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Sedentism as a Process of Innovation. Technological and Social Perspectives on the Architectural Development of a Bronze Age Settlement System

Summary

In the second half of the second millennium BC, many areas of Western Eurasia witnessed the return to a settled lifestyle after a long epoch of mobile life. Between the Black Sea, the Caucasus, and neighbouring mountains, a new type of settlements arose. Particular in the Caucasian mountains an architectural tradition emerged that involved the permanent building material stone for the construction of very sophisticated multifunctional buildings. Stone architecture probably was not invented in the Caucasus, but the innovation once adopted fell on fruitful ground. Over nearly one thousand years of recurring leaps of innovations can be followed. This article discusses the dialectics of these innovative leaps as well as between the development of new technical solutions and new social demands in building as well as dwelling.

Keywords: Architecture; *Architektursoziologie*; Caucasus; Bronze Age; innovation; building; dwelling.

In der zweiten Hälfte des zweiten Jts. v. Chr. zeigen sich in vielen Gebieten Eurasiens nach einer langen Epoche mobiler Lebensweise wieder permanente Ansiedlungen. Zwischen dem Schwarzem Meer, dem Kaukasus und dessen Nachbargebirgen entstehen neue Siedlungstypen, die ganz oder teilweise aus Stein errichtet sind. Insbesondere im Kaukasus bildet sich eine neue Architekturtradition mit komplexen, multifunktionalen Häusern heraus. Die Steinarchitektur wurde möglicherweise nicht im Kaukasus entwickelt, doch lässt sich hier ein kreativer Umgang mit dem neuen Baustoff beobachten. Fast über ein Jahrtausend hinweg sind immer wieder Innovationsschübe fassbar, die einerseits technische Lösungen

im Wohnbau abbilden und andererseits das Reagieren auf soziale Bedürfnisse, die mit den neuen Wohnformen entstanden.

Keywords: Architektur; Architektursoziologie; Kaukasus; Bronzezeit; Innovation; Bauen; Wohnen.

1 Sedentism – an innovation of the Bronze Age?

> Regardless of whether or not fixtures are present, a campsite is re-established anew with each annual occupation. Each occupation is a fresh event, to a large extend independent of previous events. By contrast, a permanently occupied village, or even one that is seasonally abandoned has a history.

— Roger Cribb

In the second half of the second millennium BC, between the Black Sea and the northern periphery of the ancient Near East, after a lacuna of more than one and a half millennia of mobile lifestyle, we witness a reorganisation in permanently settled societies. Representative of this transformation was an elementary shift in settlement structure, including related architectural features. During this epoch, building techniques appear that use stone. They develop into a sophisticated tradition of stone architecture with further consecutive technological innovations. Quantity, quality, and functionality of buildings reveal innovative leaps that are directly connected to the social development of the settled communities of the time.

Architecture is one of the most powerful aspects of human living environments (Fig. 1). Permanent or not – architecture, unlike any other element of everyday life, shapes the spatiality of human beings. Architecture integrates aspects of creation – building – and social practice – dwelling. The beginning and differentiation of a specific architectural tradition is therefore an ideal case for studying the spectrum of technological and social processes involved in an innovation process.

At first, sedentism as the focus of a study of Bronze Age innovations may seem surprising. Settled life, i.e., a habitation located in one fixed place, is considered one of the key innovative elements of the 'Neolithic Revolution'.[1] Permanently inhabited

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1 Childe 1956; for the current status: Boyd 2006; A. Goring-Morris, N. Goring-Morris, and Belfer-Cohen 2008.
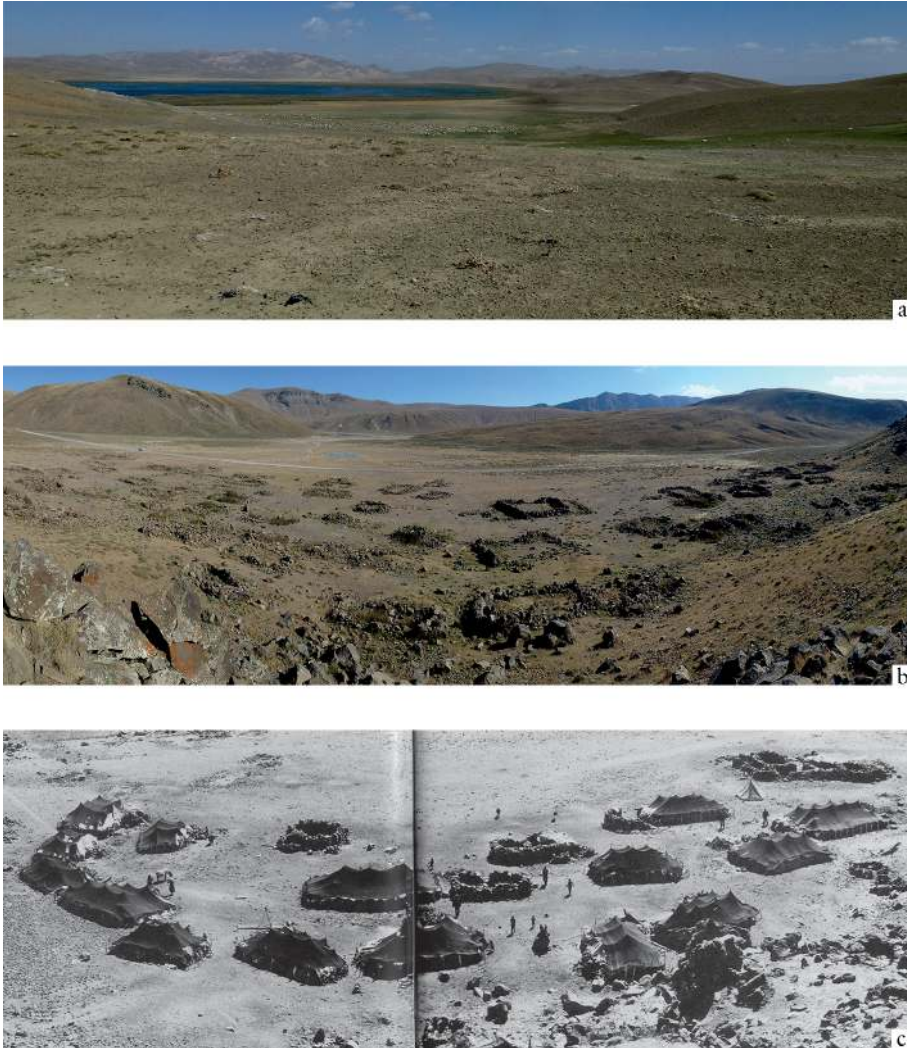
Fig. 1 Architecture creates places: (a) abandoned nomad camp at lake Tuna near Van, September 2012; (b) abandoned nomad camp with stone architecture at Nemrut Dağ, September 2013; (c) the same camp in 1981.

settlements are known at least since the 8th millennium BC. The shift away from a mobile, hunter-gatherer lifestyle, combined with a food producing economy, is regarded as one of the epochal social reorganizations of the Neolithic. However, by now it has become obvious that the criteria that once defined the 'Neolithic' as the cultural epoch of sedentary farming cultures, are misleading. Mobility, temporary or in longer cycles, was always an integral part of societies that we identify as Neolithic. According to Re-

nate Ebersbach, for example, mobility is constitutive of flexible lifeworlds where social relations within a large, widespread social collective are more important than the permanent anchoring of a smaller group with a specific subsistence economy in a given place.[2]

The shift of subsistence and quotidian practices from many to a few even to only one place, coincident with an increasing length of stay, is a conceptual answer to survival strategies that operate within the wide range of spatial movements. Certain economies, such as specialized livestock breeding with alternating pastures or the use of seasonal resources, promote mobile strategies of economy and life. Unstable environmental conditions or population fluctuations can influence mobility patterns and their characteristics. However, spatially variable survival strategies are always closely interwoven with the necessary technological solutions that a community chooses for its living arrangements, economic infrastructure, and means of subsistence. Processes of sedentarization and their counterparts can therefore still be observed today and are often solutions to problems of changing social and economic conditions.[3]

If we u conceive of innovation not as unilinear progress, but as scenarios of actions that open up new technological or social possibilities, the process of settling down can in fact be understood as a historically unique but also as a recurring process of innovation. Any group that voluntarily or forcibly trades its mobility for a fixed location finds itself in need of new architectural technologies. Such a group has to familiarize itself with new materials, or a new use of old materials, has to learn new patterns of movement, of orientation, and if necessary to develop whole new sets of material culture and new social practices to cope with this situation.

From a historical perspective, the question emerges in what social, geographic, and economic environment the process of sedentarization is anchored and whether the oscillation between 'sedentary' and 'mobile' is part of specific social groups and/or landscapes.[4] If so, cultural techniques that appear to be new would be familiar practices. They simply would not have been implemented as social practices at certain periods or in certain areas. The beginning of sedentism among Bronze Age groups in the North Caucasus leads me precisely to pose the question of whether this was an invention or a cultural and technological transfer; we know that permanent architecture developed earlier in neighboring regions to which groups in the Northern Caucasus maintained cultural links.

2   Ebersbach 2010; similar for the West Asian Neo-
    lithic: Bernbeck 2008.

3   Salzman 1980, 13–18; Hof 2001; Fratkin and Roth
    2005.
4   Cribb 1991b, 23–34; Salzman 1980, 13–17.

2 Origin and evolution of Late Bronze Age technological transfer in the North Caucasus – an example of processes of technological and social innovation

During the third and early second millennia BC mobile subsistence strategies prevailed in large areas of western Eurasia and western Asia. The assumption of high mobility stems from a recognition of an economy that specialized in livestock breeding.[5] More importantly, the lack of documented settlements that are contemporary with a large number of grave mounds is at the base of the argument for mobile lifeways. Archaeozo-ological evidence is weak but recent stable isotope analysis of animal bones strongly call into question large-scale migration scenarios argued for in the past. Nevertheless, these studies reaffirm the existence of mobile groups with a chiefly pastoral economy for this period.[6] The general situation also applies to the high-mountain zone of Caucasia and Eastern Anatolia: there is substantial evidence for human presence in the form of burial mounds since the beginning of the third millennium BC. However, sporadic camp sites and even some settlements are known as well.[7] For the Bronze Age cultures of the North-ern Pontic, a few settlements are also documented. The level of permanence of life in such places, however, is still largely unexplored.[8] The existence of individual settlements is thus no argument against a mobile lifestyle. Rather, it shows that temporarily, seden-tary components may be an integral part in mobile societies just as mobility is part of basically sedentary modes of life.[9]

Shortly before the mid-second millennium BC a portion of the previously mobile groups began to settle down in a wide area between the Black Sea and eastern Anato-lia/northwestern Iran. This is primarily detectable in changing forms of construction: archaeologically invisible, mobile, and organic architecture is transformed into perma-nent dwellings built of stone or into buildings dug into the ground.[10] This architectural development can be traced in the material record, but the reasons for this shift to a more permanent use of places are still unclear.

