

DISSERTATIONES ARCHAEOLOGICAE

ex Instituto Archaeologico Universitatis de Rolando Eötvös nominatae



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The change of the pottery style of the Makó and Nagyrév cultures in the Early Bronze Age

The settlement in Ivánca-Lapos

Tamás KESZI 

Intercisa Museum, Dunaújváros

keszitas@gmail.com

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Abstract: Review article of PhD thesis submitted in 2021 to the Archaeology Doctoral Programme, Doctoral School of History, Eötvös Loránd University, Budapest under the supervision of Gábor V. Szabó.

Keywords: ceramic style, cultural change, Early Bronze Age, networks, “skull mask”

Introduction

The finds that provided the basis of the dissertation were excavated in 2005 in Ivánca.¹ The processing of some of these finds is a step forward in the research from a purely quantitative point of view. While we know a larger number of sites in the Mezőföld from the Early Bronze Age IIB–III, there is hardly anything from the previous I–IIa period. In addition, the Ivánca finds place previous ones into a different context. Earlier distribution maps suggest that the area was essentially uninhabited or sparsely populated, becoming more populous due to later migration from the south.² In the light of the new finds, the significance of this southern connection needs to be reconsidered. In addition, the settlement in Ivánca, which dates back to the Early Bronze Age II, provides new qualitative data in two areas. The continuous use of the settlement during the Makó and Nagyrév cultures and the very small number of objects from foreign contexts (Bell-Beaker package and Somogyvár culture) suggest that the Makó–Nagyrév style³ change cannot be explained by any of the more common migration or diffusion narratives. Furthermore, the dense location of the features indicates a relatively intensive use of the site, from which we can deduce the longer life of the settlement and/or a larger community. This is in clear contrast to the view that the role of the population of Makó culture was negligible in the explanation of cultural changes taking place during the Nagyrév

1 The full version of the manuscript of the PhD dissertation is available online, in Hungarian: <https://independentresearcher.academia.edu/Tam%C3%A1sKeszi/Thesis-Chapters>.

2 KULCSÁR 2009, Fig. 4–5, 41–42.

3 By style I mean not only decoration, but also the totality of technical, formal, and decorative features (HERBICH – DIETLER 2008, 231). For the definition of style: DUNNELL 1978; WOBST 1977; AMES 1996; SHENNAN – WILKINSON 2001. In the following, I use the term “ceramic style” in a neutral sense, without any connotations that would refer to the evolutionary mechanisms related to the appearance and spread of a given cultural feature. However, it is also true for the spread of this style that it indicates the existence of interactions (learning, exchange, trade, etc.) between people living in a closed area during a given period (DUNNELL 1978, 199).

culture (change of ceramic style and formation of tells).⁴ On the other hand, several human remains were found at the site, including a culturally modified human skull, which is a unique artefact from the Early Bronze Age. It may be an instrument of a cult practice previously undocumented from the Early Bronze Age.

Therefore, besides adding to archaeological materials processed, the aim of my dissertation is to contribute to a better understanding of Early Bronze Age cultural processes and behavioural patterns by interpreting the two special phenomena: the co-occurrence of the Makó and Nagyrév styles, and the culturally modified skull and other human remains in the settlement.

The settlement in Ivánca-Lapos

The site is located by the Danube on a 560–570 m hill range running from north to south and protruding from the floodplain. We have found almost 600 features on an approximately 7000 square meter surface area in the southern part of the site. The vast majority were waste pits dated to the early Bronze Age. There were a few “atypical” burials⁵ in the settlement, also from the Early Bronze Age. As the excavation could not be completed due to accounting arguments between the museum and the investor, therefore, some numbered features where the humus had been cleared off could not be unearthed. We also had to leave a couple of pits half-excavated.

The southern border of the settlement probably did not extend beyond the mouth of the old Váli-víz. On its western side up to road number 6, no artefact was found. The cemetery of the settlement is most likely to have been located on the other side of the road. During the excavation, no houses were found. The eastern side of the settlement was probably partly destroyed by the westward shift of the Danube, partly separated from the mainland by the formation of the Adonyi-island. The centre of the settlement may have been located in this zone.

The first chapter of the dissertation contains the description and archaeological assessment of the features selected for processing and the ceramic objects found in them. The vast majority of the ceramics found in the waste pits are uncharacteristic fragments, but some can be classified into the Makó and Nagyrév pottery styles. There were a few object types that can be identified as part of the Bell-Beaker package (fragments of beakers and bowls with a T-shaped decorated rim, a stone wrist-guard, and a stone arrowhead) or that could be tied to the Somogyvár culture (fragments of cylindrical vessels and a mug of the Somogyvár style). In some pits, besides uncharacteristic fragments, only vessel types of the Makó style were found, while in others the fragments representing the Makó and Nagyrév styles were mixed in different proportions.

The co-occurrence of the artefacts belonging to the Makó style and the Bell-Beaker package suggests that the settlement was inhabited during the Early Bronze Age IIA. Thus, the Makó style items can be dated to the late phase of the culture.⁶ The presence of Nagyrév style pottery and the

4 BÓNA 1992a, 12; CSÁNYI 1996, 56; SZABÓ 1999, 15.

5 For the definition and question of “irregular,” “atypical” burials, see: RITTERSHOFER 1997; MURPHY 2008; MÜLLER-SCHEESSEL 2013; BURLACU-TIMOFTE – GOGÂLTAN 2016, 91–92; GOGÂLTAN – AILINCĂI 2016. For the deposition processes of human remains: WEISS-KREJCI 2011.

6 For the relative chronological system of the Early Bronze Age, see: BÓNA 1992a, 40–41; KALICZ-SCHREIBER 1999, Fig. 20; SZABÓ 1999. Recently, based on the ¹⁴C data, Géza Szabó proposed to distinguish only two stages of the Early Bronze Age (Early Bronze Age I: 2600–2200 BC, Early Bronze Age II: 2200–2000 BC), (SZABÓ 2017b) because no significant cultural boundary can be drawn between the Early Bronze Age I and IIA on a typological basis. KULCSÁR – SZEVEÉNYI 2013, 71–75 also state that it is not possible to draw a boundary line between the I and IIA periods of the Early Bronze Age on a typological >

presumable gradual increase of its quantity indicate that the site was continuously inhabited during the Early Bronze Age IIB. It seems that the appearance of the Nagyrév style should not be bound to a new population, but to a change in the autochthonous population's traditions.

