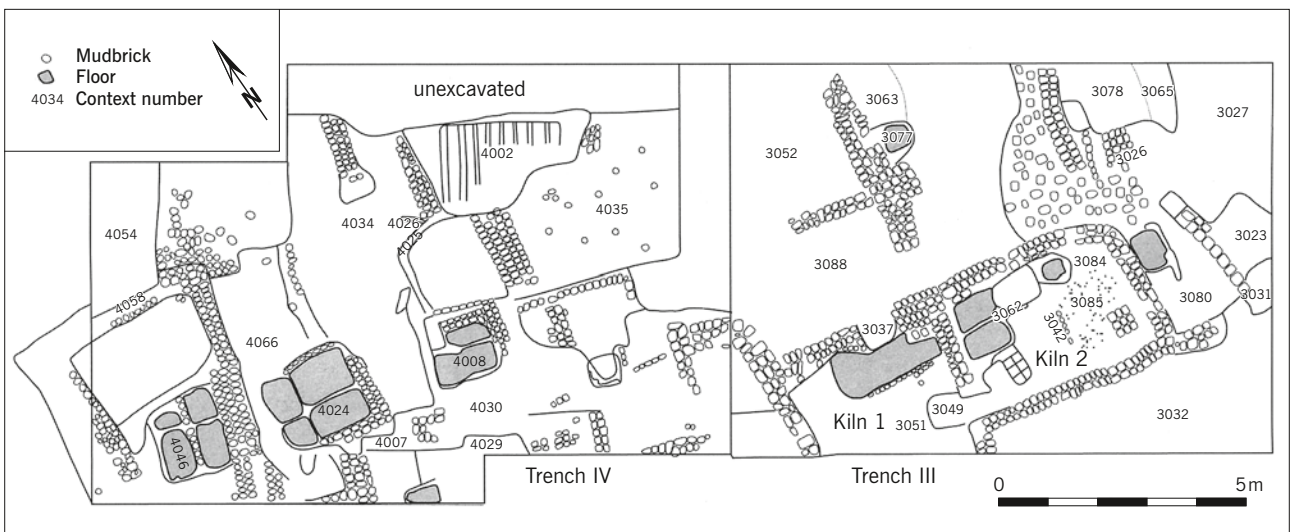


Fig. 9 Tepe Pardis, map of the specialised pottery-making compound unearthed in Trenches III and IV: houses-cum-workshops with large multi-chambered ceramic kilns. Transitional Chalcolithic period, c. 5200–4700 BC.

Abb. 9 Tepe Pardis, Übersichtsplan der in Fläche III und IV zum Vorschein gekommenen spezialisierten Keramikherstellungsanlage: Häuser und Werkstätten mit großen Keramikbrennöfen mit mehreren Brennkammern. Übergangskupferzeit, um 5200–4700 v. Chr.



year round (such organisation would clearly diverge from the seasonal, short-time pottery-making schedules by non-specialised potters hypothesised at the earlier Neolithic Tol-e Baši in Fars: Pollock et al. 2010, 106 f.). In Trench K at Zagheh, thick and deeply stratified ash deposits, approximately 5 m deep, were unearthed, including »[...] remains of pottery kilns, piles of prepared clay and crushed stone (for temper), lumps of red ochre, and production tools. Hundreds of spindle whorls indicate a highly developed textile industry and the presence of tokens may suggest a form of administration« (Fazeli 2004, 194; see also Fazeli/Djamali 2002).

In fact, the great frequency of terracotta spindle whorls in the Chalcolithic settlements of the Central Plain (as well as of the Kopet Dagh piedmont in Turkmenistan) suggest a systematic entanglement between ceramics and a crucial, but scarcely visible industrial sector: textile-fibre processing (as an aspect of cross-craft interaction, Helwing 2013a, 106). Other important finds in the ceramic-manufacturing locations excavated at Zagheh and Tepe Paridis by H. Fazeli and his collaborators are lunate-like sherds with worn fracture surfaces used as spatulas, gouges, and polishers, and special vessels possibly used for slipping. At Zagheh, the large quantities of clay tokens (pyramids, disks, cylinders, cubes, and diamonds) were presumably used to count and record the growing quantities of pottery produced<sup>6</sup>.

Special storage buildings for agricultural products are not, at present, reported for the early farming communities of the Central Plateau. In contrast, in the Jeitun and early Anau villages of the Kopet Dagh, they have been repeatedly identified, in the form of permanent, standardised rows of parallel walls intended to support clay bins (recurrent in Kohl 1984).

However, B. Helwing noted that, besides the most common medium-sized containers (Fig. 10, four vessels on top) »[...] Giant storage vessels are found regularly in sites on the Central Plateau, apparently fired in room-size kilns« (2013a, 113). If these basins and jars were required for the storage or, more likely, the public serving of large quantities of foodstuffs or liquids, these unique and highly visible »giant vessels« (Fig. 11; see Fig. 10, bottom), well built and carefully slipped and painted (as well requiring demanding forming and firing techniques), provide further important evidence of linkages between ceramics and the production of edibles and perhaps also beverages. The regular discovery of these striking vessels may thus introduce into the discussion the theme of food and beverage distribution for feasting (Dietler/Herbich 2001; see also Dietrich et al. 2012). Also, most of the larger, restricted forms in the ceramic repertoires have a carinated base that might have been sunk into the ground in storage rooms (see Fig. 11); the intensive decoration on storage and serving vessels suggests that the two functions were linked by the same ideological attitudes and social norms.

In short, there are hints of the rapid growth of an integrated, eventually »affluent« village economy, and possibly, albeit indirectly, of redistribution during feasts. At the same time, potting families experienced what looks like a sudden take-off, in painting, technology, and organisation of production.

Slab construction, coiling, and even moulding coexisted with incipient practices of wheel-throwing (apparently the earliest evidence in the world: Fazeli et al. 2010). Fine bowls were made by building up small flattened clay pellets and slabs, and finally finished at the mouth with elongated strips, thinned and compacted by rotation on the potter's wheel (Dipilato/Laneri 1998). These upper rim strips were probably needed for keeping together the slab-built lower bodies of open forms (exactly as in basketry) and wheel-throwing may have been applied for better regularising the highly visible rims, intended to be finely painted (Fazeli et al. 2010; Vidale forthcoming), rather than for speeding up production or for standardising the vessels' forms.

Larger bowls and basins were directly formed with a regular coiling process, perhaps aided, at least in some cases, by the use of the wheel. Pots were then slipped with ochre-enriched slurries and finely painted with iron-manganese pigments. The inventory of painted designs includes a rich repertoire of elegant animal and geometric motifs, sometimes combined in lively friezes (Fig. 12).

Sophisticated multi-chambered kilns were used for close control of long periods of high-temperature firing.

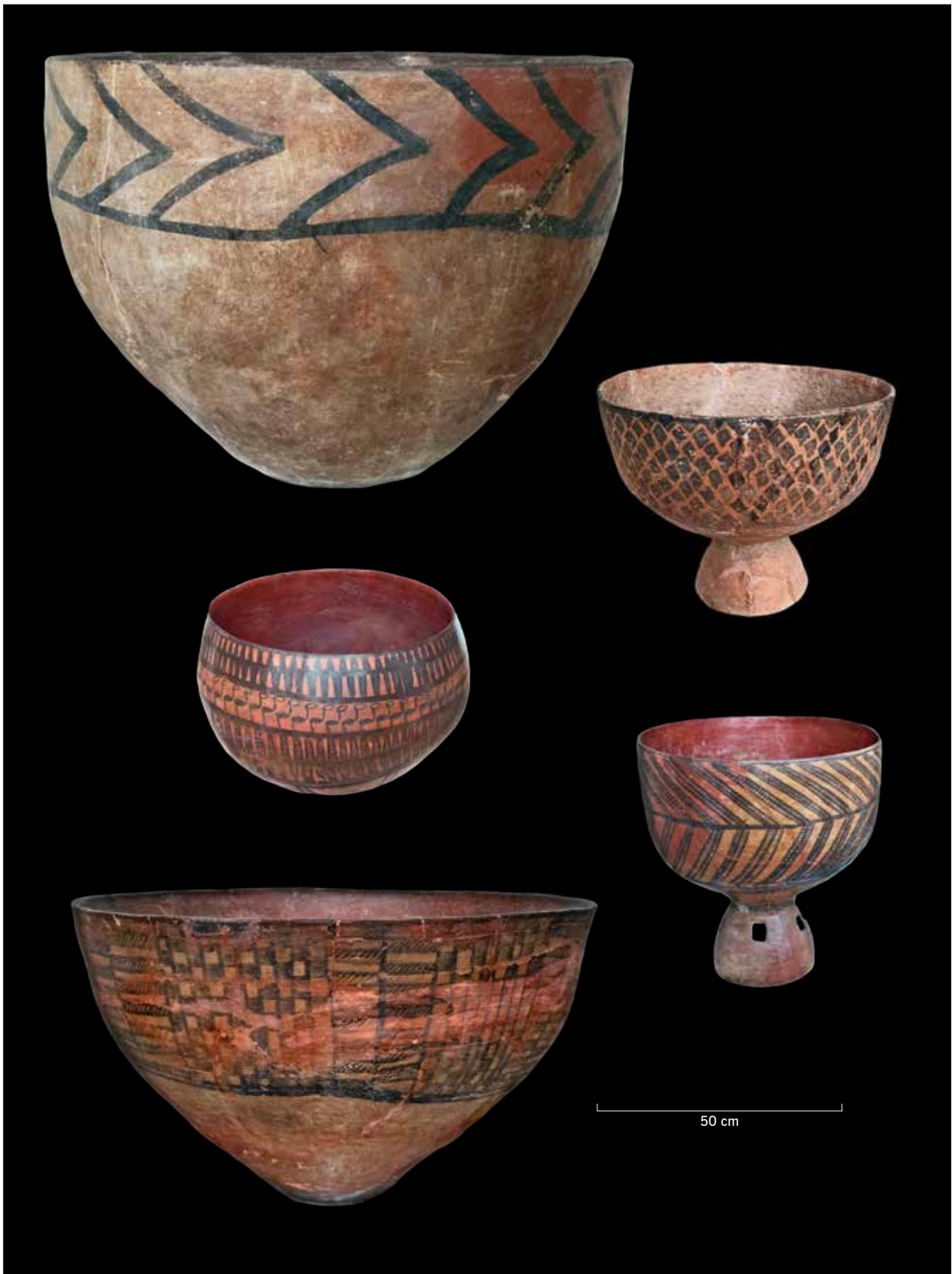
Archaeometric studies by E. Wong et al. (2010) tackled the characterisation of approximately 220 potsherds of fine Cheshmeh Ali ware of the Transitional Chalcolithic. Samples came from the sites of Zagheh, Ghabrestan, and Ismailabad, from the general survey of the Qazvin plain in late 2003, and from ceramic assemblages recovered from an old trench in Cheshmeh Ali in the early 1970s.

Chemical values and petrographic components of the sherds clustered according to their respective find spots, suggesting a pattern of individual site-based productions, rather than production at central location(s) and regional distribution to their final consumption *loci*. In particular, analytical data suggest multiple production *loci* for Cheshmeh Ali Ware, the most visible fine-textured and well painted standardised ware of the northern Central Plateau. Therefore »[...] there is clear evidence for interregional socio-cultural integration, but little evidence of direct and widespread economic interaction, at least in terms of pottery production and distribution« (Wong et al. 2010, 24).

In other words, in the Early Transitional Chalcolithic (c. 5200–4600 BC), the local production networks adjusted to the same technical, aesthetic, and ideological standards, while producing more appealing and possibly more prestigious vessels; but potters operated in full independence in a scattered network of small, even if partially specialised, individual factory sites.

<sup>6</sup> Most of the relevant information is not presently available, but in the course of being published:

Fazeli Nashli/Matthews forthcoming; Fazeli Nashli unpubl.; see also Bonora/Vidale 2013.



**Fig. 10** »Gigantic« and large-sized serving vessels at the National Archaeological Museum, Tehran. All are slipped red, painted in black with various levels of detail, and fired at high temperatures. From top down, and from left to right: from Qomroud; from Tepe Ismailabad; again, from Ismailabad; from Tepe Zagheh; from Ismailabad, Mushelan Tape; Transitional and Early Chalcolithic, c. 5200–4000 BC.

**Abb. 10** »Gigantische« und großformatige Serviergefäße im Nationalen Archäologiemuseum Teheran. Alle Gefäße weisen einen roten Überzug und schwarze Bemalung von unterschiedlicher Komplexität auf und wurden bei hohen Temperaturen gebrannt. Von oben nach unten und von links nach rechts: aus Qomroud; aus Tepe Ismailabad; auch aus Ismailabad; aus Tepe Zagheh; aus Ismailabad, Mushelan Tape; Übergangs- und frühe Kupferzeit, um 5200–4000 BC.