In modern times, external pressure often leads to rather involuntary (re)settlement processes,[11] but there are also counterexamples.[12] In our case study, external pressure, for instance by advancing military forces, violent takeovers or similar phenomena, cannot be observed. What could be the driving forces for a group to settle down? Are there internal motivations that render less mobile elements in an economy so attractive as to abandon a mobile lifestyle? Or are the permanent settlements unintended consequences

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5 Shishlina 2008.

6 Shishlina 2008, 212–217.

7 Edens 1995.

8 Pieniążek 2012, 59 with further references.

9 Modern example by Salzman 1980, 13–17.

10 Caucasus: Reinhold 2010; Northern Pontic: Pieniążek 2012; Don-Volga area: Anthony et al. 2005; Van Hoof, Dally, and Schlöffel 2013.

11 Salzman 1980, 11–14; Hof 2001; Fratkin and Roth 2005.

12 Goldschmidt 1980.

of a process that was initially not directed towards the idea of permanent residence? It is difficult to read into the archaeological record demographic pressure before the resettlement started, but such pressure becomes an important issue later, possibly along with environmental parameters that triggered the invention of new herding practices as well as innovations in infrastructure.

2.1 Architectural development in the North Caucasus – the facts

The architectural development discussed here is part of a prehistoric cultural system at the northern flank of the Great Caucasus that can be traced over a period of almost a thousand years. It it dates to the Late Bronze and the beginning of the Early Iron Age, that is, to the 18/17th through the 7/6th centuries BC. At about 1000 BC, the entire settlement system, which had emerged fully developed on a high mountain plateau, was relocated to the valleys, a process that has been studied in detail in the area around the Kislovodsk spa.[13] This displacement defines the transition from the Late Bronze to the Early Iron Age.[14]

Current knowledge of the architectural sequence includes around 170 settlements, over 100 other archaeological sites in the high mountains (Fig. 2–3), and more than 90 Early Iron Age settlements in the Kislovodsk basin. The layout of these sites has been documented using GIS technology and the sites were dated relying on systematic field surveys, excavations, and more than 40 radiocarbon dates (Fig. 4). With the help of large-scale magnetometric prospection and innovative soil analysis, comprehensive insights into the use of the sites were obtained. The presence of animals inside the houses and in the settlements could be verified and regularities of their activity patterns identified.[15]

At the center of the development of architecture in the high mountains are small villages with buildings the bases of which are constructed of dry stone walls. The settlements were built on the flat plateaus near canyon edges with good water supply from nearby springs. The sites are distributed over an area of approximately 100 x 25 kilometers. In diachronic perspective, the settlements show changes in the layout and configuration of the houses (Fig. 4). Outside the settlements proper, enclosures and individual buildings were constructed with dry stone walls. Long stone walls were set up across the landscape and stone stelae were erected. Grave monuments with stone and earth constructions are part of the repertoire of Late Bronze Age architecture, too, and extensive terrace systems evolved during the Early Iron Age. In addition, in all epochs, wooden structures like barns, sheds, huts, fences, bridges, etc., likely existed as well.

13 Reinhold, Belinskij, and Korobov 2007; Belinskij, Korobov, and Reinhold 2009; Reinhold 2010.

14 Reinhold, Korobov, and Belinskij 2012.
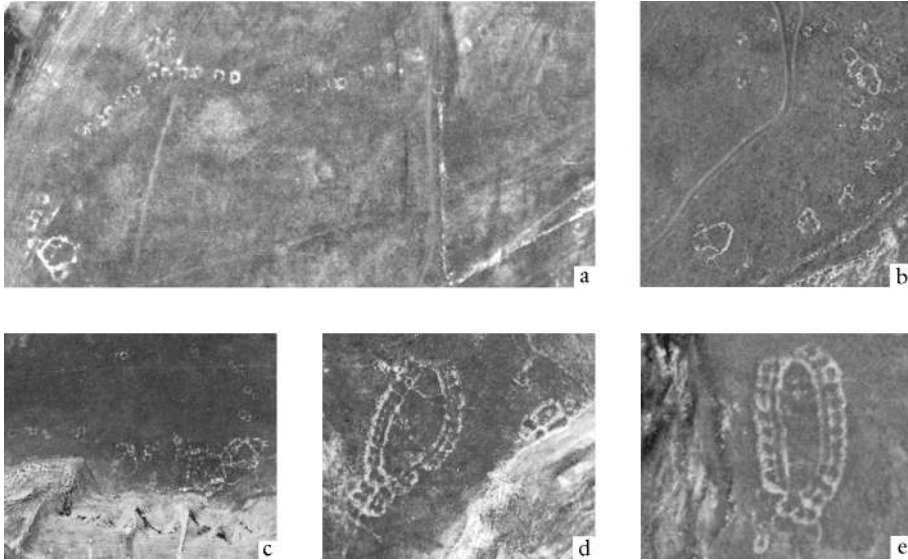15 Peters et al. 2014.

Fig. 2 Late Bronze Age settlements in the North Caucasus: (a) linear settlement concept; (b)–(c) oval-circular settlements; (d)–(e) closed settlement rings 'settlements with symmetrical layout'. – Aerial photographs, different scales.

The oldest houses dated so far have small, rectangular floor plans with a length of 8–11 meters (Fig. 5, a–c). They are one-roomed buildings with 60–120 square meters of floor space. The foundation walls were made of more or less carefully built double-faced masonry or vertical orthostates filled with cobblestones. The entrance was located at the center of one of the walls and often flanked by elongated stone blocks. Two characteristics distinguish these constructions from others: The corners of the outer line of the walls are rounded while the inner walls meet in right angels, and they are built in segments (see Fig. 8, a). Ethnographic analogies suggest that there might have been upper constructions from organic materials. After temporary use, they could have been dismantled and transported elsewhere[16] (see Fig. 1, b–c). However, during the excavations in Kabardinka 2 no indications of erosion were found inside house 23. Such layers would be expected in the snowy and rainy mountains if these walls had not been covered by a roof. Whether the buildings were permanently inhabited or not cannot be determined with certainty. However, it seems plausible that the building structures were covered with a roof year round.

It is worth noting that even these early buildings are quite standardized and are almost exclusively found in two settlement configurations: settlements with a linear lay-
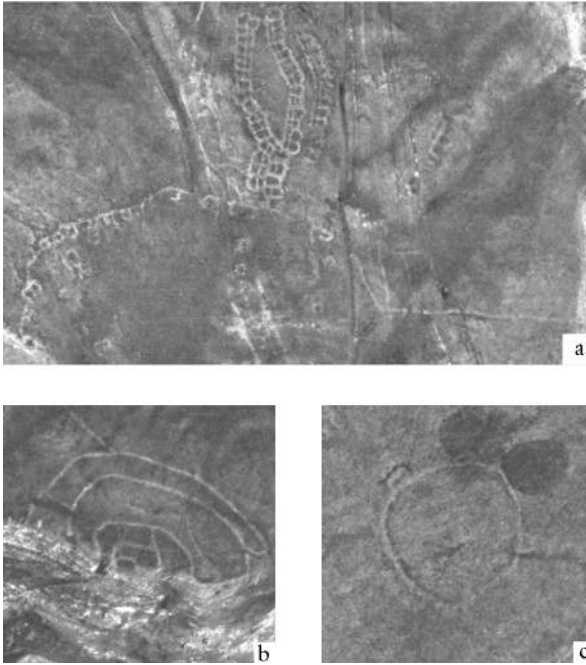
16 Cribb 1991b.

Fig. 3 Late Bronze Age settlements in the North Caucasus: (a) combination of an arc-shaped linear complex and a 'settlement with symmetric layout'; (b) the enclosure at Ransyrt 1; (c) circular complex with side buildings. – Aerial photographs, different scales.

out (Fig. 2, a; Fig. 3, a; Fig. 9, a–b; Fig. 10; Fig. 15) and settlements with an oval to circular plan (Fig. 2, b–c; Fig. 11, a–b). At these sites, the square buildings are either single buildings or part of agglutinating complexes.

So far, linear configurations are the oldest documented settlement layout in the 16th to 14th/13th centuries BC, although the oldest site with stone architecture – Ransyrt 1 (see Fig. 3, b) – is not a regular settlement but a multiple enclosure. It was built at the turn of the 18th to the 17th century BC. The particular arrangement of houses in linear settlements varies and some of them form wavy configurations where the buildings are occasionally linked by interconnecting walls. Sometimes integrated corrals are identifiable – round to oval buildings with stone walls that are clearly too large to be covered by a roof (Fig. 8; Fig. 10).

Chronologically, oval-shaped open settlement layouts follow the linear ones (Fig. 2, b–c; Fig. 11). According to the radiocarbon dates, they fall into the 15th/14th centuries BC. Since they are not represented in all micro-regions considered here, it is possible that this settlement type was not a chronological but rather a local development. In addition to square, one-room complexes, agglutinative structures are present, which comprise up to seven chambers of the same basic square room unit (Fig. 10, b; Fig. 17). They are related to large animal pens, and the number of rooms roughly correlates with the size of these enclosures. Magnetometry measurements at one of these structures –
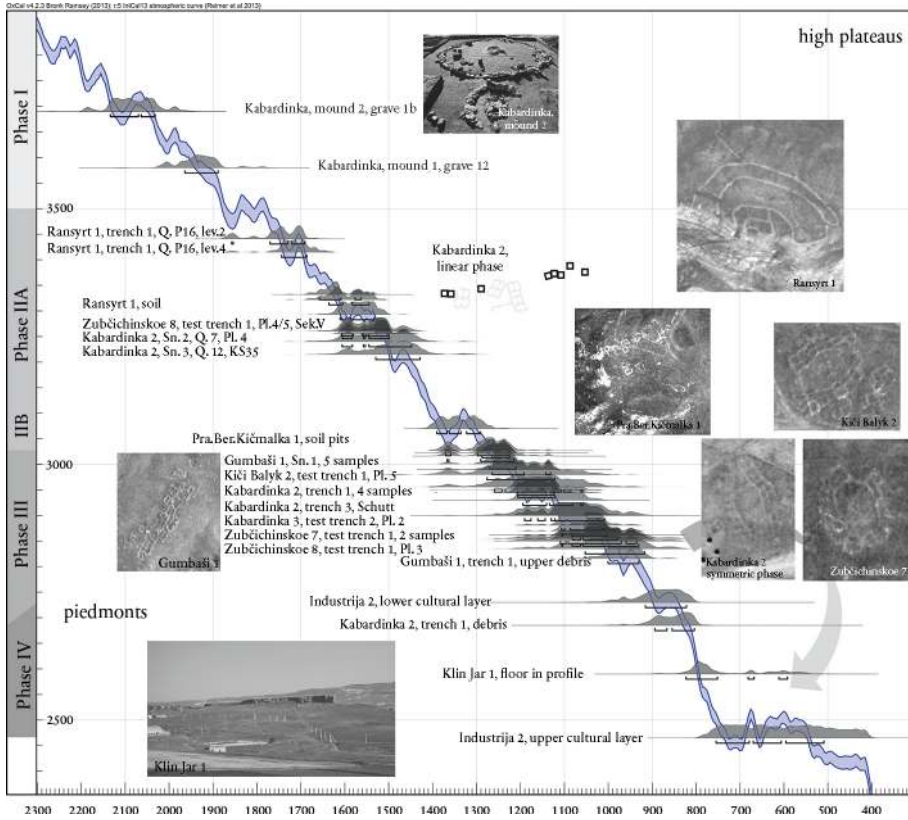
Fig. 4 Chronology of the settlement development in the region south of Kislovodsk.