An artifact made of a human skull found in feature 52 stands out, as it is still a unique specimen in the Early Bronze Age Carpathian Basin. Together with other human remains found in the settlement, this exceptional find provides an opportunity to study a special pattern of behaviour.

The evolution of the Nagyrév pottery style

The second chapter of the dissertation offers a new model for the change of the pottery style of the Makó and Nagyrév culture.

There are several proposals for the definition of culture and archaeological culture.⁷ In what follows, I accept Paul C. Munding's definition⁸ "culture is a set of populations that are replicated generation after generation by learning – an overt population of functionally related, shared, imitable, patterns of behaviour (and any material products produced), and, simultaneously, a covert population of acquired neural codes for those behaviours." In recent decades, there has been much discussion about the definition of archaeological culture, the content of the term, and its usability for research purposes. Many opinion-forming researchers have taken the view that the use of the concept of culture was not recommended.⁹ The term nonetheless stubbornly survives – probably because, despite theoretical objections, it still has practical benefits.¹⁰ Accordingly, there is still the notion that there were genuine social entities behind the archaeological cultures, so they are not merely analytical tools. Like Alexander Gramsch, I think we are able to study the formation and relations of social entities investigating the spread of different cultural traits. Instead of the vague notion of "entity", I will use the term "network". Each cultural trait spreads through human networks. The network is made up of the people living at the same time and the relationships that have developed between them. I do not wish to address the question of what kind of organizations known from cultural anthropology these networks may correspond to.¹¹

▷ basis. SZABÓ 2017a, Fig. 8 and SZABÓ 2017b, Fig. 3 convinces me that it is more appropriate to stay with the current triple division. I think the ¹⁴C data support the typological-stratigraphic observation that the Bell-Beaker culture appears later than the Makó culture. So far, this has been the common starting point for the separation of the Early Bronze Age I and IIA in the various chronological conceptions. For the absolute chronology, see: RACZKY et al. 1992; FORENBAHER 1993; KISS et al. 2015; PUSZTAINÉ FISCHL et al. 2015.

7 KROEBER – KLUCKHOHN 1952; CLARKE 1978, 42–83; HAMMERSLEY 2019.

8 MUNDINGER 1980, 190–191.

9 ROBERTS – VANDER LINDEN 2011 gives a good summary of the debate.

10 ROBERTS – VANDER LINDEN 2011, 4–5, 8, 10, and 13. BRUMANN 1999 argues for a narrower use of the term "culture." The situation is similar to what we can observe in relation to the concept of biological "species:" there are problems with the definition and the biological content of the concept, yet the concept is needed and used. "The innumerable attacks on the problem have turned the often-repeated question 'what are species?' into a philosophical conundrum... The species problem is the long-standing failure of biologists to agree on how we should identify species and how we should define the word 'species'" (HEY 2001, 326). "...the species problem is not primarily an empirical one, but it is rather fraught with philosophical questions that require – but cannot be settled by – empirical evidence" (PIGLIUCCI 2003, 596). A list of definitions of the term "species" with additional literature: <https://scienceblogs.com/evolvingthoughts/2006/10/01/a-list-of-26-species-concepts> (last access: 22. 09. 2021). Behind the concept of "species" and "culture" lies the same discontinuous mind (DAWKINS 1994). For the metaphor of ceramic style and biological species, see: SHENNAN – WILKINSON 2001, 590.

11 Fish schools, flocks of birds, and herds of animals show synchronized behaviour without any particular ▷

Accordingly, I will use the term “Nagyrev network”, by which I mean the ever-changing network that created and spread the Nagyrev pottery style. Naturally, it is not characterized by this single cultural feature. At the same time, the cultural features within the Nagyrev network are not uniform, in the same way as there are regional variations to be observed within the pottery style. It should be noted that the network that ensured the spread of the Nagyrev pottery style was not the only one to connect people. There were many networks with different structures simultaneously¹² that may have been organized for different reasons, for different purposes, and may have overlapped.¹³ It is also important to keep in mind that the network that created the Nagyrev style was constantly changing: there was a change in the people who represented the network’s nodes, and on the other hand, its geographical extent was not constant.¹⁴

There are two other closely related concepts used with different meanings in the archaeological and sociological literature examining the spread of innovations.¹⁵ By innovation, I mean any new cultural trait (technology, object, style element, and behavioural pattern required to produce them) that spreads across a human network. The archaeological literature tends to treat diffusion ensuring the spread of new cultural features as a process between separate cultures, during which new types of objects and behaviour patterns enter the given cultural context from outside.¹⁶ Sociology uses the two terms somewhat differently: diffusion is a process of spreading an innovation,¹⁷ regardless of whether this innovation was born within or outside the society under study. In the following, I will also use Everett M. Rogers’ more general definition of the latter concept. Naturally, when I examine previous archaeological models is an exception. In these cases, diffusion should be endowed with a connotation as interpreted by the original authors, which usually reflects the narrower archaeological definition.

▷ identity, often to a certain external influence. A common vessel style, and especially the network behind it, can help shape a common identity, but does not necessarily justify its existence (HERBICH 1987; DAVID et al. 1991, 171–172; HALL 1997; DIETLER – HERBICH 1998; MACEachern 1998; GOSSELAIN 2000, 94–104, 209–210; HEGMON 2000, 129–133). Clusters within a large network, which could typically be organized around several hubs, could play a more important role in determining an individual’s identity than the entire network. It was not until the 20th century that politicians began to organize the northern Nigerian Mafa ethnic group into an independent entity in accordance with their own interests. Before that, although many features of their language and material culture (including pottery) distinguished them from the surrounding peoples, they did not see themselves as members of the same group, as their communities were organized around different mountains as independent entities (DAVID et al. 1991, 171–172). The example is also interesting because of the mountain–tell analogy. For the supposed symbolic significance and legitimacy role of tells, see: SZEVEÉNYI 2013; DANI et al. 2016, 226.