20cm

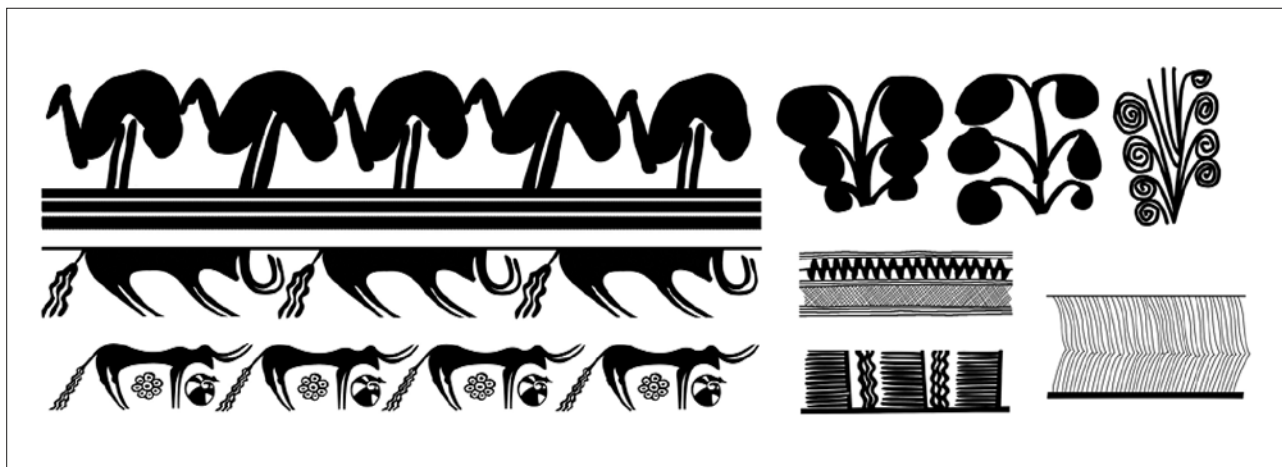


Fig. 12 A selection of graphic patterns appearing on the Middle Chalcolithic pottery of Tepe Ghabrestan.

Abb. 12 Eine Auswahl von Motiven auf Keramik der mittleren Kupferzeit vom Tepe Ghabrestan.

## 5.2. Metallurgy

The earliest metal sources exploited on the Iranian Plateau from the 8<sup>th</sup>–7<sup>th</sup> millennia BC were native copper and copper arsenides (Pigott 1999). T. Stöllner (2005, Fig. 1) mentions the mining locations of Veshnaveh, Kohrud-Qamsar, and Gorgab along the north-eastern piedmont of the Zagros, on the western margin of the northern Central Plateau, as examples of possible copper procurement areas accessible to late prehistoric prospectors. However, most old and ancient mines and metalworking sites are still unknown, and dozens of similar sites may be discovered in future (Thornton 2009, 310; Helwing 2013a, 107; Emami 2014). In the late 8<sup>th</sup> millennium BC, pure native copper was transported across long distances<sup>7</sup> and hammered into simple beads. A Late Neolithic metallurgy focusing on awls, tacks, rivets, pins, and a few other small objects developed across the Plateau during the 7<sup>th</sup> millennium BC: all these products – mostly ornaments and even piercings – were probably cold-worked and annealed (Thornton 2009, 310; Helwing 2013a, 112). Helwing (2013a, 113) stresses how the high temperature treatments of native copper link this new technology to pottery firing and probably to lithics processing, in a single network of craft-knowledge cross-exchange.

Across the Plateau, during the 6<sup>th</sup> and 5<sup>th</sup> millennia BC, the growth of copper metallurgy proceeded through slow,

discontinuous and still poorly understood steps. Famously, in the Kerman region, at Tal-i Iblis, copper oxides were first smelted in crucibles heated from above as early as the late 6<sup>th</sup> millennium BC (Helwing 2013a, 114). This happened in cottage-like contexts, but the apparent isolation of the early Iblis technology suggests that the craft competence involved was somehow restricted (and this might explain its slow spread across the Plateau highlands).

At Fars, there is early evidence of Chalcolithic lost-wax cast objects of the Bakun tradition (Helwing 2013a, Fig. 5). During the 5<sup>th</sup> millennium, extraction seems to have shifted *en masse* to the arsenic-rich ores of the Talmessi district (or to similar ore outcrops of unknown location). At this period, copper-processing areas were located near the mines, semi-finished lumps eventually being transported to the main centres (Helwing 2013a, 114). By the late 5<sup>th</sup> millennium BC, crucible smelting was being carried out at Cheshmeh Ali (contemporary Tehran; Thornton 2009, Fig. 3) and other sites. Large amounts of slag, litharge cakes, furnaces, crucibles, and mould fragments dated to the late 5<sup>th</sup> millennium BC were found by the Sialk Reconsideration Project.

Around 4000 BC, crucible smelting of copper was intensively practiced in all the most important villages of the Central Plateau region. Thornton (2009) argues that, by that time, the abundant sources of pure copper had been superseded by an explicit preference for copper alloys (obtained from polymetallic ores or, more probably, intentionally produced) containing low percentages of arsenic, lead, and other minor elements. Arsenic, acting as a deoxidant that improved casting and a hardener of the final casts, was a crucial and long-lasting technical choice of the early metallurgists of the Plateau.

Y. Majidzadeh (Majidzadeh 1979; Majidzadeh 1989; Majidzadeh 2008) gives descriptions of a two-roomed workshop in level II of Tappeh Ghabrestan dated to the Middle Chalcolithic, c. 4000–3700 BC. It had hearths and pit-furnaces, a

Fig. 11 (left page) A Middle Chalcolithic subcylindrical jar with a carinated base. The shape of the base suggests that this type of vessel was sunk in the house floor and presumably used for storage. From Sialk South, Middle Chalcolithic (c. 4000–3700 BC), Sialk Museum.

Abb. 11 (linke Seite) Subzylindrisches Gefäß aus der mittleren Kupferzeit mit abgesetztem Boden. Die Ausformung des Bodens weist darauf hin, dass diese Gefäßform in die Hausböden eingetieft war und wohl zur Vorratshaltung diente. Aus Sialk Süd, mittlere Kupferzeit (um 4000–3700 v. Chr.), Sialk Museum.

<sup>7</sup> For example, the copper of the Neolithic beads found in Fars seem to have travelled not less than 400 km (Helwing 2013a, 112).

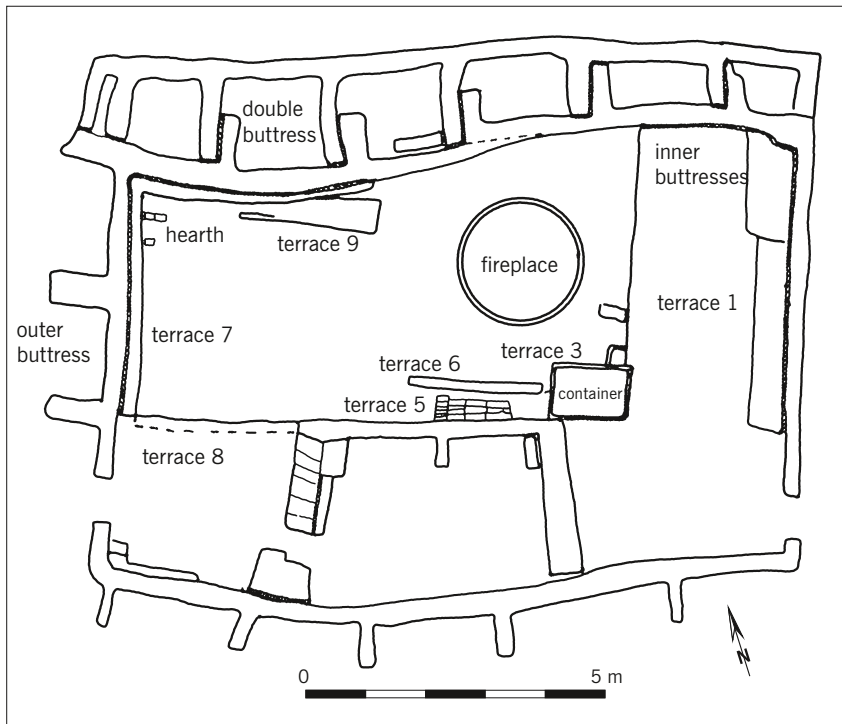


Fig. 13 The Painted Building of Tepe Zagheh, ground-plan, second half of the 6<sup>th</sup> millennium BC. »Terraces« indicate the location of raised benches.

Abb. 13 Das bemalte Gebäude vom Tepe Zagheh, Grundriss, zweite Hälfte 6. Jahrtausend v. Chr. »Terrassen« weisen auf die Position erhöhter Bänke hin.

bowl containing 20 kg of crumbled copper oxides ready for smelting, slag, crucibles, about 10 moulds for objects and bar ingots, water storage facilities, finished objects, and tools like daggers, flat and shaft-hole axes, two-headed picks, chisels, awls, needles, and pins (Fazeli 2004, 196). Crucibles had distinctive fenestrated cylinder-like bases. This workshop for copper-ore smelting and casting was surrounded by other buildings, apparently devoted to pottery firing and presumably to other crafts, in a kind of walled central compound. This is usually taken to be an early form of aggregate production, or production controlled by a minority of the village population.

During the early 4<sup>th</sup> millennium BC, copper and silver working were intensively practiced, often at small and ephemeral smelting sites, along the edges of the desert, far from associated permanent settlements (Nezafati et al. 2008; Helwing 2013a, 117). The productive intensification of the 4<sup>th</sup> millennium BC was linked to the surge of long-distance trade activities that exported tools and weapons made in the workshops of the northern Central Iranian Plateau to Khuzistan and probably to Mesopotamia (Lamberg-Karlovsky 1978; Matthews/Fazeli 2004; Helwing 2013; Helwing 2013a).

Different types of crucibles might reflect the opposition between indoor »centralised« production (like that at Ghabrestan) and independent production at the peripheral temporary sites (Thornton 2009, 313).

In the Late Chalcolithic (c. 3700–3400 BC), the smelting of arsenical copper in pit furnaces, arsenic probably being added to the smelt, was the most important technical choice (Rehren et al. 2012; Kashania et al. 2013). Besides Gha-

brestan, important copper smelting units were found at Tepe Hissar, Tepe Sialk, Arisman and other minor centres like Maral Tappeh and Tappeh Ma'morin (Helwing 2006; Helwing 2013a, 117). While Sialk was partially engaged in small-scale processing of copper, lead, and silver, Arisman was a more extensive industrial settlement. The local *chaîne opératoire* included the grinding of copper ores with a large inventory of heavy-duty stone tools. Trace element and lead isotope analyses suggest that at Arisman, when production reached a peak, copper ores came, not from a single controlled district, but from at least four different mining areas, as one would expect in the case of a decentralised socio-technical network.

In fact Thornton (2009, 313) proposed that Arisman was »[...] a community of skilled metalworkers (and potters) who preferred to work closer to the ore sources (or away from the main settlement),« an independent offshoot of their society. Perhaps the Arisman areas were seasonally settled by small groups of metalsmiths, possibly also involved in trade (Stöllner 2005, 205; Thornton 2009, 314). While nothing is known about the links between, or the integration of, these different forms of metalworking organisations, around 3700–3500 BC the prevalent context of production seems to have been domestic.

In the mid 4<sup>th</sup> millennium BC, the metallurgy of the Iranian Plateau had important regional variations, recognised in the literature. At Tepe Hissar, in north-eastern Iran, there is evidence of lead smelting (in part from anglesite<sup>8</sup>) primary and secondary smelting of copper extracted from copper-iron sulphides (bornite containing lead and arsenic) and

8 M. Vidale, preliminary X-ray diffraction analysis of ore fragments originally stored in the

former IsMEO (International Association of Mediterranean and Oriental Studies) reserve

collection, Rome.

the subsequent melting processes (Thornton 2009, 314; Helwing 2013a, 118). At Shahdad near Kerman, in south-eastern Iran (current research) the local metalsmiths extracted copper from copper carbonates and chlorides (malachite, atacamite, and paratacamite), apparently with a crucible-smelting process practiced since the mid 4<sup>th</sup> millennium BC (Vidale et al., ongoing unpublished research). As the same ores were similarly exploited in the later 3<sup>rd</sup> millennium BC workshops in Bronze Age Seistan (Artioli et al. 2005), this might point to an independent metallurgical tradition linking the edge of the Lut desert and Seistan basin, perhaps from the mid 4<sup>th</sup> millennium BC.

In the Central Plateau, the coppersmiths of Sialk, Arisman and Ghabrestan successfully shared the same embedded knowledge, using similar practices and tools to smelt locally-available oxidic and sulphidic ores rich in arsenic and iron, and produce a rich inventory of heavy copper goods (both tools and weapons) some of which might have been traded to distant Susa.

This dimension of »shared knowledge« (Thornton 2009, 319) contrasts with the earlier, apparent seclusion of copper smelting in the compound of Ghabrestan, and rather resembles the technological uniformity behind the decentralised production of pottery established since the times of the Cheshmeh Ali black-on-red-painted fine wares. Besides a higher level of exchange of technological information among craft communities, the faunal data from Arisman showed that this process of general integration may have been made easier by the introduction of domestic donkeys as beasts of burden in the macro-region from the early 4<sup>th</sup> millennium BC onwards (Potts 2011; Helwing 2013a, 121).