Pravoberežnaja Kičmalka 1 – lead to the conclusion that some of the pens probably had stables attached on their outside.

Starting with the late 14th century BC, we see a radical change in architecture, design and construction of settlements. A two- to three-roomed house type developed (Fig. 5, d–e). According to archaeological finds and the microbiology of floors, these houses combined residential and economic spaces – i.e. areas for stables – under one roof. There are houses with an elongated layout, 15–20 meters long and 10–15 meters wide, divided by one or two transverse walls with doors. Interior positions of wooden posts indicate a gabled roof with a longitudinal ridge and roof-bearing posts along the walls. In most cases, the short sides of the houses that face the outside of the settlement have an apsidial shape. The entrance is found at the center of the apses, or slightly off–center, and flanked by long, massive limestone blocks (Fig. 6, a–c; Fig. 7, c). The walls of these buildings were constructed as double-faced masonry walls. They connected neigh-

Fig. 5 House forms: (a) single-room, square house at Kabardinka 2, house 23; (b) Pokunsyrt 37 view of one-room houses in a row; (c) Pravoberežnaja Kičmalka 1, agglutinating houses one-room houses; (d) Kabardinka 2, double-room house 14, (e) Gumbaši 1, double-room house E).

boring houses. The most elegant variant utilizes vertical limestone orthostates and carefully set dry-stone walls filled with cobblestones (Fig. 7). Similar to the older buildings, the walls were completed in segments (Fig. 8, b–c) and have curvo-linear exterior edges. However, the walls are now built up to 80 centimeters in height and their widths range from 1.5 up to 2.5 meters. The upper parts of these houses were most likely log constructions, yet it remains unclear whether they had one or two stories.

The architectural and structural details of this house type are known from two completely excavated buildings in Kabardinka 2 and Gumbaši 1 (Fig. 5, d–e). House 14 in Kabardinka 2 is a representative example. The house location was partially carved into the bedrock, but some of the rooms were additionally outfitted with stone slabs as floors. Several indications support the hypothesis that the actual living floors were set on a higher level than the bedrock.[17] This is a typical construction technique in mountain-

17 Reinhold, Belinskij, and Korobov 2007.

Fig. 6 Architecture details: façades and entrances. (a) Kabardinka 2, House 14; (b) Gryskina Balka 1; (c) Gumbasi 1, house E. – Different scales.

ous regions and can be still observed in the Alps, the Caucasus, or in the Himalayas today.

At both of the excavated houses a tendency to accentuate the outside façade is visible. Almost identical buildings to those from Kabardinka 2 at two other sites reveal that this is a general characteristic for this house type (Fig. 5, a–c). A variant of the type combines two apsidal outer rooms with a transverse interior room. At several sites, this variant is aligned, forming corridor-like configurations of interior rooms (Fig. 13, a; Fig. 14 a). In these cases, a common roof can be reconstructed that covered all rooms.

Similar to the one-room houses, the double- or triple-room houses correlate with certain architectural configurations, in this case with settlement layouts, where houses were arranged around a large oval or circular central plaza (Fig. 12–15). Along with the development of the two-room, multi-functional house type, this settlement design is the second fundamental architectural innovation of the last third of the second millennium BC. The foundation walls of the buildings are interlocked and form a closed oval ensemble. All interior rooms face the central square, while the apsidal rooms with the entrances are directed towards the area surrounding the settlement.

Further characteristics of this form of settlements are a symmetrical arrangement of the buildings, the carving of the central plaza into the bedrock, a subdivision of the central square by a transverse wall, and one or more separately located individual buildings. In addition, these complexes are almost always part of two or three groups of neighbor-

Fig. 7 Architecture details: double-framed walls. (a) Pravoberežnaja Kičmalka 1; (b) Ransyrt 6; (c) Kabardinka 2, House 14. – Different scales.

ing settlements (Fig. 13, b; Fig. 14, a). A total of 122 complexes were built in accordance with this arrangement. It includes 69 % of all archaeological sites classified as settlements. Compared to the 21 (12 %) linear-shaped and 13 (7 %) oval-circular complexes, this is a significant increase in sites (Fig. 15). Dated stratigraphic sequences also indicate that these sites were inhabited for long times. In Kabardinka 2, the dates suggest approximiately 300 radiocarbon years of constant habitation, and in Zubčichinskaja 7 at least 128 radiocarbon years. A similar timeframe of about 250 radiocarbon years was documented for Gumbaši 1.

Around the turn of the second to the first millennium BC, the entire settlement system shifted into the neighboring valleys. This went along with another radical change in the history of these communities: A shift from a livestock-focused subsistence economy to intensive farming. The areas on the high plateaus were abandoned and new villages emerged with new configurations of settlement and new house types. Surrounding the settlements are now large necropolises with graves that are not visible on the surface, while the entire potentially arable land is used for agriculture. From the 9th century BC on, this applies also to hill slopes which were to a large extent terraced.[18]
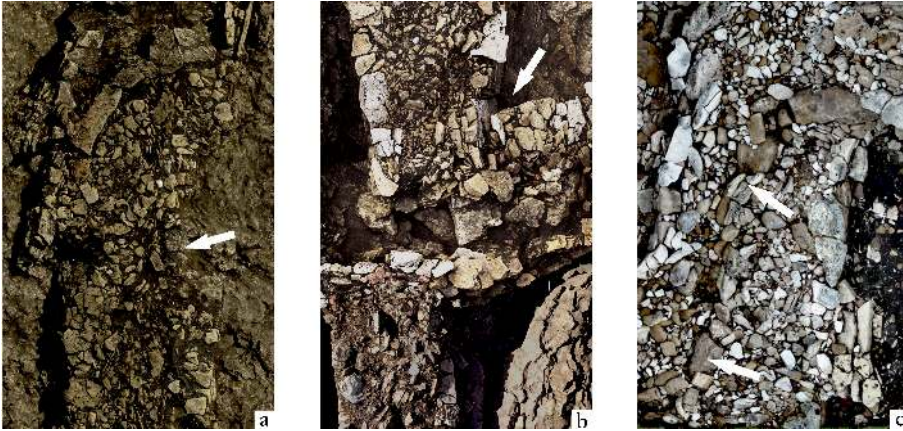
18 Korobov and Borisov 2013.

Fig. 8   Architecture details: segmented construction with wall facades inside the course of the neighboring walls. (a) Kabardinka 2, House 23; (b) Kabardinka 2, House 14; (c) Gumbaši 1, House E. – Different scales.

3   Architecture and innovation – anchoring, building, dwelling

Architecture is omnipresent in human lifeworlds. Whether mobile or fixed to a location, private or public – architecture creates artificial living environments and structures them. Built space deeply anchors social worlds.[19] Innovations in the built environment lead directly and quickly to significant changes in the physical and social practices of everyday life involving all inhabitants of a certain place. In this way, architecture differs significantly from innovations in other cultural techniques such as the introduction of new materials or a new technique in the realm of crafts.

Since the revolutionary construction programs of modern architecture in the early decades of the twentieth century, innovation is closely connected to the field of architecture.[20] To materialize innovations is still considered a central task of contemporary architecture,[21] even if the overall purpose of architecture has changed dramatically from early 20th century programs of communal architecture to the postmodern individualism of the 1990s and early 2000s. The current debate in cultural studies (*Kulturwissenschaften*) about space focuses on different aspects and levels of analysis, and considers architecture, among other elements, crucial in the structuring of space.[22]

19 Moravánszky and Gyöngy 2003; Delitz 2009; Bourdier and Minh-ha 2011.
20 Moravánszky and Gyöngy 2003, 1–7.
21 E.g. Ednie-Brown 2013.
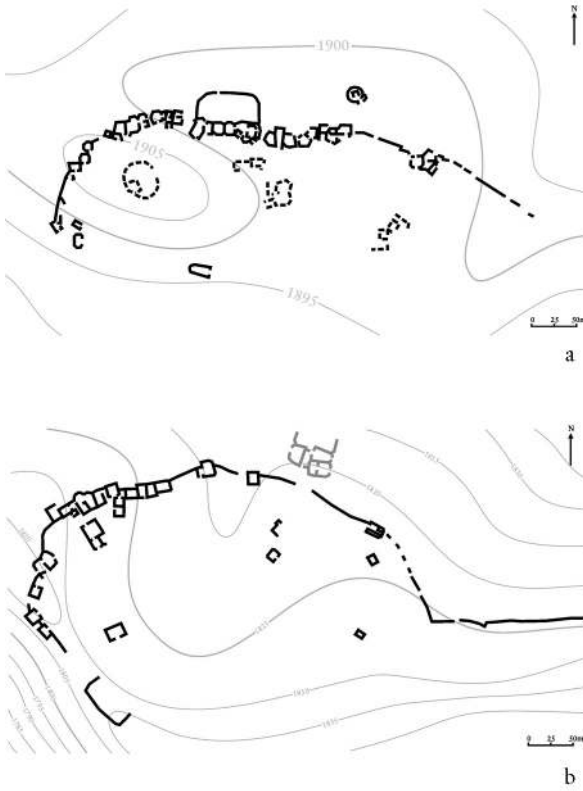22 Cf. Löw 2001; Schroer 2006; Fischer and Delitz 2009.

Fig. 9 Arc-shaped shaped settlement conceptions: (a) Pokunsyrt 8; (b) Pokunsyrt 10.