12 VAN DER LEEUW 2013, 343–345.

13 The production and distribution of metal objects took place through a different network than that of pottery products used in households. Therefore, the distribution of the two types of objects shows a significant difference. Metalworking and pottery are also independent domains in endogamic subgroups of Africa, despite a common pyrotechnic background (GOSSELAIN 2010, 204). In the Late Bronze Age of the Carpathian Basin, even the spread of some type of metal object takes place through different diffusion networks (VÁCZI 2014).

14 During the Middle Bronze Age, a similar network creates the Vatia ceramic style.

15 For the different definitions of innovation, invention, and re-invention, see ROGERS 1983, 11, 138, 175, and KRISTIANSEN 2005b, 113.

16 “Diffusion is a concept that describes the transfer of material traits from one culture to another. In the process it may introduce changes in the receiving culture.” (KRISTIANSEN 2005a, 56). This approach is not independent of the fact that the archaeological definition of diffusion developed when cultures considered to be static according to the culture-historical conception, and an interpretive frame was sought for the reason of the cultural change.

17 For the concept of diffusion and cross-cultural diffusion: ROGERS 1983, 5, 49.

In recent years there has been considerable progress in the field of network research, which has led to an important conclusion: the operation of overlapping systems (inanimate nature, biological systems, and human society) is controlled by the same general organizing principles so that seemingly distant areas can be described by the same mathematical methods.¹⁸ The network approach is not unfamiliar to archaeologists,¹⁹ but they typically use networks as descriptive tools,²⁰ mere metaphors,²¹ and rarely rely on the results concerning the general structure, properties and dynamics of different network types.²² It is strange that research has not sufficiently exploited the latter possibility:²³ in the historical and archaeological literature, we rarely find examples of using these results of network science to seek an explanation for certain cultural phenomena.²⁴ Various studies typically treat the networks known through archaeological finds as stable phenomena in equilibrium,²⁵ despite the fact that they are dynamic, time-varying phenomena.²⁶ I am convinced that if we change this static approach, the use of dynamic mathematical models can also provide insights into the origins of the Nagyrév style.²⁷ In this case, there is no need to completely reconstruct a prehistoric network, which would be an obvious impossibility. Fortunately, with the help of generalized natural laws observed during the development of better documented networks, we can reconstruct the essential elements of a process even if we are unaware of the details.

There are several theories²⁸ about the emergence of the Nagyrév pottery style that can be matched²⁹ with the following network models:³⁰

- 18 SOLÉ et al. 2003, 30; CSERMELY 2006, 5–45; BARABÁSI 2016, 8.
- 19 KNAPPETT 2011; BRUGHMANS 2013; KNAPPETT 2013a; EVANS – FELDER 2014; BRUGHMANS – PEEPLES 2017; MILLS 2017.
- 20 KNAPPETT 2013b, 4.
- 21 KNAPPETT 2013b, 3.
- 22 KARSGAARD 2010, 60.
- 23 KNAPPETT 2011, 32, 51. The phenomenon is not limited to archaeological research (WATTS 2004, 50).
- 24 MALKIN 2011, 8–9.
- 25 KNAPPETT 2011, 49.
- 26 CARLEY 1999; WATTS 2004, 28. BENTLEY – SHENNAN 2003 examined the relationship between the motifs identified in the ceramics of Neolithic settlements in Merzbachtal. According to them, the distribution according to the power law can be demonstrated in their relation system that is characteristic of the growing networks. Their research was concerned only with vessel styles, not with the effect of the increase and subsequent decrease in population on the structure of the human network.
- 27 KNAPPETT 2011, 52; VAN DER LEEUW 2013, 336.
- 28 In the last nearly twenty years, two detailed historical reviews have been published about the ideas related to the origin of the Nagyrév culture (TÓTH 2003b; REMÉNYI 2009).
- 29 There are also archaeological models that cannot be clearly classified into either category. According to Gábor Bándi, the Nagyrév culture developed from the Makó one, but in his short summary, he does not give any details of the reason (e.g., external influence) and character of the process, etc. (BÁNDI 1982, 176). According to his laconic opinion, the Nagyrév culture first emerged in the well-defined area of the Kőtörés group along the section of the Tisza between the Maros and the Körös estuary, and spread from there to the Transdanubia region (BÁNDI 1982, Abb. 10). Ultimately, this means that in his interpretation the Nagyrév pottery style also evolved from the Makó style, (see the details later) but it is not clear whether the spread was defined by migration or diffusion.
- 30 KROON et al. (2019) examine the change of the ceramic style in the framework of three models (migration, diffusion, and network). Their study suggests that the network model of cultural change contrasts with traditional archaeological models (migration and diffusion) and is a radically new explanation. In fact, diffusion always takes place within a given network, because the cultural traits spread between different nodes of a network. Migration is the spatial movement of people and, ultimately, of the network they constitute. Thus, the two archaeological concepts actually describe network processes, so they both belong to the set of network models that explain cultural change. The network model proposed by KROON et al. (2019) is not “the” network model but one of the many, which corresponds to model 4a according in my definition. This is, in fact, a variant of diffusion theory in the archaeological sense: new ▷

- 1) The appearance and spreading of a completely new network, i.e., essentially population change. The archaeological pair of this model is the migration model, which is currently the most common explanation for the appearance of the Nagyrév style.³¹ The substance of the model, whose description is connected mainly to István Bóna and Géza Szabó, is that a) a population of southern origin b) with an advanced mode of agricultural production and c) with the material culture of the proto-Nagyrév culture not characteristic of any other d) settles on the southern edge of the territory belonging to the later Nagyrév culture, where in the next period e) it develops the Nagyrév pottery style f), which was later spread by migration, and g) the population of the Makó culture does not play an important part in the process.³²

There are problems with each element of this model. a) The spreading of certain types of artefacts does not unambiguously mean mass migration of closed communities.³³ The fact of the migration is not confirmed by any scientific evidence. b) The existence of more advanced husbandry³⁴ is not supported by any scientific evidence either. There are no archaeological features found in settlements defined as proto-Nagyrév not already discovered in sites of the Makó culture.³⁵ In Dunaföldvár–Kálvária, considered to be a key site, the continuity between layers VI (so-called proto-Nagyrév) and V (Nagyrév) is highly unlikely.³⁶