In the last centuries of the 4<sup>th</sup> millennium BC, the metallurgical sites of northern and north-eastern Iran and the organisation of production changed profoundly (Stöllner 2005, 137; Thornton 2009, 315). While cottage-level production persisted in some excavated sites, larger specialised industrial areas grew at Tepe Hissar, Sialk, and Arisman. Such sites have abundant remains of installations and dumps free from domestic refuse but rich in slag and other metallurgical craft indicators. This shows the introduction of new, more efficient technologies for smelting polymetallic ores, rich in arsenic, in well-built furnaces, and a growing standardisation of the processes, which paved the way for further progress in the 3<sup>rd</sup> millennium BC.

All this happened in the context of a general quest for silver (extracted through cupellation from lead sulphide, galena ore) possibly to be used as an exchange medium (Nezafati/Hessari 2017). The recent discovery of an intensive silver refining industry employing cupellation at Tepe Shoghali (Nesafati/Hessari 2017) and Arisman (Momenzadeh/Nezafati 2000) adds to what was discovered at Tepe Sialk (Shahmirzadi 2003; Nezafati/Pernicka 2005), at Tepe Hissar (Roustaei 2004) and at more distant sites like Fatmalı-Kalecik in eastern Anatolia (Hess et al. 1998), Habuba-Kabira in Syria (Pernicka et al. 1998) and Ilgynly Depe in southern Turkmenistan (Salvatori et al. 2009). Although

there is no written or direct archaeological evidence, silver may already have been in demand from the mid 4<sup>th</sup> millennium BC onwards, because it was becoming a standard exchange medium among long-distance extraneous traders (The other component of this long-distance exchange network may be archaeologically invisible: wool).

Finally, another feature of metalworking in the transition from the Final Chalcolithic to the Early Bronze Age is a separation between »elite-driven« production and craft areas, and »utilitarian« goods and contexts (Thornton 2009, 319). Such different productions and social spheres may be recognised in the Central Plateau industrial sites, but also at Tepe Hissar (lapis lazuli and copper/lead/silver smelting workshops of the South Hill, *versus* the smelting of arsenical copper in the Main Mound); and even at Tal-i Malyan in Fars (copper artifacts in the craft compound in area TUV, *versus* those found in the palatine complex of area ABC).

### 5.3. Bead making

Helwing (2013a) recognises the spread, in the 5<sup>th</sup>-millennium settlements of the Iranian Plateau, of »large communal (store) houses« exceeding the size of common households. The most impressive assemblages of beads dated to the Transitional Chalcolithic of the northern Central Plateau come from old excavations of the exceptional ceremonial-cum-funerary complex of the Painted Building at Tepe Zagheh in the Qazvin plains (Shahmirzadi 1977; Negahban 1979), dated to the Transitional Chalcolithic<sup>9</sup> (Fig. 13).

The Painted Building stood amidst an irregular network of common subrectangular houses and open spaces. It was a rectangular hall made with mud bricks and measuring 11 x 7 m, surrounded by regularly spaced outer buttresses. In a second stage, the buttresses were enclosed by an additional outer wall, thus obtaining an outer series of square cells. The hall contained a large round hearth, nine benches and clay containers. The inner walls of the hall were painted with geometric designs in black and white on an ochre-coloured background; the skulls or horns of 18 wild goats (ibexes) featured on the painted wall were probably part of the decoration. Inside the building were found copper tools and several clay figurines.

The surrounding houses had simple intra-mural burials. Eight exceptional graves hosted the remains of females, oriented and converging towards the Painted Building. They had been buried with necklaces, armbands, bracelets, belts, diadems made of hundreds of beads in various materials like shell, carnelian, turquoise, limestone/marble, clinchlore (?), and also probably modified artificial materials like faience and fired steatite. The burials featured ochre, applied even in the mouth (Negahban 1979; Tala'i 1999). Other contemporaneous burial contexts excavated at Tepe Paridis had hundreds of beads made of shell, red oyster or *Spondylus* sp., marble/limestone, turquoise, clinchlore (?), and carnelian, plus others in unidentified stones, perhaps

<sup>9</sup> According to recent calibrated radiocarbon dates, the Painted Building was erected

around 5370–5070 BC and abandoned around 4460–4240 BC.



Fig. 14

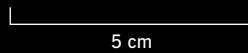


Fig. 15

**Fig. 14** Group F beads, from one of the eight rich female graves excavated near the Painted Building of Tepe Zagheh. Beads visually identified as carnelian, turquoise, a kind of fired steatite (?), and a compact dark green iron oxide.

*Abb. 14* Perlen der Gruppe F aus einem von acht reichen Frauengräbern, die in der Nähe des bemalten Gebäudes vom Tepe Zagheh zum Vorschein kamen. Die Perlen wurden makroskopisch als Karneol, Türkis, eine Art gebrannter Speckstein (?) und dunkelgrünes Eisenoxid identifiziert.

**Fig. 15** Group A beads, from a rich grave excavated at Tepe Pardis. Beads visually identified as fired steatite (?), shell, *Spondylus* sp., turquoise. Transitional Chalcolithic, c. 5200–4700 BC.

*Abb. 15* Perlen der Gruppe A aus einem reichen Grab vom Tepe Pardis. Die Perlen wurden makroskopisch als gebrannter Speckstein (?), Muschelschalen, *Spondylus* sp. und Türkis identifiziert. Übergangskupferzeit, um 5200–4700 v. Chr.



Fig. 16

**Fig. 16** Group B beads, from a rich grave excavated at Tepe Pardis. Beads visually identified as shell, amethyst or rose quartz, and carnelian. Transitional Chalcolithic, c. 5200–4700 BC.

*Abb. 16* Perlen der Gruppe B aus einem reichen Grab vom Tepe Pardis. Die Perlen wurden makroskopisch als Muschelschalen, Amethyst oder Rosenquarz und Karneol identifiziert. Übergangskupferzeit, um 5200–4700 v. Chr.

hematite or pyrite, fired steatite, steatite faience and blue siliceous faience (Fig. 14–17; Tab. 2; Vidale et al. forthcoming).

As the list in Table 2 comes from a swift examination of a selected series of beads presently kept in the Archaeological Museum of the Institute of Archaeology, at the University of Tehran, it does not represent the entire range. Shells and *Spondylus* sp. probably came from the shores of the Persian Gulf. Although we are not in a position to establish the source areas of the semiprecious rocks and minerals on the list, few of them, if any, are commonly available and they probably travelled from outcrops at a medium to long distance from the site.

Large beads like those illustrated in Fig. 18 are showy, but, being made of terracotta, certainly belonged to less affluent individuals. Siliceous faience beads, like those in Fig. 17, and fired steatite beads (which, taken together, form the majority of the specimens in the Tehran collections) pose intriguing questions, because fired steatite-based beads might be linked with the skilled industrial traditions of the earliest Indus Valley tradition, while the blue siliceous faience of Tepe Pardis, as far as we presently know, may be the earliest substantial evidence of this kind of product in the world.

Which of these base materials were locally produced and/or transformed into beads in these Chalcolithic villages? Advanced techniques for processing and thermally transforming ceramics made of talcose rocks cannot be excluded *a priori*, considering the popularity of steatite beads at Tepe Hissar. Moreover, local metalsmiths, in the 4<sup>th</sup> millennium BC, carefully mixed ground steatite with clay for producing refractory crucibles (Thornton/Rehren 2009) and added ground talc-schist, with other rocks, to oxidic ores to remove sulphur and thus improve the copper yield (Thornton 2009, 314). In short, craftsmen had a noticeable cumulative skill in the transformative pyrotechnologies of talcose rocks.

However, the evidence of local production of beads at present remains quite limited. At Sang-i Chakhmaq, Transi-

tional Chalcolithic beads only include finished specimens in marble, shale, and turquoise (Roustaei 2014). In a study of surface finds at the eastern site of Tepe Pahlavan, Vahdati (2010) collected evidence of a bead-making industry. It was based on serpentine and gypsum, while illustrations in the paper also showed a lapis lazuli flake fragment and other light-greenish stones with conchoidal fractures (Vahdati 2010, Pl. 8 and 10). Microdrills in brown flint or chert are also on record (Pl. 7). The stone varieties used in bead-making here diverge from the inventories of beads found in the graves of Tepe Pardis and Tepe Zagheh. M. Hossein Kharanaghi et al. (2016) later reported not only the processing of locally-available greenish gypsum and serpentine, but also of red and yellow jasper, not locally available and much harder to fashion, and added a lapis lazuli cylinder bead to the inventories. The microdrills are made from flakes of various sizes and crested ridge blades; part of the published drill heads have distinctive notched or indented sides, and although the authors propose a preliminary 4<sup>th</sup>-millennium BC dating, these microtools look different from those found at Tepe Hissar.

A preliminary survey of the lithics from surface surveys and test trenches in the Transitional Chalcolithic mounds of the Qazvin plains (Vidale et al. forthcoming) did not reveal any evidence of bead-making activities that could match the impressive consumption of personal ornaments in the burials of Tepe Zagheh. Out of 2272 lithics found at Ebrahimabad, Ebrahimabad III, Ismailabad, Zagheh and Kamalabad, only 43 were of a textural and chromatic quality compatible with the production of ornaments, and only four, in this group, were reliably classified as rough-outs for beads. In the same assemblage, we found no microdrills comparable to those of Tepe Pahlavan, nor meaningful concentrations of debitage left by bead-makers. The Qazvin sites, in fact, have only some yellow and red jasper flakes and cores, a few unworked lumps of banded pinkish-grey and blue agate, and variegated agate and chalcedony quite similar to those currently found in the agate fields of Rud-e Shur Baraghan, and

**Tab. 2** Comparative composition of a sample of the bead assemblages excavated near the Painted Building of Tepe Zagheh (left) with a sample (not the total assemblage) of many others more recently excavated at Tepe Pardis. Transitional Chalcolithic (c. 5200–4700 BC).

**Tab. 2** Vergleich der Zusammensetzung zwischen einer Auswahl an Perlen aus der näheren Umgebung des bemalten Gebäudes vom Tepe Zagheh (links) und einer Auswahl an Perlen aus diversen anderen, später ausgegrabenen Befunden vom Tepe Pardis. Übergangskupferzeit (um 5200–4700 v. Chr.).

Material	Zagheh		Pardis	
	No. of beads	%	No. of beads	%
»massive fired steatite«	576	34.4	291	36.2
»steatite paste«	539	32.1	50	6.2
faience	–(?)	–(?)	85	10.6
white shell	14	0.8	18	2.2
<i>Spondylus</i> sp.	–	–	15	1.9
turquoise	73	4.4	11	1.3
carnelian	10	0.6	47	5.8
rose quartz	–	–	40	5
dark green stone (chlorite?)	–	–	140	17.5
unidentified black stone (hematite, pyrite or others?)	464	27.7	–	–
white marble	–	–	106	13.2
Other	–	–	1	0.1
<b>Total</b>	<b>1676</b>	<b>100</b>	<b>804</b>	<b>100</b>





Fig. 17

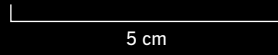


Fig. 18

Ramin (Nazari 2017). These agates were available within the boundaries of a local procurement network, but no beads seem to have been made with these hard silicate stones. Some large beads made of (silicised?) marble found at the Qazvin sites were perforated with thick, cylinder-like drill-heads comparable with those used since the 4<sup>th</sup> millennium BC in early sites of the Indus tradition (Kenoyer/Vidale 1992), as well as with borers like those found in the Late Neolithic village of Mezraa Teleilat, in the upper Euphrates valley (c. 6000–5000 BC: Coskunsu 2008). However, none of these specialised drilling heads has ever been found at a site in this study area.

In short, the picture of bead making and consumption in the Transitional Chalcolithic is still very fragmentary and remains contradictory. The disproportionate quantities of beads in a few graves at Tepe Zagheh and Tepe Pardis, when compared with the modest number of valuable ornaments in the majority of the graves excavated at sites like Tepe Sialk and Tepe Cheshmeh Ali (as reviewed in Fazeli Nashli/Matthews forthcoming) makes abundantly clear that beads were at times a crucial expression of social ranking. Beads were made with quite advanced technologies, showing that the Central Plateau societies were in touch with important craft and trade communities and dynamic flows of communication and innovation.

However, albeit minimalistic, the most reasonable hypothesis at present is that although these beads displayed at the funerals confirmed the privileged status of a minority, their production was not local. It may have been a decentralised production near extraction areas, where it was performed by specialised groups from the marginal plains (as at Tepe Pahlavan). Perhaps some of the most valuable ornaments (like turquoise, *Spondylus*, amethyst, deep red carnelian beads, and those made with high-tech artificial ceramic materials) were simply imported as finished products from remote locations. While these remain conjectures, so far we have located no centralised site of bead production, and the hypothesis of decentralised manufacturing locations would match what has so far been observed for the organisation of

**Fig. 17 (left page)** A necklace of beads made of a siliceous faience with remnants of a blue glaze found in a grave at Tepe Pardis. Transitional Chalcolithic, c. 5200–4700 BC.

**Abb. 17 (linke Seite)** Halskette mit Perlen aus einer kieselsäurehaltigen Fayence mit Überresten einer blauen Glasur aus einem Grab vom Tepe Pardis. Übergangskupferzeit, um 5200–4700 v. Chr.

**Fig. 18 (left page)** A group of large, cubic terracotta beads, found in a grave at Tepe Zagheh, very visible but obviously cheaper, for example, than the beads in Fig. 15 and 16, hints at explicit social levels in the funerary representations of the ancient Transitional Chalcolithic societies (c. 5200–4700 BC).