3.1 Localization

At the interface of a to sedentary a lifestyle, one aspect is particularly important – *architecture creates places*.[23] 'Architectural' places are artificially altered, specific, and fixed locations that differ from their surrounding space and at the same time constitute this space. Neither architecture nor the creation of places is necessarily linked to a permanent presence in a particular place (see Fig. 1). Mobile and temporary buildings count as architecture just as much as do fixed and permanent structures.[24] All of them create places. However, the places thus created are short-lived. They are less bound to their actual materialization than to the social configurations of their temporary residents or the collective memory of a group that creates an ephemeral site.[25] However, places with

23 Ingold 2000, 172–181; Löw 2001, 198–201, 272–273; Moravánszky and Gyöngy 2003, 488–502, with reference to Heidegger 2000 [1951].

24 Delitz 2010.

25 Places are certainly not solely constituted from artifacts such as buildings etc. A more open definition of the concept would be the 'anthropological place' described by French ethnographer Marc Augé (Augé 1994, 49–77). For a discussion of non-architecturally
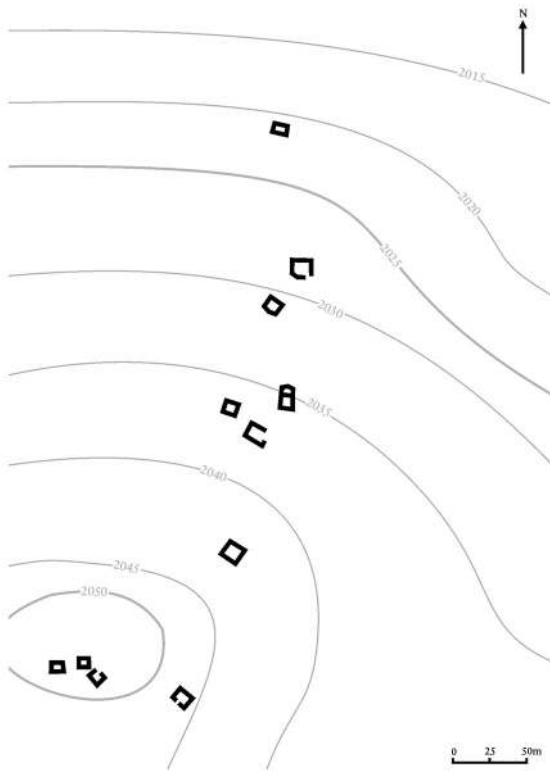
Fig. 10 Linear shaped settlement conceptions: Abasykylak 7.

architecture constructed of permanent or semi-permanent materials differ qualitatively from those made of organic materials. Both are physically present for an identifiable group of residents (Fig. 1, b–c), they often have an individual name and a historical depth, i.e., a location in time, social, and physical space.[26] As a result, the mentioned term 'sedentary' would perhaps best be replaced with the term 'localized', referring to the anchoring of a community in a fixed location. This would shift the focus from the actual presence of individual residents towards a conceptual presence of a group in one place.[27]

According to Martina Löw's on the sociology of space, a place is "the objective and [a] result of the placement of […] social goods and people or the positioning [of] primarily symbolic markings"[28]. Following this line of reasoning, the role of architecture would be that it 'furnishes' an environment with buildings – villages, castles, walls,

constituted places such as natural locations or invisible ritual places, see Bradley 2000, Reinhold 2005, 358–359, and Hansen 2008.

26 Cribb 1991b, 156.
27 See Ebersbach 2010.
28 Löw 2001, 158; 273.

Fig. 11 Oval shaped settlement conceptions: (a) Tamsamesu 1; (b) Tamčibaši 2.

paths, enclosures, canals, field terraces, etc. It creates spaces for the assembly of people, of other living beings, or the placement of goods, forming specific topologies and nodes in webs of relationships.[29]

In this context, the question of innovations concerns the emergence of new structures, or the emergence of new forms of a built environment. They create new places or new qualities of places. It requires a dialectical discourse about the particularities of such new places and their necessary 'furnishings'.

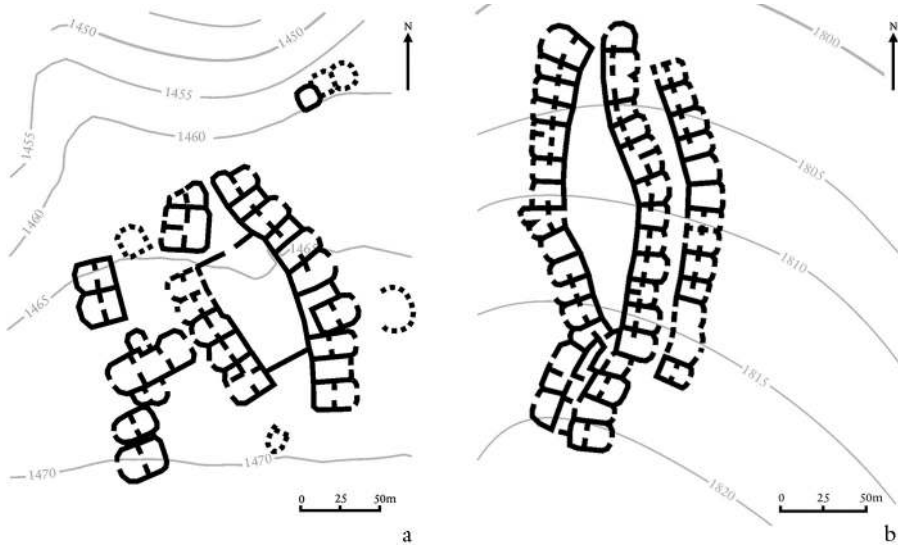29 Ingold 2000; Schögl (unpublished); Schroer 2006.

Fig. 12 Settlements with symmetrical layout: (a) Kabardinka 2; (b) Pokunsyrt 11.

3.2 Building

Building is that component of architecture where technological innovations become most easily observable and where one would expect them most clearly. New techniques of construction, new materials, new installations, new details in design, and new house forms or configurations are classic elements of a technological view of innovation in architecture.

In contemporary architecture, the technical operations related to the construction of houses are largely separated from other aspects of dwelling: architects design, specialists build, and inhabitants reside. In this sequence, innovations are supposed to derive predominantly from the claim of the designing architect to pursue his or her creative ideas, sometimes even apart from subsequent use.[30] Prehistoric architecture, however, originated quite differently. Prehistoric buildings are vernacular architecture, a way of building that is based on traditionally mediated construction. The embodied knowledge of dimensions and aesthetics, structural and material characteristics etc. is not limited to specialists, but is part of collective social practice. The builders themselves are commonly the later residents,[31] supported by other members of a local community. Only some particular knowledge is limited to specialists, e.g., on ritual aspects or specific constructive elements requiring experience or mathematical understanding. Vernacular

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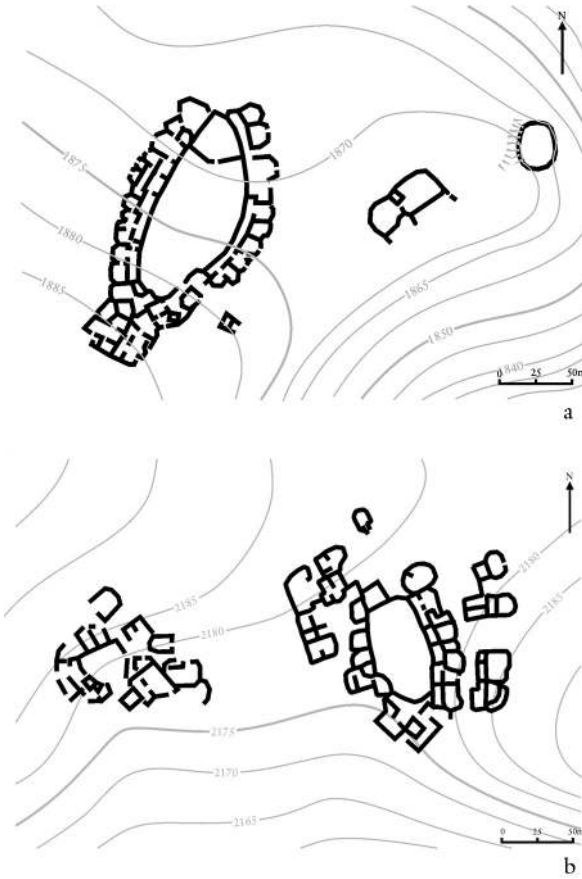30 Moravánszky and Gyöngy 2003.   31 Oliver 1989.

Fig. 13 Settlements with symmetrical layout: (a) Pokunsyrt 23; (b) Verchnjaja Kičmalka 2–3.

building is guided by economic prerequisites for an autonomous existence of a household's life. Nevertheless, social norms and sometimes the cosmology of the residents are taken into account in forms and structures of buildings.

> Knowing that all houses in the community share a single planning principle, that no house would disorient a visitor who belonged to the community, arouses and sustains ethnic solidarity.[32]

Even if one does not want to follow the idea that ethnicity is created through architecture, collective building is an aspect of social practice that creates common habitual structures, embodies them while building, and presents them to the outside world.[33]

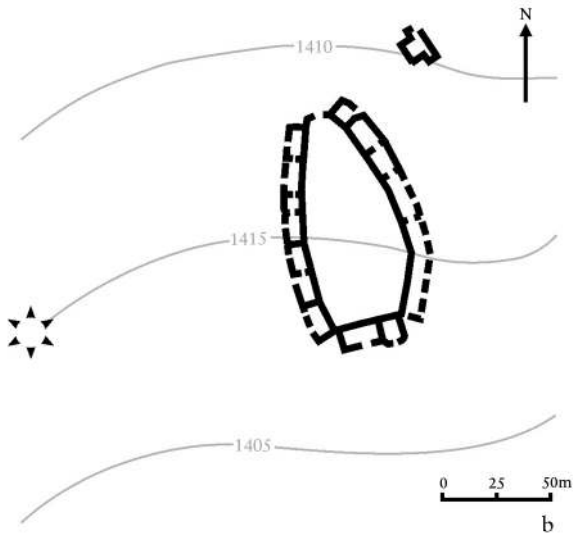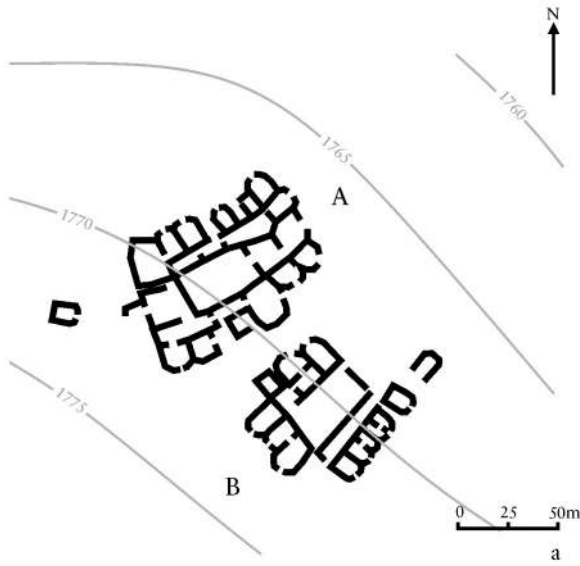32 Bourdier and Minh-ha 2011, 25.   33 Bourdieu 2000.