- ▷ connections are created between old networks, which presupposes a small-scale human mobility. The archaeological diffusion model, on the other hand, relates to several network models.
- 31 BÓNA 1992a, 18; BÓNA 1992d, 78; SZABÓ 1992; SZABÓ 1994; KALICZ-SCHREIBER – KALICZ 1999, 87; V. SZABÓ 1999, 55–56; KULCSÁR 2009, 252; PUSZTAINÉ FISCHL et al. 2015, 506.
- 32 BÓNA 1992a, 1; SZABÓ – SZÉCSI 1994, 104, 106; CSÁNYI 1996, 56; SZABÓ 1999, 15. According to the common view, only the non-culture-specific habit of brushing of the pots and the cremation rite of the Makó culture survive in the Nagyrév culture (BÓNA 1992a, 12; KULCSÁR – SZABÓ 2000, 39; KULCSÁR 2009, 89).
- 33 The archaeological dimension of migrations is examined in a number of theoretical and practical works, e.g., STARK et al. 1995; BURMEISTER 2000. For the interpretation of the frequently observed discontinuity in archaeological material, see: ROSENBERG 1994, 314–318.
- 34 BÓNA 1992a, 12; BÓNA 1992d, 78; CSÁNYI 1996, 56; SZABÓ 1999, 15.
- 35 In stratum VI of the Dunaföldvár–Kálvária settlement only five pits were excavated, no other features characteristic of the Nagyrév tells were found (SZABÓ 1992, 51–56). According to István Ecsedy (ECSÉDY 1985, 95), it is not possible to prove the independent existence of the Somogyvár culture in Dunaszekcső (SZABÓ 1992, 83) because of the absence of any authentic object. Géza Szabó defines the Szentes-Városostanya site as a short-lived settlement that may have been used by a hunting team (SZABÓ 1999). There are no objects in the site not classified as the late Makó culture. In Bölcske-Vörösgyőr, some post holes and a hearth were found in layers A–D 18–20 dated before the Ökörhalom phase, the building (?) did not have a definite floor and – according to the lack of references – a wall (POROSZLAI 1992a, 9, Figs 5–6). In the E6 layer, no ground-plan could be observed “except for a 2–3 cm thick red burnt spot and a post hole. The yellowish-gray layer, on average 50–70 cm thick, contained remarkably few ceramics, bones and shells” (POROSZLAI 1992a, 10–11, translated from Hungarian). Gyula Nováki (NOVÁKI 1966, 5–6; NOVÁKI 1967, 9) and Ildikó Poroszlai (POROSZLAI 1992a, 10–11) also pointed out that there are remarkably few ceramics and animal bones in the lower layers, but fish remains occur in large quantities. The two together refer more to a fishermen’s spot used seasonally (?) than to developed Balkan agriculture. Thus, at present we know more houses and other features from the settlements of the Makó culture (KULCSÁR 2009, 62–65) than from those defined as proto-Nagyrév. Based on these data, it should be stated that the advanced way of life of the so-called proto-Nagyrév culture is just a myth. Structures, one end of which closes in a semicircle, have been unearthed in Bölcske from Nagyrév strata (POROSZLAI 2000, Abb. 4, 6, Abb. 6). This could indeed be the result of a southern influence, but the type of building is fundamentally different from the characteristics of houses observed in other sites of the Nagyrév culture (BÓNA 1980; BÓNA 1992b; BÓNA 1992c; BÓNA 1992d; CSÁNYI – STANCZIK 1992; POROSZLAI 1992b; VICZE 1992; POROSZLAI 2000), thus, it is an atypical phenomenon.
- 36 According to Szabó, the settlement of Nagyrév culture found on the Bronze Age stratum V in Dunaföldvár–Kálvária would be the continuation of the proto-Nagyrév settlement of Bronze Age level VI. ▷

Géza Szabó has recently considered the arrival of proto-Nagyrév groups an element of a larger migration process.³⁷ In his view, the starting point of the migration was in the East European steppe, and the population involved was affected by influences in the Balkans that led to the birth of the Nagyrév tells. The model is not convincing from a theoretical point of view: it seems unlikely that a mobile population should adopt an advanced, settled lifestyle while traveling hundreds of kilometres, and eventually establish tells. c) The characteristics of proto-Nagyrév artefacts are not clearly defined.³⁸ According to Ildikó Poroszlai, proto-Nagyrév finds were not found in the lower strata of the Bölcske-Vörösgyír settlement either.³⁹ d) The artefacts classified as proto-Nagyrév can be found practically in the entire territory of the Nagyrév culture.⁴⁰ The completely similar late Makó finds can also be found in areas where the Nagyrév style was not prevalent. e) There is no explanation why the Nagyrév style did not evolve in several sites defined as belonging to the proto-Nagyrév culture (Belegiš-Gradac, Ilok/Újlak-Várhegy, Opatovac-Weinberg, Sotin-Weinberg, Vukovar-Weinberg,⁴¹ Petervaradin/Pétervárad⁴²). f) Based on the layouts

- ▷ The two levels were separated by a filled-up layer. Szabó himself admits that “there was a certain time gap between the villages before and after the filling-up” (SZABÓ 1992, 78, translated from Hungarian). The discontinuity between stratum V and VI contradicts the hypothesis that the proto-Nagyrév culture was brought by a population that engaged in a more advanced agricultural activity and a more sedentary life style than other groups of the period.

37 SZABÓ 2017a, 381–385.

38 The separation of the proto-Nagyrév culture from the Makó and Somogyvár cultures is criticized in detail by Dieter VOLLMANN (2005, 78–80, 183–184). He discusses the problem of linking some objects to levels, and their relative chronology. Géza Szabó himself writes that on a typological basis the artefacts found at Dunaföldvár cannot be separated from the ones of the Somogyvár and Makó cultures (SZABÓ 1992, 78–81). The phenomenon is not limited to the sites of Tolna County: in a wide range of Transdanubia, it is difficult to separate the Makó and Somogyvár sites on a typological basis (FIGLER 1994, FIGLER 1996, KULCSÁR 2009, 193). As the analogies listed by Szabó come from the Makó, Bell-Beaker and Somogyvár cultures, they seem to be general early Bronze Age cultural traits and vessel types. According to Szabó, the finds of the proto-Nagyrév culture can only be separated on the basis of the material and the decoration of the vessels (SZABÓ 1992, 81). This claim is not supported by scientific studies of the ceramics. The pottery style of the Nagyrév culture is separated from the Makó and other styles on a typological basis. If, according to the research, it was impossible to derive the forms of the Nagyrév style from the Makó one, then how is this possible on a typological basis in the case of proto-Nagyrév, which is indistinguishable from Makó and Somogyvár?