**Abb. 18 (linke Seite)** Eine Gruppe von großen quadratischen Terrakotta-perlen aus einem Grab in Tepe Zagheh. Obwohl sehr auffällig, waren sie deutlich weniger wertvoll als die Perlen in Abb. 15 und 16, was als Hinweis auf eine soziale Gliederung im Grabbrauch der Gesellschaften der Übergangskupferzeit gelten kann (um 5200–4700 v. Chr.).

metallurgical and lithics processing in later Chalcolithic times. Once more, absence of data prevents us from understanding the development of these industries in the 4<sup>th</sup> millennium and later periods.

#### 5.4. Lithics processing and use

In the study area, as in many important regions of the Near East and Middle Asia, lithic studies still lag behind studies of other technologies. In Late Neolithic times, reflecting in some respects the Jeitun tradition, the lithic inventories include blades from single-platform cores, sickle elements, and microliths such as trapezes and borers (e.g. Thomalsky 2014; Tsuneki 2014; Tsuneki 2014a). Information on the industries mostly depends upon a preliminary scrutiny of lithic collections from Transitional Chalcolithic sites of the Tehran plains (Cheshmeh-Ali, Sadeghabadi, Fakrabad, Mafinabad, Chakmaq Tepe and Mehdikhani, Fazeli et al. 2002) and preliminary, unpublished studies on the lithics from various ancient settlements of the Qazvin plains (Zagheh, Ebrahimabad, Ismailabad, Kamalabad and others – Siviero and Vidale, ongoing research).

In general, following Fazeli et al. (2002), the evolution of lithic industries in the time span under consideration may be summarised under four features or trends:

- a intra-regional divisions in the use of locally available raw materials (in the Tehran plains, a cline separates the western area, where red chert is common, from the eastern area, where grey and green varieties predominate);
- b a shift from the use of good quality material in the Late Neolithic and the Early Chalcolithic, often worked at off-site locations near the sources<sup>10</sup> to the use, in the Middle to Late Chalcolithic, of primarily poor-quality, local material, processed to a great extent at a family level within households;
- c the import of limited quantities of very high quality stones (tan chert, white chalcedony or agate) as exotica, sometimes being worked with refined pressure flaking techniques;
- d a final general collapse of lithic crafts, probably linked to an increased use of copper tools during the Middle and Late Chalcolithic.

Another clear, but still scarcely formalised trend was a general transition from the blade-based industries of the Late Neolithic to »simple« production and use-operational sequences, which left behind smaller-sized debitage including unworked and window-chipped river pebbles, prismatic, worn-out and broken cores, cortical and tabular flakes, crested ridge blades, platform rejuvenation flakes, unmodified blades, formal tools, and burin spalls, with some sickle blades and the occasional, rare microliths.

At Tepe Pardis (Coningham et al. 2006), too, lithic assemblages are due to the on-site processing of locally-available

<sup>10</sup> Helwing (2013a, 113; see also Thomalsky unpubl.) stresses that in the Transitional

Chalcolithic »[...] lithic industry became specialised, and knapping workshops were loca-

ted outside of settlements close to the raw material sources.«



Fig. 19 Chert blades from Tepe Ismailabad, Qazvin Plains, context 13 (Transitional Chalcolithic, c. 5200–4700 BC).

Abb. 19 Hornsteinklingen aus Tepe Ismailabad, Qazvinebene, Befund 13 (Übergangskupferzeit, um 5200–4700 v. Chr.).

varieties of silicate stones, such as brown, tan, grey, and honey-coloured chert, red jasper and quartz. Unlike the locally available stones, the finer honey-coloured silex was chipped in off-site locations and imported to Pardis in the form of finished blades.

Similarly, one of the best reported assemblages, from the Arisman excavations, shows the exploitation of several silicate stone varieties: chert (opaque grey and green tuff) and silex (fine-grained grey, banded, black, reddish-brown and caramel-coloured). The lithic collection at Arisman evidences a blade-oriented industry with a clear emphasis on sickles, with specific functions within an agricultural context during the late Sialk III period. Next comes a flake industry distinct in technology and morphology, but also in raw material preferences.

Excavators also noted the presence of »[...] smaller groups of artefact classes of blades or flakes - drills, scrapers, microliths and sandstone blades »as well as« [...] the complete absence of specific tool groups, such as core tools, burins, regular scrapers and points« (Helwing/Thomalsky 2011, 345). In the later Sialk III assemblages, too, blade-based pro-

duction gave way to later flake-based industries. This important technical choice may be also mirrored in the evidence of lithic industries found on the surface of the aceramic sites of the south-eastern Iranian sites of Darestan near Bam, reportedly dominated by similar retouched, backed, denticulated and notched flakes (Shakooie/Garazhian 2013).

A preliminary survey of the lithics collected by one of the present authors (Fazeli Nashli) on the surface and in the excavated trenches of sites on the Qazvin plains showed the use of a similarly varied range of base materials, confirming one or more highly dynamic systems of intra-regional exchange of silicate rocks. A preliminary look at the Qazvin assemblages shows a noticeable rarity of blades (a few examples in Fig. 19) and an almost complete absence of bladelets. Pyramidal and bullet-like cores are also rare or absent; most cores are coarsely flaked pebbles or polyhedral specimens.

The Qazvin plains lithics, both those found on the surface and those uncovered in stratigraphic test trenches, are largely based on the detachment and use-driven reduction of flakes of »Levallois«-like form<sup>11</sup>, detached through direct, hard hammer action and probably also by indirect percussion from

<sup>11</sup> This definition, obviously enough, is purely morpho-typological, and has no bearing on the cultural and chronological attribution of the industry. The heavily retouched tools on flake from the Chalcolithic sites of Qazvin look quite similar to those published as

Middle Palaeolithic by S. Heydari Guran and E. Ghasidian 2011: sites at Qal'e Gushe (Fig. 3, 9–13) and Holabad (Fig. 8, 2–11). A chopper-like tool found at Holabad, too, matches very well similar flaked pebbles found in the Qazvin sites (see for examples our Fig. 25). In a

surface survey, Palaeolithic and Chalcolithic assemblages containing the same types will be easily misidentified. Mode 1 stone flaking industries were still widely used in Chalcolithic Central Asia.

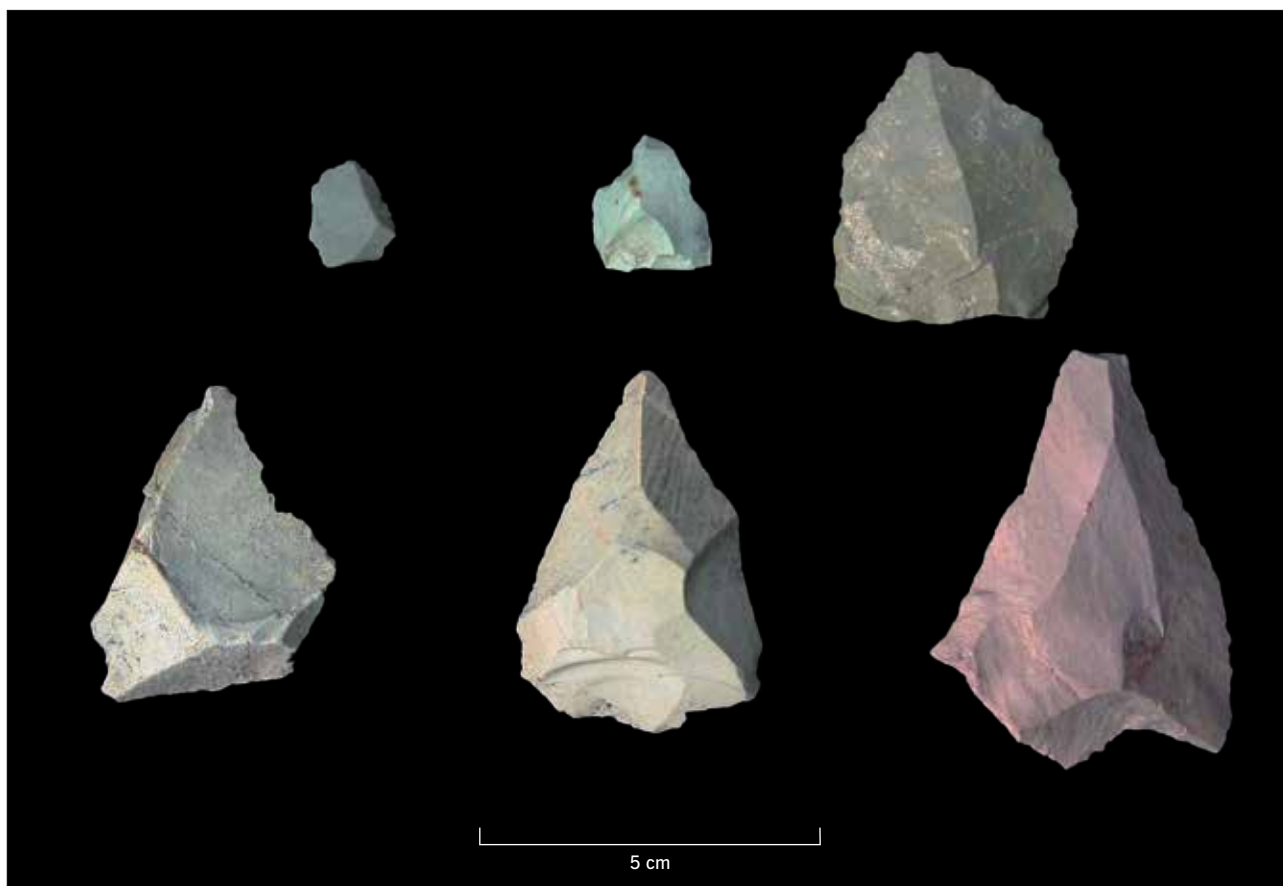


Fig. 20 Trapeze-like points on large flakes from various excavated contexts of Kamalabad, Qazvin Plains. All points in this picture have the striking platform at the lower left edge, and represent the standard form which, subsequently reduced by use and retouch, creates the tools of Figures 20–22 and other functional types. Note the apparent similarity with Middle Palaeolithic tools of the Levallois technology (Transitional Chalcolithic, c. 5200–4700 BC).

Abb. 20 Trapezförmige Spitzen an großen Abschlägen aus diversen Befundzusammenhängen in Kamalabad, Qazvinebene. Alle hier abgebildete Spitzen haben ihre Schlagfläche am unteren linken Rand. Dies ist die übliche Form, welche durch den Gebrauch und die Retuschen zu den Werkzeugen der Abbildungen 20–22 sowie zu weiteren Geräten umgearbeitet wurde. Auffällig ist die offensichtliche Ähnlichkeit mit mittelpaläolithischen Geräten der Levallois-technik (Übergangskupferzeit, um 5200–4700 v. Chr.).

river pebbles, and transformed either into heavy-duty points and denticulated or notched tools, or into thick frontal, lateral/bilateral and rear scrapers<sup>12</sup> (some examples are shown in Fig. 20–23). The tools' morphology seems dictated, to a large extent, by the degree of intensity of their exploitation, continuous peripheral consumption, and the backing of thick and large flakes of standardised trapeze-like form.

The striking platforms of the large »Levallois«-like flake preforms, when not heavily retouched or completely exhausted, are often broken in the centre, as if originally impacted for detachment with a hard (copper?) punch. As copper points with bone hafts are common at the Late Chalcolithic Plateau sites, the same technique has been independently hypothesised (in Helwing 2013a, 116).

Cutting/scraping tools sometimes retain traces of bitumen or resin applied on the haft section, and evident traces of bright red ochre along the heavily re-sharpened edges (examples in Fig. 23: the image is part of an ongoing, still unpublished research by Fazeli, Azizi Kharanaghi, Siviero

and Vidale). The function of these tools is totally unknown, will require future specialised studies. Sickle blades with incipient reaping sheen are irregularly fashioned and, on the whole, not common, and the few drill-heads on record are large and evidently not standardised. Boring tools seem to have experienced long use on soft materials rather than being used for drilling hard beads (see above). The scarcity and lack of formal care of the sickle blades on record, compared with their high frequency and evident technical curation in Neolithic and Late Neolithic assemblages, is ascribed to the introduction of copper reaping tools.

In summary, as remarked by Helwing and Thomalsky (2011, 349): »During the later period, the former specialized blade industry is replaced by an *ad hoc* industry with an emphasis on flakes and small-scale debitage.«

And exactly as observed for northern Mesopotamia, »[...] the presence of a more flake-oriented tool production – accompanied by a predominance of flakes and chipping debris – should not be considered a regressive trend in tech-

12 On the surface of the site of Tell Lashkar, in the Iraqi Kurdistan near Erbil, one of the

authors (Vidale) has recently observed a Halaf-Ubaid chipped-stone techno-complex

that has several points of contact with the Chalcolithic industries of the Qazvin plains.