Fig. 14   Settlements with symmetrical layout: (a) Kici Balyk 4–5; (b) Pokunsyrt 33.
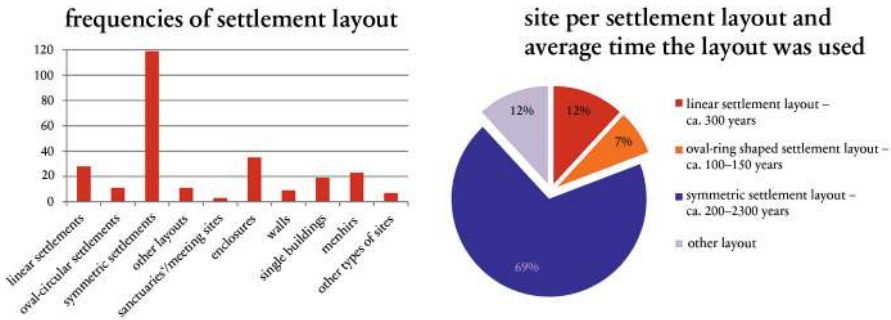
Fig. 15 Settlement concepts, their frequency and their probable period of use.

At the same time, collective construction creates social bonds similar to other collective activities. Traditional architectural design is therefore an effective way of representing social conformity. Social control in the transmission of techniques through learning-by-doing consciously or unconsciously leads to standardization.[34] This may cause a reduction of individual creativity where traditional schemata are repeated without much thinking. However, ethnographic case studies in vernacular architecture reveal that even seemingly standardized buildings are used in a broad variety of individual adaptations by their actual dwellers. Innovations that change the basic structures of buildings or settlement layouts represent all the more a deliberate and conscious divergence opposing traditions and thus are a perceptibly breaking away from the conventional.[35]

3.3   Dwelling

Architecture creates living space. In current discourse, the concept of dwelling centers around a phenomenological debate that largely goes back to the essay *Bauen, Wohnen, Denken* by Martin Heidegger.[36] "Building is already dwelling, and not the other way around"[37]; this view of vernacular architecture reflects Heidegger's existentialist understanding of living and dwelling, and it holds true even if one is not following the entire existentialist program.[38] A similar existential notion of dwelling can be found in the ethnographic perspective of Tim Ingold's work[39] or in the discourse of architect Achim Hahn[40] whose understanding of dwelling is taken very far and is more metaphorical than practical. Practical aspects are related to the creation of certain atmospheres, moods, and feelings rather than to actual activities. The limitations of archeology's sources must make us

34 Oliver 1989.
35 Oliver 1989, 56–59.
36 Heidegger 2000 [1951].
37 Bourdier and Minh-ha 2011, 22.

38 Moravánszky and Gyöngy 2003, 486.
39 Ingold 2000, 185–187.
40 Hahn 2010.

very cautious when trying to operate on the basis of such a philosophical discourse. However, if we recall the profound and often radical break that innovations can initiate in conceptual worlds, it seems justified to investigate the causes and consequences of architectural innovations in their relation to dwelling.

In contrast to activity areas, living space is generally constructed within the physical boundaries of architecture. It concerns everyday life and the social relations of all individuals who live in a building – humans, animals, and also possible imaginary residents.[41] In practice, the social, economic, and spiritual parameters direct the design of house floor plans, the presence or absence of closed rooms and open spaces, installations, light, acoustics, air supply, and the form and placement of furniture.[42] In a phenomenological perspective, these parameters affect the moods and atmospheres of spaces.[43] Strict rules for the use of space inside a house can be present, such as the dualistic division of space in the "Berber House" as described by Pierre Bourdieu[44] or gender-related spaces in ancient Greek houses.[45] However, everyday life often blurs such ideal-type spatial assignments.

The fragmentary archaeological evidence leaves little room to reconstruct such aspects of dwelling. However, with the help of modern survey methods and excavation techniques it is possible to detect evidence of the actual use of rooms or the activities performed in settlements.[46] The Caucasus case study moreover shows that it is possible to identify changes in the spatial practices of the inhabitants.

3.4 Cascading, continuous, and discontinuous innovations

How long does an innovation process take, when does it start, and when does it end? Much ink has been spilled over the question of what an innovation process is, which parameters and sequences of action belong to it, and what course it takes.[47] Most scholars agree to distinguish the creation of a new idea or technique – an invention –from the process of its appropriation – an innovation. Invention is a creative act during which individuals consciously or unconsciously transcend traditional thinking and create new things. Innovation is a social act of accepting a new way of looking at things, among a larger group of users. Innovation also includes the temporal and spatial transmission beyond an original group of users.[48]

41 One might think about ancestors, house ghosts, and other imaginary inhabitants whose presence can play a significant role in the welfare of a house as a whole (e.g., Bourdier and Minh-ha 2011, 39–40; 44).

42 E.g. Hof 2001 and Schroer 2006, 82–106 with reference to Pierre Bourdieu; Bourdier and Minh-ha 2011 for an ethnographic view.

43 Hahn 2010.

44 Bourdieu 2000.

45 Nevett 1995.

46 Kent 1990; Reinhold, Belinskij, and Korobov 2007, 149–153.

47 Rogers 2003; O'Brien and Shennan 2010.

48 Haggett 1991; Rogers 2003; Schiffer 2010, 237–239; Roux 2010, 217–218.

In modern, technologically oriented innovation theory, the appropriation of new features or techniques generally has a positive connotation. Adoption is a wavy but somewhat linear process with an adoption rate that comes close to 100 %.[49] More complex is Michael Schiffer's cascade model of innovation that draws attention to longer periods, feedback, and side effects, as well as possible discontinuities in the developmental flow of innovations.[50] Neither specific time frames nor a linearity of the development or its appropriation are fixed in Schiffer's model. Innovative spurs originate in the deficits of earlier innovations, requiring new solutions. This, however, leaves the question open when an innovation cascade ends.

French approaches to the sociology of technology rely on a similar model.[51] However, Valentine Roux distinguishes innovations qualitatively: 'Continuous innovations', such as those in Schiffer's cascade model, react to technological – but why not also social? – deficits and find an end when a practicable state is reached. Roux distinguishes these from 'discontinuous innovations' which raise a whole technological system to a fundamentally different level. Such processes can have existential consequences for social organization. Breaking traditions is more severe than in continuous innovations, the risks are higher, and benefits can often only be felt retroactively.

4 Innovations of Bronze Age building

4.1 Walls, floor plans, settlement configurations

For the case study reviewed here, it is worth noting that before the development of domestic architecture, i.e. 'localized' dwelling, an experimental phase of construction existed when stone walls were not used for the erection of residential houses but for buildings that clearly had a communal, non-domestic function.

The oldest stone walls of the North Caucasian plateau zone are the dividing and terracing walls of the huge enclosure at Ranysrt 1 (see Fig. 3, b) that was built on a plateau that is hard to access. Four rings of walls, some with passages, surround a central complex. Stone buildings were recently excavated in the center. Their small size, taphonomic data and the huge quantities of finds suggest that these were locations for communal activities, including extensive feasting, rather than residential buildings.

The perimeter walls are massive, double-faced, with a width of 1.5–3 meters (Fig. 16). Near one of these walls, excavations uncovered a fire place that was already visible on the local magnetometric plan as a small anomaly. The floor here was paved with stones, but

49 Haggett 1991, 386, fig. 13–3.
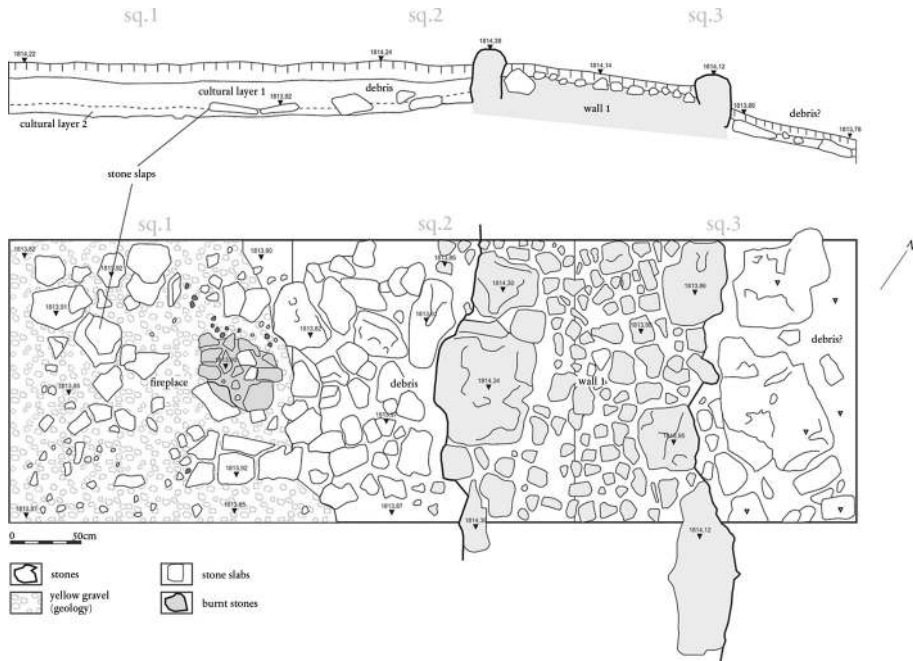**50** Schiffer 2005, 486.
51 Roux 2010.

Fig. 16 One of the oldest stone walls of the study area. The double-layered fortification wall of the enclosure at Ransyrt 1.

no other architectural features were present. Cultural debris included pottery and animal bones alongside the hearth. Marginal remains of mobile architecture, made from organic materials, could barely be detected. The magnetometric image, however, shows several hundreds of such anomalies within the area of the site. They could all be similar hearths. These possible hearths are most likely the palimpsest of hundreds of visits by a mobile population that did not yet use the newly developed technique of building stone walls for their every-day life.

At the beginning of the architectural development in the North Caucasus, the first buildings of stone most likely had a communal function, including ritual and feasting activities, at a site that was most likely only used temporarily. Ransyrt 1 is an ideal place to round up herds in autumn, to divide and slaughter a selection of animals, and to preserve the meat by drying it in the mountain air. It may represent the focal point of a fragmented society of pastoralists who assembled periodically at a central location that shaped common values, rituals, and social coherence.[52] At such a site, labor forces for communal building activities can easily be recruited,[53] and today there is increasing

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52   Cf. Mauss 1999, 192–195.

53   Reinhold, Korobov, and Belinskij 2012.

evidence that groups from various regions came together at the site to found a new common identity.