39 Although the A–D19–20 and the corresponding E6 layers were given the unusual term “Ende der Proto-Nagyrév-Kultur (Proto-Ökörhalom-Phase)” (POROSZLAI 2000, 114, 136), Ildikó Poroszlai asserts emphatically that the “Somogyvár – Proto-Nagyrév-Phänomen” known from Dunaföldvár was not found in Bölcske (POROSZLAI 1992a, 105; POROSZLAI 2000, 114). In another article, she uses the term “Ökörhalom-Phase, Proto-Nagyrév Funde,” but she also states here that the life of the settlement begins with the Ökörhalom phase of the Nagyrév culture (POROSZLAI 1992b, 142). In a later version of the article, the term “proto” disappears from the definition of the layers, and the “phase d’Ökörhalom” remains (POROSZLAI 1994, 142).

40 SZABÓ 1999; DANI – KULCSÁR 2000, 46; KULCSÁR 2009, 30, 31; REMÉNYI 2009, 233–235. During the revision of the Kötörés and Ada groups it became clear that we are dealing with pre-Nagyrév artefacts, which show close connections with the finds of the Danube region of the same time (CSÁNYI 1983, 58–59; KULCSÁR 1998, 40; P. FISCHL et al. 1999, 99–101; SZABÓ 1999; V. SZABÓ 1999, 55–56; KULCSÁR 2009, 24). The sites of the Kötörés group defined by István Bóna were also found around the Danube Bend (BÓNA 1963, 15–16; CSÁNYI 1983, 58–59; BÓNA 1992d, 73). The current state gives the impression that the further spatial expansion of the artefacts that can be classified as proto-Nagyrév did not stop: they can be found practically everywhere in the distribution territory of the later Nagyrév culture. All this raises the question of whether the concept of proto-Nagyrév can be used in the sense found in the studies of Bóna and Szabó, and whether we can suppose a special role for the groups settled in the Tolna County section of the Danube.

41 BÓNA 1992a, 14.

42 KULCSÁR 2009, 262.

of features found in the layers of tell at Tószeg, István Bóna concludes that the population was continuously shifting away from and to the settlement.⁴³ This contradicts the theory that the population of the culture lived in one place for centuries. g) The excavations of the past decades demonstrate that the population of the late Makó culture also created fairly large settlements and its survival into the Early Bronze Age II must be reckoned with.⁴⁴ In parallel, research has questioned the existence of several cultural groups whose formation was linked to migrants coming from the south.⁴⁵

- 2) A new network encroaches on an existing one and, as a result, the material culture changes. Its matching archaeological pair is the concept that after the arrival of a smaller migrant (conqueror?) group the autochthonous population's material culture is transformed. Due to the coincidence in time, Rózsa Kalicz-Schreiber previously assumed a definite connection between the appearance of the Bell-Beaker package and the formation of the Nagyrév culture, considering the new population as the initiator of the transformation.⁴⁶ However, the process of the formation of the new ceramic style cannot be explained by this migration, as the typical vessel types of the Nagyrév culture cannot be derived from the elements of the Bell-Beaker package.⁴⁷
- 3) The pottery style is changed due to the new impulses arriving on the old network. Its archaeological equivalent is the diffusion model.⁴⁸
- 4) The restructuring and rewiring of the old network: a) connection to another existing network which transmits new impulses.⁴⁹ Its matching archaeological pair is also the diffusion model.⁵⁰ Nor does this network model provide an answer to the question of why the

43 BÓNA 1992d, 78.

44 VLADÁR 1966, 254–255; KALICZ 1981; SZATHMÁRI 1999; TÓTH 2003b, 79–80; TÓTH 2004, 82–83; HORVÁTH et al. 2005; KÓVÁRI – PATAY 2005; DANI et al. 2006, 9–11. The large settlements and cemeteries also appear in the distribution territory of the Bell-Beaker culture, which can also be dated to the early Bronze Age IIA (ENDRÓDI 1992; HORVÁTH et al. 2007; PATAY 2013; ENDRÓDI 2013a; ENDRÓDI 2013b; ENDRÓDI 2014; ENDRÓDI – REMÉNYI 2016; CZENE 2017). Thus, regardless of network connections, the process can be observed everywhere, as a consequence of the population growth typical of the era.

45 For the Ada group: P. FISCHL et al. 1999, 95–96; V. SZABÓ 1999, 55; KULCSÁR 2000, 53, 60; TROGMAYER 2001; TÓTH 2003b, 88–89. For the Gyula–Roşia group: DANI 1998, 57–59; KOÓS 1998; KOÓS 1999; DANI 2001, 134, 139–140; KULCSÁR 2002, 447; TÓTH 2002, 36, 47; TÓTH 2003b, 92–93.

46 SCHREIBER 1972, 153. For the migration of the Bell-Beaker folk in the area of Budapest, see: PRICE et al. 2007; OLALDE et al. 2018.

47 BÓNA 1963, 21; CSÁNYI 1983; SCHREIBER–KALICZ 1984, 146, 151; ECSEDY 1988, 16–17; BÓNA 1992a, 12; BÓNA 1992d, 73. Behind the model of Rózsa Schreiber lies the correct recognition that in the vicinity of Budapest, the Begleitkeramik of the Bell-Beaker package are the same ceramics that István Bóna defined as the Kötörés group of the Nagyrév culture. It is actually an assemblage of pre-Nagyrév artefacts, which can be classified as the late Makó style.

48 A distinction must be made between the dynamic process (diffusion) on the network and the dynamics (change) of the network (WATTS 2004, 54–55). Since network considerations did not play a role in the formulation of previous archaeological models, it is difficult to decide whether each diffusion concept can be classified in this or in model 4a) discussed below. I review the archaeological theories explaining the origin of the Nagyrév culture by diffusion at point 4a).