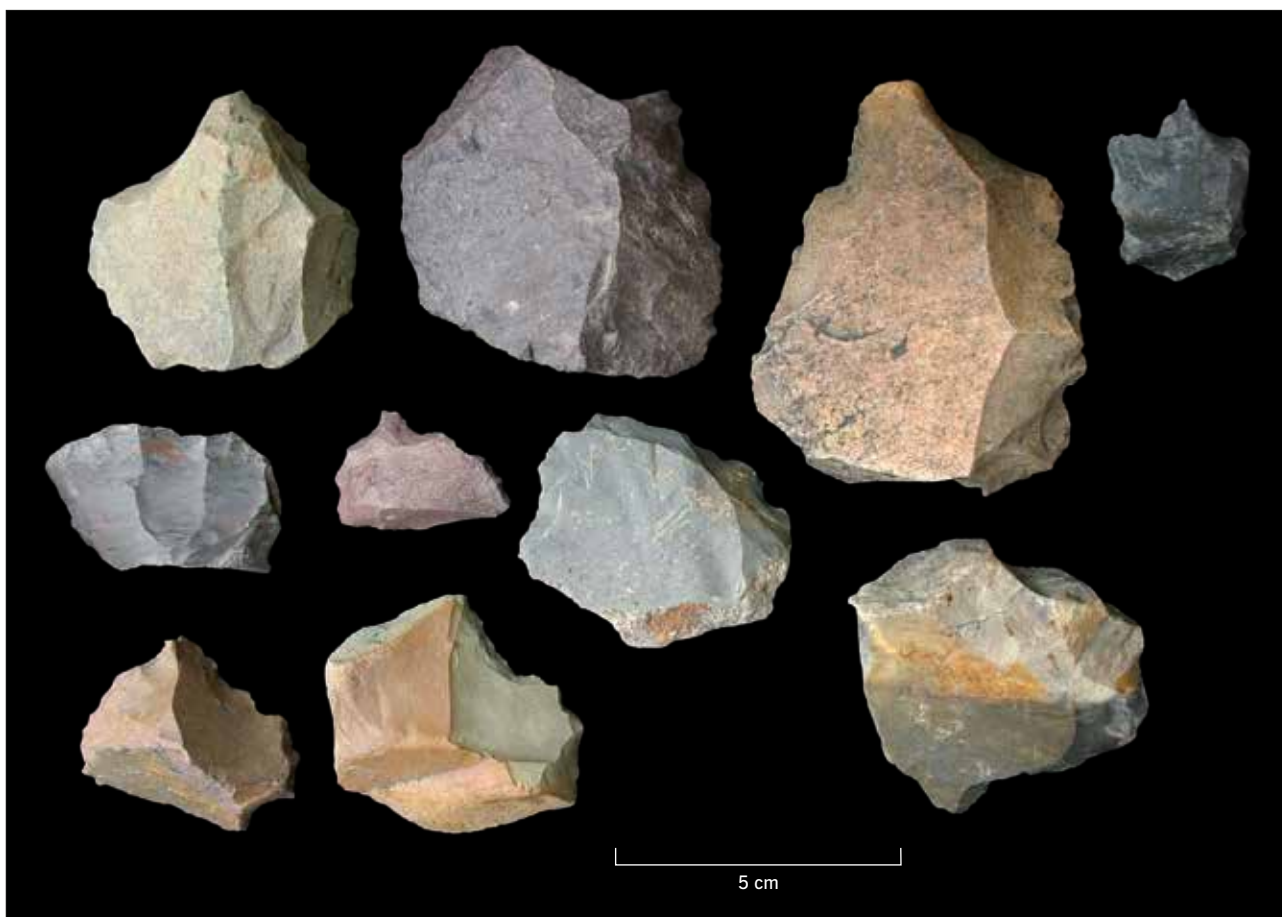


Fig. 21 Carinated scrapers made out of thick flakes from various excavated contexts of Kamalabad, Qazvin Plains (Transitional Chalcolithic, c. 5200–4700 BC).

Abb. 21 Kielkratzer an dicken Abschlägen aus diversen Befunden in Kamalabad, Qazvinebene (Übergangskupferzeit, um 5200–4700 v. Chr.).

nological skills, but as the result of cultural choices and specific contextual patterns» (Thomalsky 2012, 418).

Thus, the capability of stone knappers to efficiently break away, when needed, from the older and apparently finer blade traditions is another expression of the specialised, flexible and opportunistic nature of the local Chalcolithic techno-systems.

How far this was due to the gradual household »privatisation« of lithic processing for domestic purposes, and involved decreasing standards of craft specialisation, as argued by Fazeli et al. (2002), or was rather due to the intensification of a set of craft industries that, for the moment, remain archaeologically invisible, are major questions. There is no reason why the development of an intensive, specialised manufacturing process could not have brought about an efficient use of coarse and simple, but still quite effective tools. In fact, the late 4<sup>th</sup>-early 3<sup>rd</sup> millennium BC lithics visible on the surface at Tepe Sofalin and recovered at Tepe Zagheh (like the items shown in Fig. 24–25) and other sites in the Qazvin plains mounds were coarse scrapers and other large tools made from large flakes detached from thick pebbles. Some roughly-flaked implements made from natural, elongated pebbles look similar to Neolithic »wood-working chisels« found in Neolithic sites of the Levant (Barkai 2011, Fig. 7).

The late 4<sup>th</sup> millennium assemblages, too, in spite of their apparent coarseness, require specialist use-wear studies, as they may potentially reveal other technical functions and adaptations, and unknown forms of productive intensification. It is clear that the basic opportunistic efficiency of the chert industries of the Chalcolithic millennia on the Plateau diverges from our traditional models of morpho-technical evolution.

## 6. The evidence of seals, sealings, and tokens

From the Transitional Chalcolithic onwards, a relatively complex system of tokens, with different but standardised forms, allowed a reasonably efficient recording of economic transactions (Fazeli/Moghimi 2013; Moghimi/Fazeli Nashli 2015). Tokens were not linked to a particular individual, and could have been used, since late prehistoric times (Bonora et al. 2013) as a flexible medium of recording, in forms that at present are unknown. Other crucial evidence indicates the local invention or adoption of information technologies involving a higher level of control, i.e. the use of personal seals and clay closures on jars, baskets, doors and the like. For a long time, in the study area, the evidence of stamp seals and their impressions was rather limited (Fig. 26). A

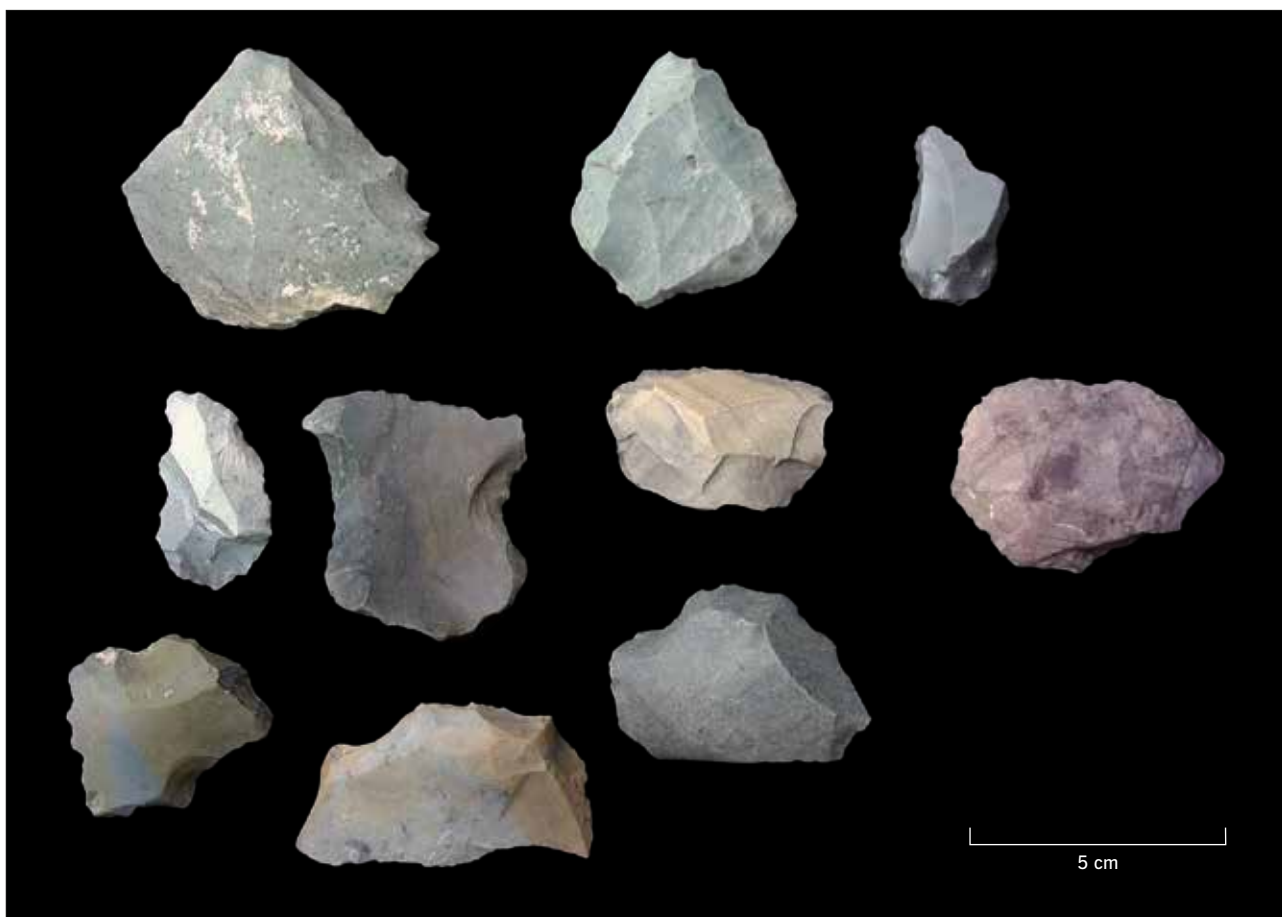


Fig. 22 Various kinds of denticulated tools and scrapers from thick flakes, found in various excavated contexts at Tepe Zagheh, Qazvin Plains (Transitional Chalcolithic, c. 5200–4700 BC).

*Abb. 22 Diverse gezähnte Geräte und Kratzer an dicken Abschlägen aus diversen Befunden in Tepe Zagheh, Qazvinebene (Übergangskupferzeit, um 5200–4700 v. Chr.).*

few seals were found at Sialk, Period III (Helwing 2013b, 101); and a few stamp and cylinder seals at Tepe Hissar, but no sealings (perhaps because of recovery errors). At Arisman, seals were used for a short time only, at the peak of the craft-producing »Proto-Elamite« settlement.

New discoveries, however, are currently revolutionising this picture. Early examples of stamp seal impressions in the Qazvin plain were found in recent excavations at Tepe Zagheh (Fazeli Nashli unpubl.) and go back to the 5<sup>th</sup> millennium BC. Large numbers of administrative artefacts, including 91 stamp-seal impressions on clay tags and 158 tokens of different forms, were found during the 2016 archaeological excavation of Ālou in the Qazvin Plain, and date to the Late Chalcolithic (3700–3400 BC; Niknami et al. in press). On the whole, seal impressions from Zagheh (Transitional Chalcolithic), Qomroud (Early Chalcolithic), Sialk (Early to Late Chalcolithic), Tepe Hissar (Late Chalcolithic), Chakhmaqlokh (a possible stamp seal impression in a non-stratified Late Chalcolithic potsherd: Alibaigi et al. 2011) and the recent discovery of Ālou Tepe suggest a long-lasting development of administrative technologies, parallel to what has been observed at Susa, Periods I–III, and more generally in Mesopotamia during the 5<sup>th</sup> and 4<sup>th</sup> millennia BC.



Fig. 23 Scrapers on flakes with evident traces of red ochre on the edge. Tepe Ebrahimabad, from excavated context 14, Tepe Ismailabad (Transitional Chalcolithic, c. 5200–4700 BC).