At this particular and 'new' place, a new spatial permanence was created. Since all stone architecture in this region known from previous epochs is connected to burial monuments and is technologically very different, Ransyrt 1 represents the 'invention horizon', referring to an entirely new form of construction that was experimented with. The massive walls clearly defined a territory separated from its surroundings, delimiting an interior from an exterior. The durable material gave this demarcation a permanent reality. The semicircular shape of the complex, whose central axis is almost perpendicular to the cliff face of a gorge, leads to a focal point at the center where a well-built small room and neighboring platforms with successive layers of deposited feasting remains were excavated 2015.

If innovation constitutes a break with what previously appeared to be secure and useful, the start of something new in an exceptional place is not inherently surprising. A place such as this, where it is possible for all users to break old rules and traditions, has a great potential for creating hybrid new forms of social practice and their material representations. Hybridity and creativity are important means of negotiating new social configurations. The new architecture at the communal site of Ransyrt 1 may well have served as an integrative medium.

Nevertheless, while the techniques of building in stone were developed as early as the late 18th century BC, domestic architecture remained in its organic, archaeologically invisible form for the next century at the least. Everyday living and building changes only with the development of domestic house architecture in the early 16th century BC. These stone constructions set physically noticeable signs into the landscape (see Fig. 1, b–c). In this particular region, this is an ideological novelty as well – all earlier visible monuments had always been reserved for the dead.

The initial citation of Cribb describes this step towards permanent stone architecture as a step towards a place-bound historicity. With the new locations, the inhabitants were permanently positioned in space and time, and new nodes in spatial communication networks had been created.[54] From this point on, one can assume that social groups began to identify their homes and the surrounding territories. Pastures, routes, locations of certain resources, or possible places with spiritual significance are frequented also by mobile groups, but in a dynamic way. Now, they turn increasingly into fixed territories.[55] Participation rights must be organized and negotiated consensually in order to prevent over-exploitation of territories and prevent conflicts.[56] Ownership claims emerge quickly, even if they are flexible and fragmented. The distance between Late

54 Cribb 1991b, 156; Schögl (unpublished).
55 Weichhart 1990.
56 Stadelbauer 1984 with examples from the Caucasus.

Bronze Age settlements at the time usually ranged from four to five kilometers. This suggests that territorial rights of neighboring settlements were observed or that new settlers could demand territorial respect by force.

Due to a lack of radiocarbon dates, the time span over which these developments proceeded cannot currently be determined with precision. However, the earliest domestic stone buildings can be dated to ca. 1600 BC. Likewise, it is still unclear which percentage of mountain dwellers started adopting this new form of settlement. It is quite likely that some communities continued life in mobile camps and the new form of dwelling was only one among many. Similarly, as communities continued to rely on a pastoral economy, a considerable part of the inhabitants must have retained a mobile or semi-mobile lifestyle despite the existence of fixed base camps.

As stated earlier, the oldest house type known so far is a square, single-room house, built using similar techniques as for the enclosure walls of Ransyrt 1. It could accommodate a nuclear family of five to seven persons. Despite the standardization of construction techniques, these houses were flexibly managed in their spatial arrangements. The linear arrangement of buildings permitted their expansion. The number of households to be built together was therefore not fixed, regardless of whether people lived permanently in the settlements or not. Of particular interest are the respective distances of the buildings to each other, and the use of built-up space.

Two basic layouts can be discerned: on the one hand, a close alignment of houses, sometimes in groups (see Fig. 9) or rows (see Fig. 10, a); on the other hand, houses set apart at distances of up to 50 meters. At some sites with buildings of the first sub-group, the houses are connected by an additional wall (Fig. 9), and settlement plans of this kind are almost always slightly curved. In addition, they all feature a large corral, where the herds of all inhabitants were apparently accommodated together. The second sub-group comprises straight lines of houses loosely built in the countryside (Fig. 10, a). They are never connected and there are very rarely enclosures. These complexes are smaller than the other ones. They display another social strategy to cope with the new style of living. The variability in the appropriation of stone buildings is a good indicator for the adoption process. The new material feature of life was experimented with, and a customized solution for the particular needs of each group was sought. The linear composition of the sites, however, still reflects the preferences of mobile pastoralists – flexibility, easy access for humans and animals, workspace and depositional areas around the houses, and a focus on small social units.[57]

Spatial distance between individuals and places to stay – and not just of humans – as well as their spatial arrangement play an important role in the regulation of social

57 Cribb 1991b, 123–132; 139–149, fig. 8.3–6, fig. 8.9;
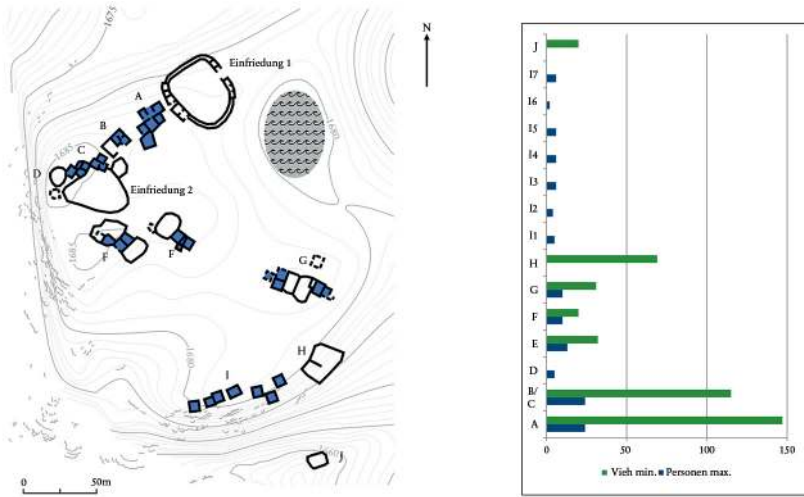   162–184.

Fig. 17   Differentiation of the inhabitants (humans and animals): Prav. Kichmalka 1.

structures.[58] Space and the objects arranged therein are media of non-verbal communication.[59] Thus, the choice of close or loose arrangements, connected or separated, are indicators of more intensive cohesion or a greater autonomy of the individual households. The first sub-group also seems to have integrated a greater number of animals in their living environment; even the herds were not kept near or inside the houses, as the lack of the corrals suggests, identified via soil analysis in Kabardinka 2. This may have had practical reasons, however, as current studies of human-animal relations suggest a close interdependence on both sides at the household level.[60] Seasonal cycles and the species-specific needs of animals certainly influence the disposition of houses, stables, and corrals.

The curved shape of some sites (Fig. 9), moreover, is a first step towards a spatial configuration that is no longer as open and flexible as a linear settlement or camp site. The tendency towards demarcation using the spatial structure of the settlement layout intensified with the later oval or circular shaped complexes (Fig. 11). This building arrangement in a ring focusing on a center is something fundamentally new. These locations could no longer be expanded and were closed off from the outside world, even if it was still possible to access the center from the outside because intermediate spaces between the buildings were not closed. However, it was now much easier to control movement. Enhanced visual control and passive contact – the chance to meet more or less often due

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58 Fraser 1968; Grøn 1991, 101–108; on the psychological foundations: Jüngst 2000.

59 Schögl (unpublished).
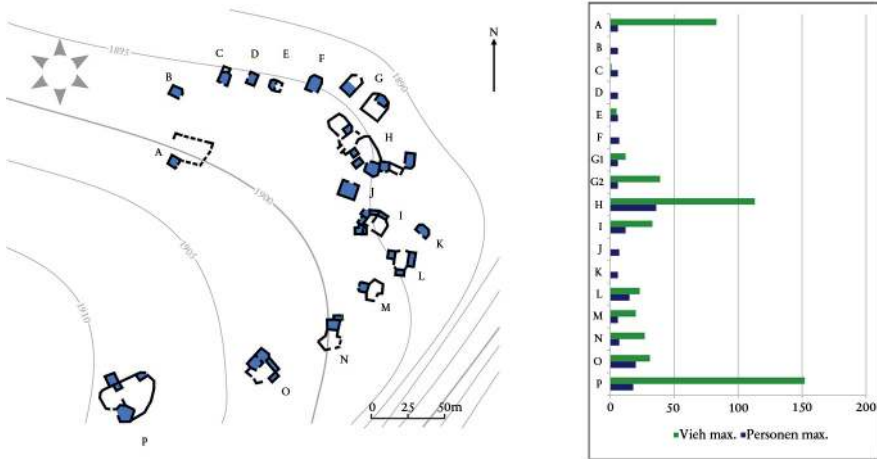
60 Armstrong Oma 2013.

Fig. 18 Differentiation of the inhabitants (humans and animals): Tamsamesu 1.

to the regulation of movement patterns – are of far-reaching consequences for the social organization of communities (see Fig. 1).[61] Social control through observation did not only regulate the actual construction process of houses, but likewise their arrangement in terms of more or less straight lines-of-sight.[62] The same applies for movement patterns in space.[63]

At this stage, the change in lines of sight and movement is the actual innovative step. The house architecture seems to have remained unchanged. Only the combining of several one-room buildings to agglomerated complexes is a novelty. It indicates the beginning of a differentiation into larger and smaller households. Since the larger complexes always include individual animal enclosures, the architecture also indicates the start of an economic imbalance of the inhabitants (Fig. 17). Compared to the linear arrangements with communal corrals, space for animals becomes 'privatized'. The larger complexes with enclosures are often concentrated in specific areas of the rings, while separate houses without enclosures fill the gaps (Fig. 11; Fig. 17). Further excavations would be needed to explain this spatial differentiation more precisely as a reflection of the beginnings of social differentiation.

The most significant change in the development of the North Caucasian Bronze Age architecture was, however, the development of settlements with symmetric layout at the turn of the 14th to 13th century BC. This radically changed living arrangements

61 Grøn 1991, 107–109.
62 Bourdier and Minh-ha 2011, 25.
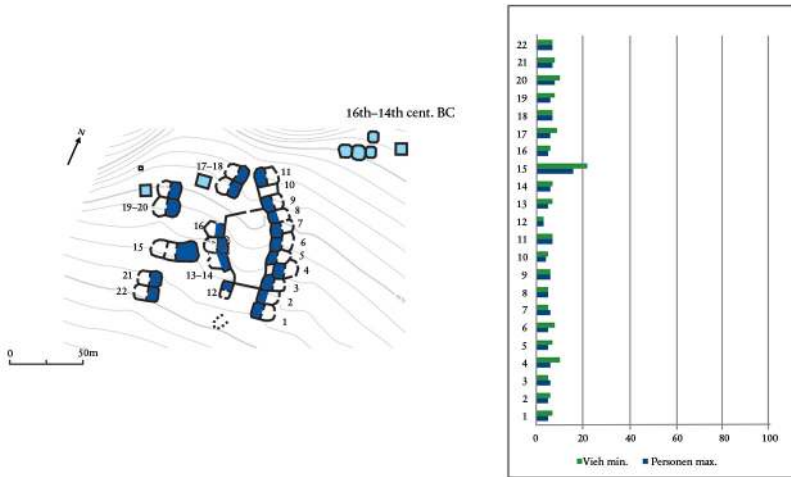63 Hillier and Hanson 1984.