49 At the border of the community (BARTHÉLEMY 2011, 12, 17; BARABÁSI 2016, Sec. 9. 6), a new community emerges, or new relationships are formed with a previously existing but isolated community.

50 CHILDE 1929, 215–222; TOMPA 1937, 64–65; KALICZ 1968; TORMA 1972, 30; ECSEDY 1979, 110; KALICZ 1984, 146; TÓTH 2003b, 73. Those ideas can be classified in this model that see the reason for the change of the ceramic style in the change of the relationship systems of the communities without further explanation (V. SZABÓ 1999, 55). It is noted above that the vessel types of the Bell-Beaker package did not play a role in the formation of the Nagyrév style. The appearance and spread of the Somogyvár culture in Trans->

Nagyrév style developed in only a small part of the Makó network, despite the fact that the effect prevailed in a much wider geographical area than where the Nagyrév culture eventually appeared. b) Emergence of modules due to network clustering. The goal of the second chapter of the dissertation is the exposition of this model. The theoretical model is based on the results of network theory, archaeological theoretical research on the spread of ceramic styles, investigations on the spread of innovations and ethnoarchaeological observations.

The human communities that inhabited the Carpathian Basin in the Early Bronze Age basically formed a continuous network. The spatially limited extent of the Nagyrév style cannot be explained by impenetrable geographical barriers and distances. The only reason that seems feasible is the structure of the human network covering the Carpathian Basin: the Nagyrév style can be assigned to a cluster which is isolated from its environment due to network reasons.

Basically, there are two ways for modules to come into existence in a network: by parcellation or by integration.⁵¹ One model for parcellation is inverse percolation.⁵² It would presume a decreasing population in the Early Bronze Age, which however contradicts archaeological data. It is also conceivable for a larger network to fall into subgraphs by removing large hubs from the system.⁵³ This model is also unsuitable for describing reality, because in the Early Bronze Age, larger centres had just appeared.

Clusters can also be created through integration in regular networks by rearranging some of the connections.⁵⁴ However, neither does this model take into consideration the increasing number of nodes in the network, of which there is clear evidence in Early Bronze Age archaeological records. Finally, clusters can emerge from regular networks through the integration of newly emerging network nodes. I recommend the following model to describe the process.

▷ danubia can be explained at least in part by migration, but cultural diffusion also played a role, especially in the case of the effects observed outside the core area of the culture, i.e., outside South-Western Transdanubia (SCHREIBER 1972, 153; ECSEDY 1979, 110; SCHREIBER-KALICZ 1984, 147, 152; ECSEDY 1995, 16–17; KALICZ-SCHREIBER 1997, 186; KALICZ-SCHREIBER – KALICZ 1999, 88; P. FISCHL et al. 1999, 99–101; V. SZABÓ 1999, 55–56). István Ecsedy, similarly to others, refers to the integrative role of metallurgy (ECSEDY 1995, 16). It should be noted that rather than integration, we observe disintegration in the ceramic style: a series of well-distinguishable regional styles appear in the second half of the early Bronze Age.

51 SOLÉ et al. 2003, 23.

52 BARABÁSI 2016, Sec. 8. 5–8, Fig. 8.5. According to SHENNAN – WILKINSON 2001, in the settlements of the Linear Pottery culture of the Merzbachtal, a change in ceramic decoration can be observed when the number of houses and sites decreases in phases VIII–IX. As an alternative to their explanation, we can think of a change of the network that connected the population of the area: the decrease in houses and sites indicates a decrease in nodes, which inevitably entails a transformation of the structure of the network. During the transformation, the communities living in each area became relatively isolated, the innovations of the pottery decoration appearing in each community could not spread evenly, and the accumulation of cultural differences began in each community, which led to different regional styles. The population decline also caused a rapid change of the ceramic style of the Zuni people (HARDIN – MILLS 2000, 157–158). The authors did not examine (apparently could not examine in the absence of a proper sociological survey) the effect of population change on the structure of the social network.

53 STROGATZ 2003, 257–258. There are countless archeological and historical examples of the disappearance of royal and urban centers operating as hubs. Examples that are best researched and close in time include early Bronze Age processes in Mesopotamia (COOPER 2006; WEISS 2015) and late Bronze Age ones in the eastern Mediterranean (MORRIS 2006; MARAN 2009; LANTZAS 2016), where urban centers and royal palaces ceased to exist or continued to function to a much lesser extent. The process is usually accompanied by a decline in population and the number of settlement sites (inverse percolation). It seems the network did not need these hubs.

54 WATTS – STROGATZ 1998.

In the Early Bronze Age I, cultural relations of the communities that created the Makó style were basically short-term, where typically each community had direct contact only with its neighbours. There was hardly no difference between the traditions of contiguous groups.⁵⁵ The synchronization of pottery styles is triggered by short-term contacts between neighbouring communities. Under such circumstances, new behaviour patterns that would lead to a new style cannot spread quickly,⁵⁶ and the network does not limit the spread of new behaviour patterns. The spread of new types of artifacts appearing in different places is therefore regulated by chance. Therefore, the accumulation of different cultural traits within certain closed areas is not possible. Differences in material culture become apparent only when distant areas are compared due to the accumulation of minor differences. From the point of view of network theory, this situation can be described by the concept of the irregular lattice: the network is homogeneous,⁵⁷ the degree of specific nodes (settlements and the people living there) is low, its distribution follows the bell curve.⁵⁸ The average distance of communities far apart in space is large.

The increasing quantity of nodes (population growth) and the preferential attachment of new nodes shape the structure of the network.⁵⁹ The end result of the process is that the irregular lattice of the Makó network⁶⁰ develops into heterogeneous,⁶¹ small-world networks, one of which is the Nagyrév network.⁶²

55 See e.g., the graves of Kajárpéc-Pokolfadomb, which the excavator classified as belonging to the Somogyvár culture (FIGLER 1994, 22–23), while others to the Makó culture (KALICZ-SCHREIBER – KALICZ 1999, 85; KULCSÁR 2009, 193).