*Abb. 23 Kratzer an Abschlägen mit offensichtlichen Ockerspuren an den Rändern. Tepe Ebrahimabad, Befund 14, Tepe Ismailabad (Übergangskupferzeit, um 5200–4700 v. Chr.).*

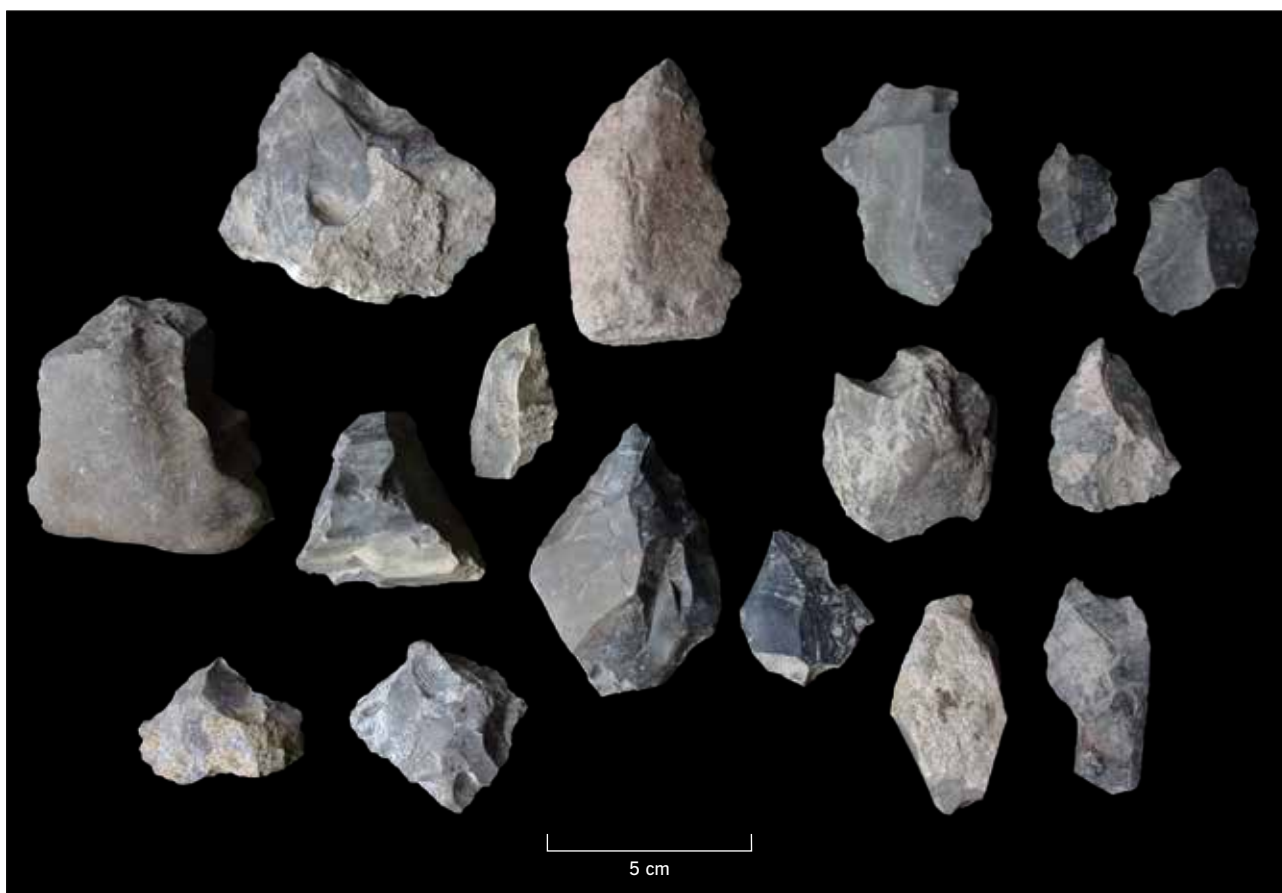


Fig. 24 Coarse scrapers and points on flakes, from excavated context 14 (Late Chalcolithic, second half of the 4th millennium BC).

Abb. 24 Grobe Kratzer und Spitzen an Abschlägen aus Befund 14 (späte Kupferzeit, zweite Hälfte 4. Jahrtausend v. Chr.).

## 7. Land, water, people, and environmental changes

In the northern Central Plateau, permanent large settlements died out around 3000–2900 BC, just when, in other regions of ancient Iran, southern central Asia (Turkmenistan) and Mesopotamia, regional and long-distance trade and communication flows were developing. Yet in the study area, despite insufficient information, it is clear that many of the preconditions for early urbanisation processes had been fully established in the course of the 5<sup>th</sup> and 4<sup>th</sup> millennia BC, well before the general collapse of the Early Bronze Age.

We refer to the use of artificial irrigation for agriculture, with the cognitive and organisational implications that implies (Vidale in press); to quite advanced and fast-developing craft technologies and village-level specialisation; and to the presence of effective, dynamic long-distance trade networks. The communities of the northern Central Plateau had an important symbolic apparatus, shared by an extended network of small rural settlements. The shared symbols (e.g. the designs on fine Cheshmeh Ali-like pottery) supported and promoted feelings of identity and solidarity. At the same time, other symbols, in the form of valuable ornaments made of exotic materials, both natural and artificial, displayed the superior rank of restricted groups.

In the Middle Chalcolithic (c. 4000–3700 BC) villages also developed a skilled metallurgy that linked the Central Pla-

teau with Khuzistan, where advanced processes of social differentiation and an early urban organisation are archaeologically visible from the 5<sup>th</sup> millennium BC onwards. Eventually, around 3500/3400 BC, the societies of the northern Central Plateau were impacted by the crucial flow of information and (presumably) economic exchanges of the so-called Uruk expansion, archaeologically visible through Uruk-related pottery types, and finally, although only temporarily, adopted the Proto-Elamite technologies of information processing (see below).

Given such a favourable socio-technical framework, why did the settlement networks of the northern Central Plateau not reach a higher level of political integration? Or, more precisely, what exactly hindered the growth of major centres of power within early urban settlements, as happened after 3000 BC on the opposite side of the Kopet Dag and the eastern Alborz?

Early urban civilisations in southern Eurasia thrived on three basic resources: land, water, and people ruled by the authority of restricted and privileged minorities. D. Potts, in a balanced review of the »unparalleled productivity« of the Mesopotamian plains, owing to the high yields of the sedimentary soils, watered by streams and canals, concludes that the land was »[...] one of the strongest agricultural underpinnings ever seen« (2016, 58). This was hardly the case with the cultivable alluvial surfaces of the fans of the Central Plateau (Walker/Fattahi 2011), nor does it apply to

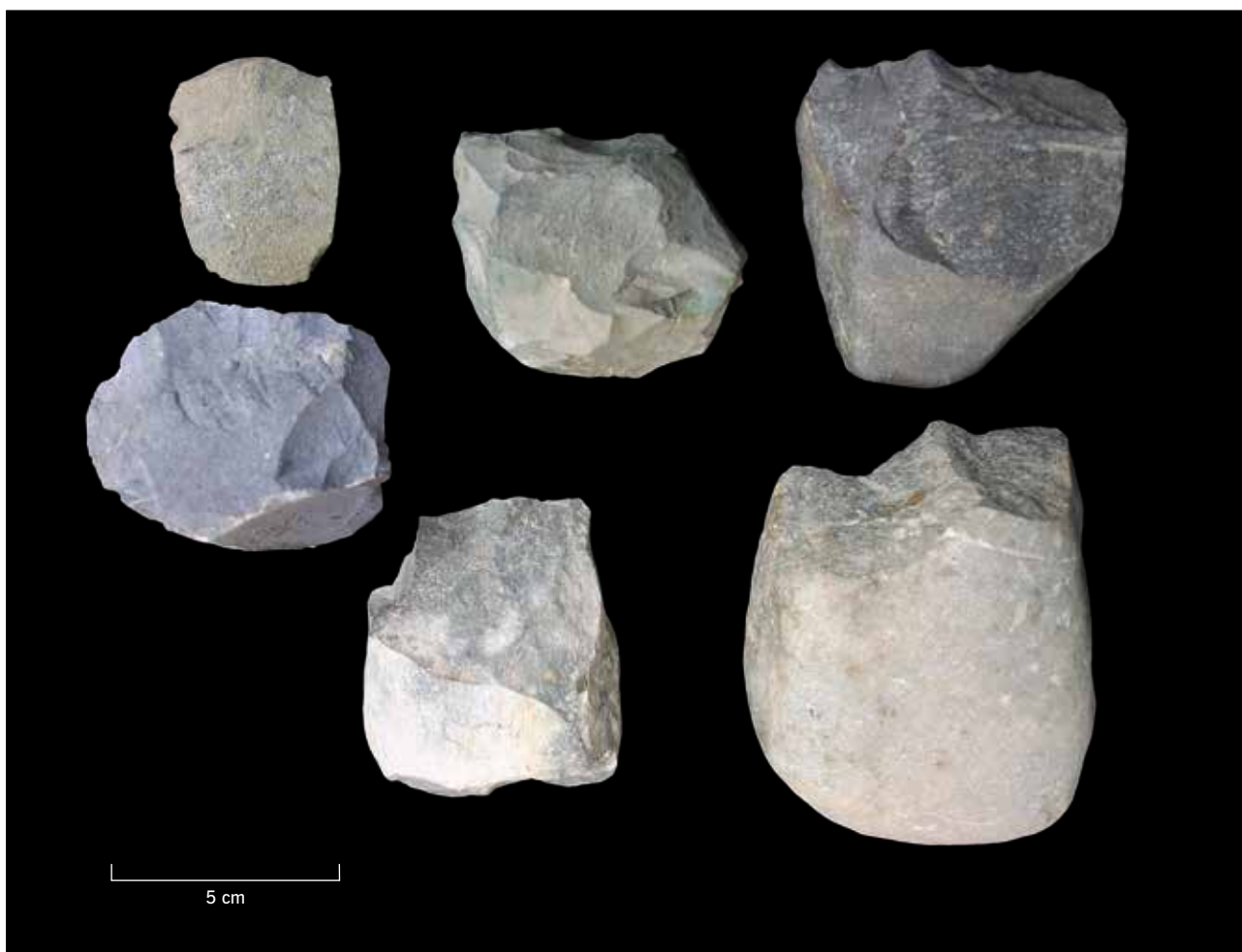


Fig. 25 Tepe Zagheh, Qazvin Plains. Coarse flaked tools on pebbles and cores, Trench VI, Tr. K.C. (Transitional Chalcolithic, c. 5200–4700 BC). Note the apparent similarity with Mode 1 lithics, with which these and similar artefacts would have been easily confused in a surface survey.

Abb. 25 Tepe Zagheh, Qazvinebene. Grobe Abschlaggeräte an Kieselsteinen und Kernen, Fläche VI, Tr. K.C. (Übergangskupferzeit, um 5200–4700 v. Chr.). Bemerkenswert ist die offensichtliche Ähnlichkeit mit Steingeräten der Mode 1-Technik, mit denen diese und ähnliche Funde verwechselt werden könnten, wenn sie als unstratifizierte Oberflächenfunde vorliegen würden.

the equally limited piedmont fans of the Kopet Dagh. Scarcity of land and water was certainly a most crucial constraint. As simply stated in the past by R. Ghirshman: »The physical aspect of the Plateau was harsh and austere. The oases were dispersed in difficult country, the population was sparse and scattered. As a result the urban revolution was retarded, and society continued in its prehistoric stage for centuries« (1954, 42).

As we have seen, however, although their agriculture, on the piedmont and along the edges of the alluvial fans, was inadequate and low-yielding, the settlement networks described can hardly be dismissed as being in a »prehistoric stage«. Rather, they were constantly threatened by the interplay of tectonics, erosion and alluviation, and human ideas of property.

In fact, it is arguable that, along the unstable alluvial fans of the piedmont, human communities frequently moved as the water sources shifted, so that, in the absence of permanent occupations, social complexity took other forms (Manuel et al. 2014, 47). However, north of the Kopet Dagh, at exactly the period when the sedentary villages of the northern Central Plateau were dying out, an agricultural life

basically similar to that possible around the Iranian basins continued to develop. This allowed the fast growth of large and technologically advanced early cities like Altyn Depe, Namazga Depe and Ulug Depe (Masson 1981; Kohl 1984; Kircho et al. 2008).

Today, rains in southern Turkmenistan are only slightly more substantial than on the opposite side of the mountain chain; if the onset of simple irrigation technology seems to have occurred in southern Turkmenistan 1000 years earlier than in northern Iran, this is not obviously correlated with any clear-cut divergence in rain patterns. By 6000 BC, artificial canals were probably crucial for cultivation in both these regions (Tab. 3).

All this excludes the relative scarcity of good, cultivable land, and adverse rain patterns as primal causative factors of a failed urbanisation. Besides Holocene climate changes, environmental catastrophes such as earthquakes, flood and volcanic eruption may partially explain the desertion of the plains soon after 3000 BC. The role of climatic change, particularly of a peak of aridity at c. 2550 BC, in the settlement hiatus in the Sagzabad cluster, seems to be beyond question (Schmidt et al. 2011; Maghsoudi et al. 2014); however the set-





Fig. 26 Stamp seals in limestone (left) and chlorite (right). From Sialk South, Middle Chalcolithic (c. 4000–3700 BC).

Abb. 26 Siegelstempel aus Kalkstein (links) und Chlorit (rechts). Aus Sialk Süd, mittlere Kupferzeit (um 4000–3700 v. Chr.).

tlements of the Central Plateau were abandoned five centuries earlier<sup>13</sup>.

Of course, further investigation will involve a careful, critical evaluation of the mutual influences of climate, settlement, cultural transitions, vegetation, tectonics, earthquake history, and access to localised water sources. For example, a major destructive earthquake hit the settlement of Tepe Sialk around 3800 BC. Later, people tried to build their houses with anti-seismic precautions (Berberian et al. 2012). During the settlement of the Sagzabad triangle, people probably experienced major earthquakes with return periods of 500–1000 years. To give an idea of the destructive power of such earthquakes, the 1962 Buyin Zara event, whose epicentre was located about 22 km south-south-east of the Sagzabad tells, killed over 12 220 people and damaged beyond repair 21 330 homes in 300 villages across the region. Such an earthquake would probably have seriously compromised the economic foundation of a prehistoric community. Mathematical models indicate high probabilities that late prehistoric settlements of the Sagzabad cluster experienced at least one major catastrophe of this type, and at least at Sagzabad itself, depositional and architectural anomalies in one horizon have been ascribed to an earthquake (Schmidt et al. 2011).