Fig. 19 Differentiation of the inhabitants (humans and animals): Kabardinka 2.

as well as activity and movement patterns of the residents. The development of the multifunctional byre-dwellings that united humans and animals under one roof, required not only the new double-roomed floor plan design (see Fig. 5, d–e), but also more massive walls (Fig. 7, c) and probably more massive superstructures. The segmented construction technique of the walls (Fig. 8, a) was developed further to construct durable foundation walls (Fig. 8, b–c). The walls of the houses were built exceptionally carefully and the stones were often dressed (Fig. 6, a–c). The massive walls and their construction certainly changed the optical, thermal, and acoustic characteristics of the houses. Stables, which were probably seasonally used as storage rooms or workspace, allowed the removal of activities from the interior or the courtyard into the economic section of the house. Storage space also must have drastically increased, e.g., in the attics below the roof.

Lines-of-sight and axes of movement in these settlements suggest surprising patterns of mobility.[64] The representative entrances of the houses that faced to the outward required people to walk around the settlement if they wanted to visit neighbors on the opposite side of the plaza. Access to the plaza from inside the houses cannot be verified based on the archaeological evidence. Even if wooden steps might have existed, the patterns of movement of the houses were directed away from the center. The central square was entirely sealed off by walls with only one narrow entrance that was protected by a massive gate. The central squares of these settlements obviously did not have the focusing

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64 Reinhold 2010, 224–226.

function of internal plazas at other settlements.[65] Nevertheless, the whole arrangement served as a fortification ring, less for the inhabitants of the houses than for the animals kept in the central square. Soil analyses demonstrate their presence in the plazas.[66] Effective herd management, where the interbreeding of animals is artificially influenced, requires the ability to separate old and young animals, as well as males and females respectively.[67] The central square was a highly suitable building arrangement for this purpose. The development – invention? – of the byre-dwellings with the possibility of safely wintering large numbers of livestock, and the central places that allowed breeding control, combined different strategies of herd management. Both targeted high economic efficiency of livestock production. However, the architectural detail and the symmetrical arrangement of the buildings are specific to the studied area. Other architectural solutions for herd management could have served the same needs, such as sheltered enclosures or separate winter stables.[68]

Houses and squares were thought of as a unit. This becomes obvious in construction details. At the excavated sites of Kabardinka 2 and Gumbaši 1, neighboring houses have interconnected foundations. The wall frames of the double-faced wall of one house run sometimes inside the wall of the next building (Fig. 5, d; Fig. 8, c). Such construction technique makes only sense if the entire settlement is planned in advance, following a well-known template with standardized house forms. The whole complex must have been built at the same time. There is further evidence for all three points. One site was never completed, yet even the half-finished structure reveals the general layout and the intended number of houses. At nearly all sites, the central places were carved into the bedrock, showing that the number of possible buildings had already been set at the start of the construction. These settlements did not grow slowly but were planned and established systematically for a more or less fixed number of inhabitants.

Returning to the aspect of building, an important prerequisite for collective construction is a clear coordination of the construction processes and a large number of helpers.[69] The symmetrical settlements with their large, multi-functional houses are signs of a highly organized society that shows its social coherence and economic prosperity in its architecture. Compared to the earlier oval- or circular-shaped systems with their differentiation of households, the uniformity of building and settlement layout is remarkable. With the advent of symmetric settlements, individual traits in the architecture disappeared. The settlement plan and the clearly outlined ideal number of

65 For archaeological examples, see Zdanovich and Batanina 2002; for ethnographic ones, Bourdier and Minh-ha 2011, 153–171; Kumhera 2010.

66 Reinhold, Belinskij, and Korobov 2007, 157–158, Fig. 19–20; Peters et al. 2014.

67 Ebersbach 2002, 141–145.

68 See Giovanioli 2004 for Alpine economic architecture.

69 Oliver 1989; Bourdier and Minh-ha 2011, 153, fig. 159.

occupants appear just as stringent as the actual construction and architectural details. The power of social regulations within this collective must have been immense.

Despite the fact that a settlement organization as described here is hardly conceivable without regulatory mechanisms and individuals who make decisions, there are no architectural traces of any subgroups that could be designated as elites. The above-mentioned beginnings of social differentiation during the period of open oval sites did not lead towards a more complex social organization, but rather toward the opposite. With their uniform architecture, the communities living in symmetric settlements tried actively to counteract the segregating tendencies displayed in the earlier oval complexes. Unlike suggested by Bourdier and Minh-ha[70], who understand uniformity in architecture as an indicator of ethnicity and a positive sense of community,[71] uniformity is as strong a social means of discipline as it can be the result of forceful repression. At the investigated sites, visually perceptible social differentiation was meant to be regulated if not suppressed entirely.

With the byre-house and the symmetrical-oval settlement plans the architectural development arrived at a stable solution for social and economic requirements. It persisted for more than 300 years, longer than any constructive scheme before or after. This architecture was perhaps perfectly adapted to the economic and social needs of its inhabitants, so that they saw no need for further improvements. However, it is also possible that the stone foundations of the buildings were so inflexible that later residents did not want to undertake the effort to change the entire system. It is also possible that the inflexible ways of life and the suppression of individuality were such strong means of disciplining people and their conceptual horizon that further changes, including new forms of architecture, became unimaginable. The innovation cascade, if we return to Michael Schiffer's terminology, had reached its end. The following architectural development of groups who migrated into the valleys after 1000 BC changed their economy, with the result of new architectural forms. They are, however, not the subject of this paper.

4.2   Social practice – innovations in dwelling

With the changing types of houses and settlement layouts, social practices that took place within them and in their direct surroundings had to change gradually. Dwelling itself is not bound to a specific architecture, and it includes many more aspects than physical residence in a particular area. With the step towards 'localization', living and dwelling were altered. The builders of the 'new' stone buildings probably became soon aware of the changes in their everyday life. Mobile architecture, which was probably

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70   Bourdier and Minh-ha 2011, 25.   71   Bourdier and Minh-ha 2011, 25.
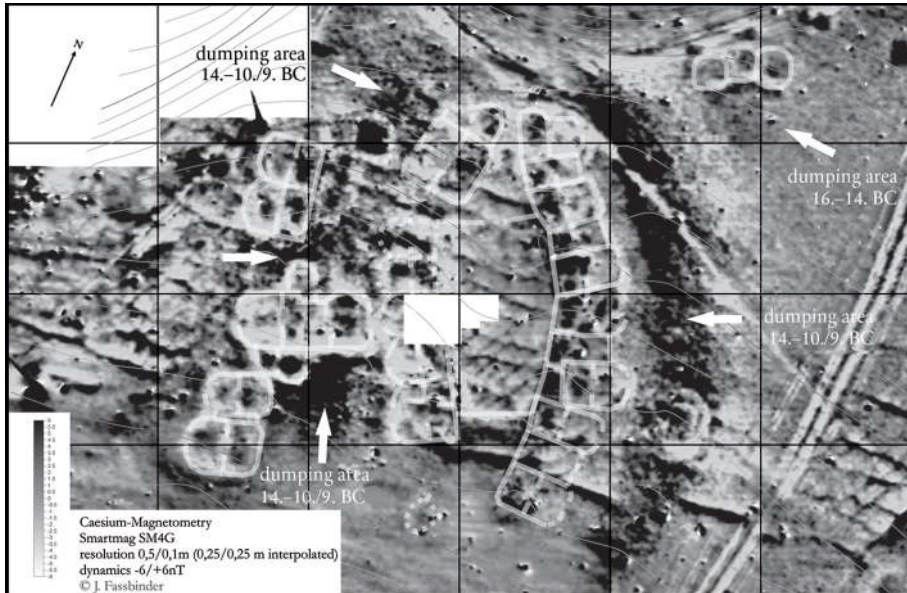
Fig. 20 Midden zones around the linear and symmetrical settlement Kabardinka 2.

mainly textile or organic architecture – tents, yurts, huts –differs substantially in terms of lighting, acoustics, smells, or temperature from stone or massive wooden or earthen constructions.[72]

Magnetometric measurements and the subsequent investigations make it possible to delineate activity areas, i.e., to separate economic from residential areas and compare intensities of activities. Although the ground plans of the different house types vary considerably, an undivided room of about 60–100 square meters was typically used as living room. This would accommodate nuclear families of five to seven or maximal ten people per house, regardless of the respective house forms of different epochs.[73] Only in the open oval settlements with their agglutinative structures could larger and smaller overall units emerge. At these particular sites, the number of co-residents became more flexible (Fig. 18). With the symmetric settlements, however, the communities returned again to the standard size of living rooms suitable for a core household. Magnetometry and soil analyses reveal similar ranges of activity intensities of rooms in the double-room houses (Fig. 20). This indicates that these buildings had largely identical use patterns.

The actual innovation in dwelling probably took shape only in response to the adaptation to the characteristics of the stone architecture, i.e., with the development of closed

72 Cf. Hof 2001.

73 Cf. various calculations at Mischka 2007.

symmetric sites. Initially, there were few differences in terms of everyday routines be-
tween linearly organized tent camps and linear architecture with stone houses. This
concerns movement patterns of humans and animals or the use of open spaces around
individual dwellings. Living in flexible camps and similarly arranged linear complexes
preserved the residents' autonomy. Most likely, the new building materials initially af-
fected above all the quality of living. One can assume that the increasingly massive ar-
chitecture influenced first aspects such as lighting conditions, ways of sleeping, eating,
resting, working, playing, or hygienic conditions.[74] Thick walls made of solid materials
such as the later multi-functional byre-houses, resulted in warmer but also darker and
acoustically enclosed spaces. Hard materials restrict movement, and the accumulation
of garbage and filth is different in a house than in a tent or a yurt. Moisture can accumu-
late and adversely affect the hygienic conditions. Also, entry into closed spaces is difficult
and contact to the outside takes place only when wanted. The ethnographer Annedore
Hof describes the sedentarization process of Yürük families in Turkey. Communication
structures changed for former camp residents who now could no longer informally visit
their neighbors in their tents. Instead of personal visits, communication shifted toward
indirect means such as the use of the telephone.[75] In this particular case, social behav-
ior in villages permits public participation outside the house only for males so that the
women became bound to the house. With permanent buildings, the accumulation of
objects, including heavy furniture, began as well. Unfortunately, without more excava-
tions that would allow a comparative analysis of different houses within the sequence
of the North Caucasian architecture, such aspects still remain in the dark.