56 Cascade-like changes cannot occur if the network is not well connected (WATTS 2002; WATTS 2004, 238–241).

57 BARRAT et al. 2008, 37, 51–52.

58 In this feature, the irregular lattice is similar to the Erdős–Rényi random networks. They differ in their other properties (clustering coefficient and average path length) (ERDŐS – RÉNYI 1960). The random networks, beyond a certain average degree, form a single, coherent system within which information can theoretically flow unrestricted (SOLÉ et al. 2003, 21–22).

59 BARRAT et al. 2008, 60–61, 75–76. Irad Malkin uses a similar approach to study the transformation of the Greek settlement network and its consequences in the age of colonization (MALKIN 2011, 22, 31–41). The transformation occurs in the same way, regardless of the type of network involved and exactly what constitutes the nodes. However, the detection of certain characteristics of the new network by statistical methods may be difficult because e.g., the scale-free distribution can only be clearly detected in the case of a sufficiently large, in fact infinitely large network (e.g., www). The networks observable in archaeological material do not meet this criterion. This is accompanied by the problems related to the nature of the archaeological record (the ratio of known/unknown sites, precise determination of the size of known sites, and sufficiently accurate dating). Together, these make it practically meaningless to try to detect scale-free distribution in the archaeological record by statistical methods, because it would not be possible to decide whether the form of the log-log function is influenced by the scale-free distribution or the limited size of the network (WATTS 2004, 111–112).

60 The essential difference between a random network and a regular lattice, as well as a scale-free network, is the degree distribution: in the case of the formers, it moves within narrow limits or is the same at all nodes, while in the latter it shows significant differences (BARABÁSI 2016, Sec. 4. 14). Phase transition between random, small-world and regular networks by adding long range links for one- and two-dimensional spatial networks: SEN et al. 2002. The small-world network represents a transition between the regular and the random network.

61 BARRAT et al. 2008, 37; WATTS 2004, 193–194.

62 WATTS – STROGATZ 1998. For network classification aspects: IKEHARA – CLAUSET 2017. For different classes of the small-world networks (which have in common that they have a higher clustering coefficient than random networks): AMARAL et al. 2000. The first model offering an explanation for the transformation of random networks was the Barabási–Albert-model (the increase in the number of nodes and the preferential attachment of the new ones create a scale-free network) (BARABÁSI – ALBERT 1999). In recent years, there has been a debate whether scale-free networks can be considered a general phenomenon and, in particular, how suitable they are for describing social networks (AMARAL et al. ▷

Small-world networks are characterized by high clustering and weak connections⁶³ connecting individual nodes (individual people, households, and settlements), which lead to a shortening of path lengths, thus bringing remote groups and regions closer together.⁶⁴ Regarding the latter, nodes with higher than average degrees (hubs) play an important role.⁶⁵

Due to the changes, modules (clusters) emerge from the homogeneous Makó network.⁶⁶ In these clusters the numbers of connections between the nodes are greater than the numbers that connect them to their environment. The emergence of a scale-free network⁶⁷ due to population growth is facilitated by the fact that one can only handle a limited number of face-to-face relationship.⁶⁸ Beyond a certain limit, relationships are already managed in the form of intergroup relationships through group leaders. The networks operating in several settlements are already in contact with each other's highly centralized individuals.

▷ 2000; SEN et al. 2002; IKEHARA – CLAUSET 2017; BROIDO – CLAUSET 2019). The debate also continued on Twitter: <https://twitter.com/manlius84/timelines/952248309720211458> (last access: 04.11.2021). Network theory is a dynamically evolving science, and obviously a number of theoretical models will emerge that more accurately describe the various networks that exist in the real world than the models available to us today, fragmenting what was previously considered a uniform set of scale-free networks. At present, the scale-free networks appear to be only special cases of the complex networks with high clustering coefficient that emerge from random networks under dynamic conditions. For other organizing principles (aging, active-inactive vertices, cost of adding links, limited capacity of a vertex) and correspondingly for other types of networks, but still with high clustering coefficient, see AMARAL et al. 2000; BARRAT et al. 2008, 68–72. Disintegration of connections between certain nodes, formation of new ones: BARRAT et al. 2008, 238–241. From an archaeological point of view, three things are important: 1) indisputably, there are networks in which the number of nodes is constantly increasing 2) new nodes are not randomly connected to existing ones 3) the previous two phenomena transform the network structure and create subnetworks/clusters. It is likely that sooner or later new mathematical models will emerge to describe networks with different degree distributions. But for archaeologists, it is irrelevant what function the new network can best describe. The important and, in my opinion, unshakable fact is that the change of the nodes and the increase of their number have an effect on the structure of the network. I note that none of the models addresses several important features of social network dynamics: 1) even in networks where the number of nodes increases, there are nodes that disappear from the system along with their connections, and this event is not necessarily preceded by the aging of the nodes 2) the connections or a part of them can be inherited 3) the number of nodes can decrease 4) the spatial position of the nodes has an influence on the development of the connections. For different types of network dynamics, including the death of a network, see BARABÁSI 2016, Fig. 9.31. For the relationship between the different models: BARABÁSI 2016, Fig. 6.15. For differences between the social networks and the mathematical models (e.g., for the social identity of the formers), see MALKIN 2011, 40.

63 For the weak ties and their role in the diffusion: GRANOVETTER 1973. The definition of the weak tie – strong tie can vary from situation to situation. In my dissertation, in line with Granovetter's original definition, ("Weak ties are more likely to link members of different small groups than are strong ones, which tend to be concentrated within particular groups."). I consider the ties between the members of small, face-to-face resident groups to be strong ties and the ties between these groups to be weak. I therefore call the relation connecting the communities living in separate settlements a weak tie.

64 "Far-away geographical regions can thus only be linked by edges connected to large degree vertices, which implies a more central role for these hubs." (BARTHÉLEMY 2011, 55). The absence of these hubs during the Early Bronze Age I indicates the lack of small-world networks. During the early Bronze Age IIA–B, the emergence of large Bell-Beaker communities was not surprising: they were part of a network that connected remote regions in Europe.