However, »despite the near certainty that the residents of these Holocene settlements experienced large destructive earthquakes, the near-continuous history of occupation at this area suggests that early humans were not apt to relocate

in response to earthquake activity. Environmental (e. g., alluviation, stream channel avulsion, climate change), cultural and/or political factors may have been more important drivers of settlement shifts and abandonment at the Sagzabad cluster of Iran« (Quigley et al. 2011).

Actually, many ancient and current settlements in Iran, including the northern Central Plateau, are situated on active alluvial fans, which pose flood and sediment inundation hazards, but provide fertile soil along the edges (Maghsoudi et al. 2013). Tectonic instability may have caused diversion of streams, destruction of canals and discharge of sterile gravels across agricultural land, thus causing recurrent conflicts and social insecurity. Alluvial fans often coincide with active faults, which are not only the sources of destructive earthquakes but also conduits for abundant fossil water, thus explaining what has been called the »fatal attraction« of agricultural sedentary communities to earthquake-prone locations (Fazeli Nashli et al. 2014: see Jackson 2006).

At other sites on the Plateau, too, stratigraphy has recorded major seismic events. For example, at Tol-e Spid in the Mamasani area (western Zagros), archaeoseismic studies revealed a major earthquake around 3850–3680 BC, and another c. 3030 BC (Berberian et al. 2014).

In other cases, destructions may have been caused by human violence. For example, at the settlement of Tepe Ghabrestan, in the uppermost layers of the Late Chalcolithic period, evidence was uncovered of a violent end and sudden abandonment: extensive burning, a burnt human skeleton

13 An important question that cannot be answered in this paper is whether the failed urbanisation of the Central Plateau during the 4<sup>th</sup>

millennium BC was *politically responsible* for the general desertion of the piedmont network around, or shortly after 3000 BC.

Age cal BC	Central Plateau	Turkmenia	Central Plateau	Turkmenia	Central Plateau	Turkmenia	Central Plateau	Turkmenia	Central Plateau	Turkmenia
	Settlement patterns		Territorial potential		Precipitation		Artificial irrigation		Administration	
6000 – 5500	? scattered, clusters around springs	? scattered	Permeable to outer valleys	Limited (horizontal shift)	Limited but higher than present in mid Holocene	Limited (but higher than present in mid Holocene) and greater than in Central Plateau	–?	Incipient	–?	Tokens
5500 – 5000	? sparse, clusters, simple hierarchy (0.5 ha to 6–7 ha)	? scattered					Incipient ?	Simple canal networks	Tokens	Tokens
5000 – 4500	? sparse, clusters, simple hierarchy (0.5 ha to 6–7 ha)	? scattered					Simple canal networks	Simple canal networks	Tokens	Tokens expanding use
4500 – 4000	? sparse, clusters, simple hierarchy (0.5 ha to 6–7 ha)	? scattered, but growing in number					Simple canal networks	Simple canal networks	Tokens	Tokens expanded use, animal forms
4000 – 3500	? sparse, clusters, simple hierarchy (0.5 ha to 6–7 ha)	Two-tiered hierarchy (< 1 ha vs. 10–20 ha)					Simple canal networks	Canal networks and basins	Tokens	Seals with eccentric (off-centre/off-centred) holes
3500 – 3000	Deformed hierarchy: 0.5 ha to specialised industrial areas measuring 30–50 ha	Probably three-tiered hierarchy (capitals > 30 ha)					Simple canal networks	Canal networks and basins	Sporadic use of seals (?) »Proto-elamite« tablets	General use of seals with central holes
3000 – 2500	Collapse, abandonment	Urbanism peak (capitals > 30–50 ha)					Strongly circumscribed (Murghab)	Drought event	Drought event	–
2500 – 1700	Desert	Former cities abandoned, palatial urbanism in the Murghab delta	Strongly circumscribed (Murghab)	Increased aridity	Increased aridity	–	Canal networks and basins urban artificial basins	–	Seals and no writing	

Tab. 3 Evolution of the prehistoric settlement patterns of the northern Iranian Central Plateau and southern Turkmenistan, with reference to territory, precipitation regimes and artificial irrigation; information technologies and administrative media are also considered.

Tab. 3 Entwicklung der prähistorischen Siedlungsmuster im nördlichen Iranischen Hochland und im südlichen Turkmenistan mit Hinweisen auf den Landstyp, Niederschläge und künstliche Bewässerung. Die Methoden des Informationsaustausches und der Administration wurden ebenfalls berücksichtigt.

left on a floor, clay sling shots, and complete but broken pottery *in situ* (Negahban 1977; Fazeli 2004, 197).

However, tectonic processes are equally active, and earthquakes are as frequent (and at least as dangerous) along the northern piedmont of the Kopet Dagh as across the Central Plateau. As far as we know, similar catastrophic events and the same geomorphological changes may have taken place north of the Kopet Dagh, but if so, they did not impede the growth of cities and presumably of one or more early Bronze Age proto-states (Tosi 1977; Biscione/Tosi 1979). Thus, neither climatic differences, nor soils, geomorphology, and tectonics, can deterministically explain why cities and early states developed rapidly north of the Kopet Dagh, but not at all south of the Alborz.

## 8. Opposing hierarchisation?

Beads made with exotic, rare, or technically elaborated materials can be seen as symbols of political rank, high-level communication with outside groups, power, and authority. Conversely, individuals and groups that did not have access

to these goods would have been at a disadvantage. In fact »[...] the embodiment of order and its use in legitimation require wealth [...] the amassment of wealth cannot be understood merely as an end in itself, but also as a means of expressing and maintaining order [...] (being wealthy) is an expression of unequal access to labor and to key resources« (van Buren/Richards 2000, 4).

The transformation of staple goods into valuable materials or status symbols by enrolling part-time skilled craftsmen (if the beads in the graves were actually produced locally) or by exercising control over long-distance trade links (if, on the other hand, they were imported), were both possible spheres of activity of strategic interest for socially emerging individuals and families. Both could have recurrently linked the groups in power, or aspiring to power, to agriculturalists (for the surplus they produced) as well as to the craft and trade spheres, ultimately consolidating important social relationships and *supporting the established order*.

Conversely, the ritual destruction of such large quantities of valuable ornaments in funerals might have been seen as a public super-statement, expressing to the whole community

that the authority of the survivors did not depend on the actual possession of accumulated ornaments or the wealth it implied. At the same time, the burials of wealthy ancestors near settlements and sacred areas would symbolise genealogies that legitimated the active centres of power (van Buren/Richards 2000, 9). Investing wealth in public destruction events is an elementary, obvious and recurrent way of building up political power. The deep ambiguity of such strategies is that the practical annulling of accumulated wealth also works against the ongoing consolidation of power within the same family. The violent events brought to light at Tepe Ghabrestan suggest such concentration of power could be controversial and result in open conflicts.

It is probably impossible to discuss the consumption of valuable personal ornaments without critically considering the linked functions of special houses like the above-mentioned Painted Building of Tepe Zagheh<sup>14</sup>.

The elaborate and lavishly decorated Painted Building, differently from other larger, multi-roomed Late Neolithic complexes of the Iranian Plateau and the Near East, does not seem to have hosted storage and administrative facilities, being apparently void of seals and seal impressions (although a recovery problem might be implicated).

Rather, according to the cross-cultural model of K. Flannery and J. Marcus 2014, and in the light of the clearly male-oriented symbolism of the ibex skulls, it could be interpreted as a »bachelors' house«. Moreover, the discovery of eight rich female burials in the area south of the building, covered with beads (see below) and with the crania facing the house, strengthens, by way of contrast, the argument for a male orientation of the ritual construction.

Male-managed houses of this sort, according to the quoted authors, may have featured in various chronological and cultural contexts (from the pre-ceramic Neolithic of the Near East to prehistoric Mesoamerica) as seats of secret societies or congresses restricted to males, and elements of horizontal social connectivity. In these buildings, usually characterised by recurrent features like restricted access, rows of benches for sleeping, and elaborate symbolic paraphernalia, segregated adolescents may have undergone regimented instruction and learned the society's ethics, cultural heritage and shared ritual practices. Such buildings, and the associated institutions and ceremonies, were possibly intended – still according to Flannery and Marcus – to promote egalitarian values and horizontal connectivity in societies threatened by growing social differences. Like the destruction of accumulated wealth in special ceremonies (in our case, in funerals), these practices could have delayed or efficiently counteracted the vertical growth of social complexity.

## 9. Discussion

In the northern plains of the Central Plateau, many of the processes described above, linking agriculturalists, herders, traders, and craftspeople in loop-like dynamics, were com-

pletely independent of what are commonly included among the main features of the »urban revolution« – i.e., large amounts of agricultural surplus stored in major buildings, the concentration of large masses of people, and the development of centralised factory sites and stable, central markets in regional centres. At the same time, the advanced technological standards of these Transitional and Early Chalcolithic communities rule out the traditional colonial and core-periphery exploitive models that have been so popular in recent decades (Stein 2014; see discussion in Thornton 2009, 305 f.). In fact, core-periphery models envisage thriving technological investments and specialised know-how at the hubs, and not in the exploited communities.

As long-distance trade routes were fully active in the Central Plateau at least from the late 6<sup>th</sup> millennium BC onwards, it was not because of a lack of inter-regional trade that the political organisation of local communities did not advance according to the better-known hierarchical models. Even in the late 4<sup>th</sup> millennium BC, the impact of western demand, and then of the briefly flourishing »Proto-Elamite« trade networks, seems to have produced only an burst of local, independent production in inflated industrial areas managed by the local communities, without major repercussions for the local, traditional structures of power. In this sense, it was the supposed periphery which exploited, through a flexible strategy, the links to the western urbanisation cores, and not the other way round. In fact, the surface expansion of shifting industrial occupations at sites like Arisman, Sofalin and Shoghali – far from the advanced urban lifestyle of the major »Proto-Elamite« settlements (see Helwing 2013b, 93) – speaks more of specialised groups involved in an ephemeral and opportunistic exploitation than of the growth of permanent local elites with a strong grip on local space, people, and resources.

Paraphrasing S. J. Gould 1989, we must acknowledge the possibility that, given a chance to rewind the tape of history and let it play again, we might find that things did not actually evolve at all as we have conjectured. In fact, we cannot exclude the possibility that the failed early urban take-off in the Central Plateau was simply due to the casual co-occurrence of worsening environmental conditions, the untimely death of a prestigious leader and a particularly ruinous earthquake in a single town. However, this and similar propositions are not fully testable and therefore remain of little use for archaeological reconstructions.

Firstly, then, we have to consider socially-inherent factors which might explain the absence of an »urban revolution«, i.e. the positive evidence of active strategies of resistance to social change employed by local agriculturalists and semi-nomadic herders; some such potential evidence has been discussed in section 8 above.

Secondly, we must look at external factors. If the search for single primary factors is naive, and if the diagrams with interacting networks of multiple factors, so popular between the 1970s and the 1980s, have left us with a deep wariness of sweeping explanations, isolating a limited set of causal fac-

<sup>14</sup> See Fig. 14; Shahmirzadi 1977; Negahban 1979; Negahban 1984; Tala'i 1999; Fazeli Nashli/Matthews forthcoming.

tors seems a sensible objective. Following Pareto's law of the vital few<sup>15</sup>, we propose the following two objective and realistic potential factors to explain the absence of hierarchisation and an urban revolution in the Central Plateau:

- a The scarce agricultural potential and undependability of the endorheic alluvial fans of the inner Central Plateau. The limited arable land and unstable geomorphological and hydraulic features of these fans did not allow local leaders to accumulate the surplus needed for planning major economic, political and military projects. The limited economic value of the cultivable areas may have kept the Chalcolithic societies of the northern Central Plateau below a critical threshold of agro-demographic capability and therefore, almost by default, of potential vertical complexity, even more so because ecological risks required solidarity and extensive collaboration, rather than centralisation.
- b The absence of ecological circumscription (Carneiro 1970). Before the introduction of large-scale nomadism based upon camels and horses, the dating of which is much debated, the Kizil Kum desert could not be crossed. In southern Turkmenistan, therefore, the early farmers were bound to the piedmont of the Kopet Dagh, and to their limited belt of cultivated plots near springs, and could move only latitudinally. The Central Plateau societies, however, had important alternatives. In fact, the semi-arid piedmont strips surrounding the Central Plateau hosted several important passes leading to the more hospitable inner valleys of the Zagros hinterland<sup>16</sup>. Groups who found themselves threatened by political or demographic pressure could more easily reflow inland, supporting their subsistence temporarily or permanently with nomadic pastoralism from and to the highlands.

The importance for state development of ecological circumscription, a crucial factor, for example, in the political unification of Ancient Egypt (Allen 1997), is indirectly confirmed in the context of Bronze-Age Turkmenistan by the crisis of the important early urban settlement of Altyn-Depe during the Namazga V period in the second half of the 3<sup>rd</sup> millennium BC, and the almost immediate rise of an impressive palatine centre at Gonur Depe on the north-eastern edge of the Murghab delta, between the 24<sup>th</sup> and the 23<sup>rd</sup> centuries BC. Possibly also affected by a mega-drought, dated here to c. 2450 BC (see Tab. 2), this change was made possible by the strong grip that a powerful local Middle Bronze Age dynasty was able to exert on the endorheic delta of ancient Margiana, still abounding in water but entirely surrounded by a harsh desert.