Both the multi-functional byre-houses and the co-developing symmetric layout of
settlements must have changed village life in fundamental way. With each stage of ar-
chitectural development, the spatial distance between neighbors as well as humans and
animals waned. People in symmetric settlements lived separated from their neighbors
only by a wall and were in close contact with animals in the stables, at least temporar-
ily. The massiveness of architecture certainly created new barriers. Nevertheless, one
inevitably met more people when entering or leaving houses. We can assume an in-
creasing relatedness of all neighbors that could perhaps also have created new forms of
distancing, including polite ignoring, looking away, and not listening. Such behavior
would be an indirect but certainly imaginable side effect of an innovation cascade.

Another aspect of social life is garbage. Hygiene and waste disposal are important
activities reflecting various mentalities toward mobility. While mobile groups tend to
dispose of the little waste that accumulates during their stay close to their areas of res-
idence, a well-directed garbage disposal is more of a concern for sedentary groups.[76]

74 Delitz 2010; with example Bourdier and Minh-ha 2011.

75 Hof 2001.

76 Cribb 1991b, 122–129, fig. 7.4.6–7; 10.3; Sommer 1991.

Geophysics, soil analysis, and archaeological evidence reveal that accumulation of waste took off at the sites with the advent of stone constructions. While this is still rather ephemeral in the linear and oval settlements, settlements with symmetrical layout have significant 'rings of waste'. Magnetometry shows in several localities dark anomalies that are due to high concentrations of ash and organic perishables in the soil (Fig. 20). On-site surveys and an excavation at the Kabardinka 2 site also exposed considerable layers of ash, bones, and pottery concentrations.

A last aspect of dwelling considered here is the presence of animals. At all stages of architectural development a close coexistence of humans and animals can be assumed. However, the spatial relations and above all the intensity of human-animal contact changed significantly over time. In a study on human-animal interaction, Kristin Armstrong Oma argues that the particular species-specific behavior, the seasonal rhythms, and the specific needs of animals have a clear influence on conditions and intensities of co-habitation.[77] It likewise influences the construction of houses, stables or corrals. The closer the spatial integration, the clearer are the changes in the perception of animals and their products. Animal excrements in cases of integrated residential-stable spaces, for instance, might not be perceived as 'dirt', but rather as 'pure', welcome heating material, or just as neutral. The close symbiosis between humans and animals allowed the boundaries between them to dissolve.[78]

The North Caucasian case study demonstrates an increasing proximity of humans and animals over the course of time. At the excavated house of the linear phase of Kabardinka 2, microbiological soil analyses show that no animals had been present inside or in the vicinity of houses. In the oval to circular shaped complexes, stables for animals were initially probably built alongside corrals. In the multifunctional byre-houses, animals were integrated directly into the immediate living environment of humans. Not only the distances between human inhabitants decreased with the transition from linear to symmetrical settlements, but also those between humans and animals. As both moved closer to each other, the latter won security while the former gained easy access to animal products. At the same time, degrees of autonomy, freedom of movement, and hygiene were lost, increasing the risk of parasites or transmission of diseases. With the integration of animals into residential areas, a change in their perception is almost certain. In Armstrong Oma's view, this can be regarded as a 'domestication process', only in this case, human behavior adapts to animal needs and not the other way around.[79]

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77 Armstrong Oma 2010; Armstrong Oma 2013. For Kabardinka 2, the archaeo-zoologist Ekatarina Antipina draws attention to the enormous social stress that animals endure in an enclosed space, especially if the species-specific individual distances fall short, or different sexes are housed together.

78 Armstrong Oma 2013, 171–172.

79 Armstrong Oma 2013, 164.

These few insights into possible changes of lifeways reflected in the archaeological sources demonstrate that with innovations in Bronze Age architecture go hand in hand with fundamental innovations in social practice, often probably as unintended byproducts. The decision in favor of greater localization and the choice of permanent buildings initiated these fundamental changes in daily routines as well as the adaptations of architecture to new, unforeseeable tasks. This is clearly demonstrated by modern case studies as well.[80]

5 Stone architecture at the transition from Middle to Late Bronze Age in the Caucasus – invention or technological transfer?

With the last phrase in mind, it is necessary to ask whether the Bronze Age settlement development in the Northern Caucasus was indeed the (re)invention of a sedentary lifestyle and of solid architecture, or whether they were adopted via as cultural and technological transfers from the outside.

Architecture, and domestic stone architecture in particular, is a phenomenon that is nearly unknown in the Northern Caucasus during the Middle Bronze Age (MBA) in the third and early second millennia BC. While thousands of burial mounds were erected using stone construction for graves and mound embankments, no technological link can be drawn between this form of architecture and the later buildings discussed above. This is also true for the few excavated domestic MBA constructions in the Western Caucasus or Dagestan.

Technological aspects, however, and in particular the double-faced wall construction, link the Caucasian sites to places with domestic buildings and fortifications in the Lower Don region and on Crimea. During the epoch of the multicollared ("Mnogovalikovaya") ceramics, i.e., at the turn of the third to the second millennium BC, a settlement development similar to that of the Northern Caucasus begins. It is not as straightfoward as in the latter area, but it reveals quite comparable traits.[81] The changes in the Lower Don and on Crimea predate the oldest complexes with stone walls in the Northern Caucasus by several centuries and display their own peculiarities. The double-faced construction technique in Planerskoe,[82] a Crimean site from the beginning of the second millennium BC, however, is a direct prototype for the walls in Ransyrt 1. Even more revealing are the structures excavated at the site of Livencovka near Rostov-on-Don. A twin-complex with massive stone walls was excavated in the 1980s.[83] It also dates to the epoch of multicollared ceramics. Livencovka is considered a fortification and refuge

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80 Hof 2001; Cribb 1991a.
81 Pieniążek 2012, 59–62, fig. 11–12; 170–179.
82 Kislyj 1991.
83 Bratčenko 2006, 34–76.

for a larger, mobile population. Inside the enclosure, tombs have been found, but no domestic architecture. Contemporary domestic buildings, however, existed in the vicinity of the Livencovca fortress and inside the neighboring Karataevo enclosure.[84] Both adjacent complexes are semi-circular in shape, built at the edge of the steep bank of the river Don. These places were constructed as a series of stone platforms with gaps in between. It is unclear, to what extent these sites were really inhabited on a permanent basis and used as fortifications.

Is the process of sedentarization in the Northern Caucasus then a cultural transfer from the adjacent steppe zone in the northwest? Is the double-layered wall construction a technological transfer? In 2015, one of the excavators of Livencovca visited the Ransyrt 1 excavation in the mountains and confirmed considerable correspondences not only in both building techniques and site layout, but in parts of the material culture as well. From this perspective, it is quite possible that the first impulse to abandon the predominantly mobile lifestyle of the Middle Bronze Age arrived in the Northern Caucasus from the Lower Don or the Lower Kuban area. This may have included the development of new forms of construction, Nevertheless, the local development that started there is neither comparable in terms of the architecture nor in terms of settlement conceptions. And it ended just before the development in the Caucasian mountains took off. Magda Pieniążek noted for the North Pontic area, which has with its own ecological and economic regularities, that unlike in the Northern Caucasus the sedentary way of life was never really anchored deeply in the mentality of the population. Rather, it always oscillated between more or less mobile principles.[85]

6 Concluding comments

Why do humans construct architecture? The question of its 'utility' has occupied architectural theory since its inception. The need for 'shelter' was long considered the primary motivation for human construction of buildings, but the shaping of 'new cultural ideals' is already mentioned by Gottfried Semper in the 19th century.[86] The architect Joseph Rykwert concludes that the significance of architecture lies in its symbolic and creative potential, not in its protective function.[87] Rykwert mentions the need for a 'home' in one of his essays, not an entirely unproblematic term.[88]

The invention of buildings constructed in stone – a technological innovation involving a new material in domestic architecture – should therefore not be considered only

84 Bratčenko 1969.
85 Pieniążek 2012, 170–179.
86 Moravánszky and Gyöngy 2003, 35.

87 Ingold 2000, 181–182; Trebsche, Müller-Scheeßel, and Reinhold 2010, 16–19.
88 Rykwert 1991; Ingold 2000, 182.

as a technological phenomenon. The mobile groups of the early second millennium BC probably did not need fixed homes. They had their transportable buildings – tents – that gave them protection and shelter. The adherence to a site layout that resembles those with mobile architecture during the first phase of the innovation of 'sedentism' suggests that it was not necessarily the functional benefits of stone houses in a village configuration that led to their initial construction. More likely, these houses were symbols for the creation of new places for a newly formed population with a new self-conception. All subsequent developments are adaptations to the consequences of this decision, innovative spurts in an innovation cascade, to reference Michael Schiffer again.

It is undeniable that the image drawn up here neglects all social groups that remained rooted in mobile architecture and are thus not archaeologically documented. The seemingly linear development from mobile to sedentary could therefore certainly be disrupted by the existence of such alternatives. Yet, the overall trajectory would remain the same.

The Northern Caucasian case study, despite the early stages of research, opens up some interesting aspects in the debate on technological and social innovations. Radical shifts in everyday life have been mentioned above. Yet, it remains uncertain why settlers started to settle down in the high mountains at all, and why they did not move to the more convenient valleys when faced with population growth and probably harsher climate conditions after the mid-second millennium BC.[89]

The first question might be answered with reference to the pastoral economy of the first settler groups who had to cope with the problem of aridization of the steppe zone. This required them to find new treeless pastures for their herds in mountainous terrain. The second question is harder to answer. The invention of settlement forms adapted to semi-mobile seasonal pastoralism, i.e. an actual combined mountain economy (*Almwirtschaft*), permitted a considerable population increase in a precarious environment. The number of sites and households per site increased steadily at a time when climate conditions became harsher, i.e., when external pressure started to weigh on the environment.[90] The mountain dwellers, however, instead of shifting down to the valleys, reacted with the development of new architectural solutions for a new form of intensive herd management. This probably went hand in hand with an intensification in mountain agriculture operated by parts of the population that was now permanently located in villages.

Technological innovation as an answer to economic or social tasks is a characteristically modern thought. Yet, the Northern Caucasian Bronze Age mountain communities

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89 Davis et al. 2003, fig. 3.
90 The overall European data on harsher climate conditions after the mid-second millennium BC is confirmed by the finding of several studies of pa-

leopathology of the cattle from this period, which suffered from severe colds and hypothermia (Antipina 2013).

obviously preferred the investment in technological solutions involving considerable risk to the 'easier' solution of out-migration. Life in high mountain locations occupied by their ancestors only a few hundred years earlier was apparently deeply anchored in the collective memory of these communities, opposing utilitarian aspects of a more convenient life in the shelter of the valleys.

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