In contrast, without a substantial surplus, demographically constrained, and not affected by a strict ecological circumscription, the northern Central Plain farmers and herders may have been influenced by traditional social institutions, values and ethical constraints, which, in the long run, prevented or discouraged local leaders from escalating and consolidating their spheres of power.

## 10. Conclusions

Keeping in mind limited agricultural potential and absence of ecological circumscription as the probable main causative factors, we may attempt the following narrative reconstruction. In the Late Chalcolithic, human settlements grew and clustered in a piedmont ring of unstable patches of agricultural land surrounding the deserts. Grazing lands were easily available. Important natural resources, like clay and pigments for ceramics, copper-bearing mineralisations, and outcrops of fine silicate rocks for lithic production, were scattered around the edges of the deserts in various locations, so that no particular community could easily monopolise their exploitation and trade and gain important advantages over others. Maintaining a constant, decentralised flow of rare, highly prestigious base materials for exchange, while looking for the optimal varieties, became a common interest. A homogeneous population, with a high degree of connectivity and the same *chaînes opératoires*, shared the same social conventions and the same needs. Such conditions led to high levels of social interaction that became increasingly embedded and stable, without visible epicentres, and with no need of vertical coordination. As far as we know, the flourishing of skilled, complex crafts did not require the appearance of stabilised central markets or distribution centres, as Childe (1950) had thought. The social complexity of the communities of the Southern Levant, during the 5<sup>th</sup> millennium BC, is described exactly in the same terms (Roux forthcoming).

At the same time, no community could accumulate the agricultural potential and surplus to patronise major conquest projects – although the evident investments in the manufacture of heavy weaponry (axes and daggers) and episodic evidence of violence suggest that peer interaction was a consequence of the material preconditions, rather than a fundamental ideological choice. Moreover, a politics of conquest might have been unrealistic, if the permeable border with the Zagros highlands also implied alliances and shared interests between the individual piedmont villages and the inner pastoral highlands communities, helping people to escape external pressure.

On the contrary, the evidence of trade and exchange of fine varieties of chert, flint and, to a lesser extent, obsidian, shows an apparently regular and constant intra-regional interaction. As already stated, the fragile ecological foundations of agriculture on the endorheic alluvial fans may have promoted forms of collaboration among the neighbouring settlement clusters that would have improved the general chances of survival in the event of natural catastrophes.

Besides serving bowls, most restricted vessels of the 5<sup>th</sup> and 4<sup>th</sup> millennia BC are medium to large-sized carinated jars, probably intended to be half-buried in clay floors, and this supports the impression that storage at a household level was important. Consider also the impressive, well built and lavishly decorated »giant vessels« that are unique to the Central Plateau culture, which may have been used in redis-

15 According to which, in a complex process, a minority only of causal factors is responsible for the greatest majority of the effects.

16 The ecological fractioning of the geographical interface between the Zagros, the eastern plains and the northern frontiers, with its

multiple corridors for husbandry, trade, and interaction in general, is well described in Thornton 2009, 306 f.

tributive feasts. Feasting may have afforded recurrent socio-emotional scenarios in which chiefs and leaders exerted their oratorical skills and displayed generosity. The ethnographic studies of P. Clastres (1989) add polygyny as a further possible element of connectivity in »tribal« social networks that may have resisted centralisation.

Perhaps for similar reasons, in the mid 4<sup>th</sup> millennium BC, the thriving villages of the region shared the same advanced metallurgical and ceramic technological styles, and – as far as we can presently judge, but further studies are mandatory – a basically similar, flexible approach to lithic reduction and use. Even the stylistic uniformity of the fine wares of the Central Plateau and their painted repertory stresses a dimension of practical and ideological condensation; and Helwing (2013b) is probably right when she emphasises continuous anastomosis, i.e. *branching interchange among different technologies* (reconsidering Kroeber 1948), as crucial during the two millennia of the Central Plateau Chalcolithic.

As stressed in Fazeli Nashli/Matthews (forthcoming) this may point to the development around 5000 BC of a permanent network of the »supra-local communities« of Drennan and Peterson (2012, 73), capable of mediating between individual groups and a wider, more pervasive regional identity.

So far, bead-making has remained somewhat out of the present picture: the limited archaeological records of local production and use/consumption (emerging from the grave furnishings of Tepe Pardis and Zagheh) do not match (Vidale et al. forthcoming). The apparent popularity of beads made of thermally transformed materials like fired steatite and faience (to be confirmed!) in the grave furnishings might point to the import of rare exotica for building the prestige of restricted kinship groups at funerals, but this is only a conjecture, because a local production (or even invention?) of siliceous faience and fired steatite-based ceramics, in the light of the present evidence, cannot be excluded.

On the other hand, the taste for ornaments made with similar highly-developed techniques has been linked to active, incipient social stratification within pre-protohistoric societies (Vidale/Miller 2000), a process which at present appears less and less likely in the northern Central Plateau (Fazeli Nashli/Matthews forthcoming). If future work will establish that these ornaments were imported, the evidence would fit one of Clastres' (1989) models where chiefs monopolise the exchange of highly prestigious, exclusive goods as a strategy for obtaining recognition, legitimation and power; and the decentralised settlement system suggested by the available data might have been quite efficient in granting the long-distance provisioning of these goods on a person to person gift/exchange trickle-down basis.

If the picture of two-tiered settlement networks described for the Chalcolithic networks is accurate (small sites measuring 0–1 ha *versus* villages of 5–6 ha), the larger settlements, although still relatively small, were nevertheless six times larger than the other hamlets. Local communities intensively interacted at a peer level, but in the main hubs there were probably active processes of social differentiation, intensified in the latest centuries of the sequence. Here, demographic growth might be also explained by the aggregation of outsiders.

A measure of the permeability of local groups is perhaps provided by the evidence of the use of seals and sealed clay tags, which becomes substantial in the course of the 4<sup>th</sup> millennium BC. It implies the formalised collaboration, in the same social networks, of people interacting at an impersonal level, i.e. not connected, or only marginally linked, by kin relationships and family-bound obligations. We may assume that the Chalcolithic communities of the Central Plateau (like those of Fars and southern Turkmenistan) initially tried to manage new bureaucratic tasks by intensifying horizontal network communication and emphasising kinship ties in the relevant institutions. However, on the long run, as they became less socially homogenous, impersonal relationships also became prevalent in the socio-economic structure of these societies.

At present, the term and archaeological definition of »chiefdom« are so harshly (and rightly) criticised as to appear almost meaningless (Bondarenko et al. 2004; Maisels 2010). The social organisation of the decentralised settlement networks of the Central Plateau in the Late Chalcolithic probably had nothing to do with chiefdoms. It may actually have been transegalitarian or heterarchic (Bogucki 1999) – in that different peer groups or communities, over time, may have contended for power, within or among the main settlements. But we should always keep in mind that »[...] The heterarchical strategy should not be considered as a more egalitarian and earlier one in comparison with the hierarchy. The heterarchy is not less complex than the hierarchy« (Kradin 2011, 192).

As stated above, the unique archaeological context of Zagheh's Painted Building and its nearby rich female burial ground is soaked with ambiguity. The waste of such quantities of valuable ornaments, most of which were *possibly* imported, was an act of renunciation and statement of solidarity with the less affluent rest of the community, but was also, in practice, a step towards formally building an exclusive ancestry for a ranked minority. At the same time, in terms of gender politics, women were loaded in death with useless jewellery (however the latter was acquired). The beads trade was perhaps used by emerging individuals to establish a growing control over traditional female spheres of power. In contrast, male-managed wealth was more practically invested in a prestigious building where rituals encoded cultural patterns and re-enforced the role of leading males in the society. Thus, the archaeological evidence can be read in both directions – as indicating either the promotion of equality, or the attempt to transgress its traditional limits.

In the northern Central Plateau, for the reasons we have tried to review, horizontal, loosely stratified social networks eventually survived hierarchisation, but not the general settlement desertion of c. 3000 BC. Thus, the last inescapable question is the following: is there a causal link between the »transegalitarian« choice presently suggested by the archaeological data, and the subsequent dramatic failure?

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## Source of figures

- |      |   |        |   |
|------|---|--------|---|
| 1    | F. Desset, Archéorient, Lyon (UMR 5133)/University of Tehran  | 14–18  | Archaeological Museum of the University of Tehran, photos H. Fazeli, University of Tehran and M. Vidale, University of Padua          |
| 2    | Courtesy of NASA/METI/AIST/Japan Space Systems, and U.S./Japan ASTER Science Team < <a href="https://asterweb.jpl.nasa.gov/gallery-detail.asp?name=iranfan">https://asterweb.jpl.nasa.gov/gallery-detail.asp?name=iranfan</a> > | 19–25  | Institute of Archaeology, University of Tehran, photos M. Vidale, University of Padua and A. Siviero, University of Bologna (Ravenna) |
| 3    | after Bahrami et al. 2015, Fig. 8; graphic M. Wiegmann, LDA   | 26     | Courtesy of the National Museum of Iran   |
| 4–5b | University of Tehran, photo H. Fazeli, University of Tehran   | Tab. 1 | Chronology after Pollard et al. 2013, 45 Tab. 9   |
| 6    | National Archaeological Museum Tehran, photos top N. M. Fakoorzadeh, bottom N. H. Tehrani   | Tab.   | 2–3 authors   |
| 7    | Archaeological Museum of the University of Tehran, photo  |        |   |
|      | M. Vidale, University of Padua and H. Fazeli, University of Tehran  |        |   |
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| 9    | H. Fazeli, University of Tehran   |        |   |
| 10   | National Archaeological Museum Tehran, photos H. Fazeli, University of Tehran   |        |   |
| 11   | Sialk Museum, photo H. Fazeli, University of Tehran   |        |   |
| 12   | Fazeli Nashli et al. 2013, 114 Fig. 7.8.  |        |   |
| 13   | Tala'i 1999, 16 Fig. 2  |        |   |

## Addresses

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Political Forms and Organisational Structures in Prehistoric Societies		
Region considered: Northern Iran		
Time considered: ca. 6000–3000 BC		
	Questions	
Forms of Organisation/Political Structures	Is there any evidence for social stratification or specialisation?	There is evidence of larger and smaller settlements, and social differentiation (elites, minorities) within the villages. Specialisation remains an open question, but some studies propose a trend towards village-level specialisation in ceramic manufacturing and possibly a transition to production organised beyond seasonal schedules.
	Were there different levels of political organisation that may have corresponded with certain tasks in society?	The answer is difficult. A possible cultic/ceremonial building at Tepe Zagheh, surrounded by rich elite female graves (?) suggests that this might have been the case, at least in certain contexts.
	Can we assume a well-defined territory?	No.
	Is there a population approximation?	No.
	How large were the settlements and what was their time duration?	Sites ranged from six to less than one ha. Settlements frequently shifted their location from site to site, probably after earthquakes and tectonic events. The duration varied from case to case, from a few centuries to periods of one/two millennia, sometimes with significant gaps.
Conflict and Warfare	How high is the potential for violence within the society or between different populations?	The potential is there, considering the early production of effective copper weapons and some possible evidence of conflicts. However, in general, the evidence of external or internecine violence is very limited.
	Is there any organised warlike behaviour besides individual violence or are there any types of military structure?	No.
	What was the scale of warlike conflicts?	–
Economy	What was the economical basis of the society?	The Neolithic agricultural package, supported by husbandry. In later times, hunting of wild species and copper exploitation also become important.
	Was there any specialisation or extensive use of specific resources?	Local clay beds were certainly exploited as a base material for a very curated, local ceramic industry. Production seems to have been performed at several locations and not centralised.

	Questions	
Economy	Are there indications for surplus agricultural production or other available resources that would allow investment in the construction of communal buildings, gathering places, or monuments?	The high frequency of intensively decorated large storage vessels, a single communal building, and the ritual destruction of wealth in the form of personal ornaments may each represent forms of investment (and destruction) of staple wealth.
	How high was the investment in activities that were not directly necessary for survival or did not serve the production of food, or provide resources for clothing or housing?	Communal painted buildings, high-quality decorated ceramics, personal ornaments and (later) valuable tools and weapons in copper may suggest that such investment was significant.
Distribution	Are there specific materials or products that were integrated into a distribution and/or communication network?	Certainly the stylistic uniformity and graphic repertory of the most refined ceramic classes indicates an extensive network of communication and shared identity. The distribution pattern of some varieties of silicate rocks for lithic industries may be another case of the same type.
	What was the scale of that network?	Regional (involving a large part of the northern Iranian Plateau south of the Caspian Sea)
	Can we assume a standard medium of exchange?	In the second half of the 4 <sup>th</sup> millennium BC, several sites of the general area seem to be involved in cupellation processes for the extraction of silver. It is not known if this metal was refined or distributed according to a shared standard.
	Were there centres of distribution or trade?	Several centres, across time, were engaged in intensive processing of copper, lead, and silver. There are not enough data to assume that any one centre was more important than the others.
Technology	Which materials were used for making every-day tools?	Chert, flint, jasper
	Is there any evidence for metallurgy?	Abundant, since the late 5 <sup>th</sup> millennium BC.
	What technology was used in agriculture?	Irrigation, on variable scales
	What materials are buildings made of?	Mud bricks. The roofs were probably made of beams supporting branches, mats and one or more layers of plaster.