65 BARTHÉLEMY 2011, 52; WATTS 2004, 160.

66 CSERMELY 2006, 38.

67 For note on the problems of the concept, see note 62.

68 DUNBAR 1996, 55–77; DUNBAR 2014.

An essential element of Social Network Theory is that interactions exist between only some of the population living in a given area, and that social structure influences who can interact with whom, in what way, and with what consequences.⁶⁹ According to the interaction hypothesis,⁷⁰ interactions between different social units have an effect on the decoration of vessels produced by members of these groups. In other words, the spread of any style in a closed area indicates the existence of interactions between people living there in a given period.⁷¹ The interactions through which information spreads within a network are varied:⁷² learning relationships, kinship relationships (which are partly identical to the previous one), work group relationships, exchange, and trade. The inner balance of communication processes within a given social unit is necessary for a style to survive for a certain period, since spatial uniformity requires a high communication density.⁷³ The breaks in communication density at the boundaries of the clusters prevent the spreading of innovations.⁷⁴ The relative isolation results in the accumulation of differences within the isolating clusters.⁷⁵ Everett M. Rogers says the same thing: the spread of innovations takes place through diffusion networks,⁷⁶ and the social system – and the boundary it creates – determine the communication that plays a fundamental role in the spread of innovations.⁷⁷

The emerging Nagyrév cluster thus created a break in communication density mentioned by H. Martin Wobst. The result is a diffusion network that is to some extent isolated from its environment, and which corresponds to the range of the Nagyrév style.

The phenomena assumed by the model can be observed in the archaeological record. In the Early Bronze Age I, the settlement network of the Makó culture consisted mostly of smaller and larger

69 SIH et al. 2009.

70 GRAVES 1981, 8–14, 24–79, 282–285.

71 DUNNELL 1978, 199–200; GRAVES 1981, 299, 301. For the role of connectivity in synchronization, see Strogatz 2003, 48–49. Among wild chimpanzees as well, the spread of innovations is determined by the inventor’s social network (HOBARTER et al. 2014).

72 GRAVES 1981, 284–298.

73 WOBST 1977, 318–319; CENTOLA et al. 2007, 906; BLAKE 2013, 205. As we will see, what is needed to maintain a uniform style is not simply dense relationships but denser relationships than those that tie the community to its environment.

74 The theoretical model and archaeological observations are confirmed by ethnoarchaeological studies: changes in the social networks (i.e., a break in communication density) (MACÉACHERN 1998, 123–124; GOSSELAIN 2000), and social boundaries (STARK et al. 2000; LONDON 2008, 169–178) affect the spread of the behavioural patterns observed in pottery and certain elements of the ceramic style. The social boundaries are also network boundaries, regardless of the organizing principles of the network. For the role of small-world networks in synchronization: STROGATZ 2003, 229–259.

75 Isolation can be one of the most important triggers for speciation (FUTUYMA 2005, 379–402) because the reproductive isolation of populations belonging to the same species prevents gene flow, because of which the genetic mutations and the corresponding behavioural changes can accumulate. The ring species (HELBIG 2005; PEREIRA – WAKE 2015; IRWIN – WAKE 2016) are animal (IRWIN et al. 2001; ALCAIDE et al. 2014) or plant species (CACHO – BAUM 2012) whose populations form a continuous chain. The gene flow is theoretically ensured between each group, and some gene flow does occur between the closely sited related populations, however, the behavior of populations living at the two extreme points of the distribution area is so different that they are no longer mated with each other, i.e., they can be considered as separate species. These populations live in relative isolation from each other.

76 ROGERS 1983, 293–304.

77 ROGERS 1983, 24–26, 110. The terms he uses as “structure of a social system” and “communication structure” may fully correspond to the social structure in an archaic society, i.e., the network that connects the members of society to each other and through which communication is possible. Without communication proximity and interlocking personal networks (ROGERS 1983, 295), diffusion is unthinkable. For the relationship between the speed of the diffusion of an innovation and the density of the network (more network interaction, degree of interconnectedness), see: ROGERS 1983, 235–236.

short-lived villages, homesteads, and camp sites.⁷⁸ The finds from the hilltop settlements do not suggest that they had a special position or function within the settlement network.⁷⁹ The conclusion drawn from the burials is similar. There are no larger cemeteries, at one site mostly 3 to 10 graves were found.⁸⁰ Based on the finds there is no territorial group that can be separated from the others and which preserved its separateness from its environment for a longer period of time. The distinction of the Makó and Somogyvár cultures in a large area of Transdanubia causes numerous problems, due to the similarities of the material cultures and customs.⁸¹ The differences are only accumulated between communities with larger distances in between.⁸²

On the basis of the increasing number of sites, we may assume a huge population growth during the Early Bronze Age I–III. Not only the number of sites increased in the Mezőföld⁸³ but also their size, intensity, and the length of usage time. The growth did not occur because of immigrants whose ceramic style differed from the Makó one.⁸⁴ During the process we can only assume inner migration, a mobility bridging shorter distances. There are signs of population growth not only in the area of the Nagyrév style, but also elsewhere where the Makó culture is widespread.⁸⁵

Population growth rearranged the structure of the network, which is mainly due to the fact that settlements form a spatial network.⁸⁶ The sites of the Makó and Somogyvár cultures are sporadi-

78 KULCSÁR 2009, 66–67.

79 P. FISCHL – REMÉNYI 2013, 727. KULCSÁR – SZEVEÉNYI 2013, 75–76 raise the possibility that the fortified hilltop settlements of South Transdanubia may have been the central sites of a two-level settlement network.

80 KULCSÁR 2009, 71–87.

81 FIGLER 1994, 22–23; KALICZ-SCHREIBER – KALICZ 1999, 85; KULCSÁR 2009, 193. This is not the phenomenon of the cultural interference between clearly recognizable subclusters, which can be seen in the later periods of the Bronze Age (e.g., the spread of the Transdanubian Encrusted Pottery, the burials of the Kisapostag culture in the cemeteries of the Nagyrév culture), but the outcome of centuries-old development (KULCSÁR 2009, 176) leading to the disappearance of previously existing sub-clusters. Due to cultural similarities, Dieter Vollmann classifies the Makó culture and the earlier stage of the Somogyvár culture into a single complex (VOLLMANN 2005, 35). In essence, we can talk about a “ring culture”.

82 Within the distribution area of the Makó culture, several regional differences were observed during the examination of several artefact types (KULCSÁR 2009, 134, 138–139, 146–147, 149, 154, 171–172) and burial customs (KULCSÁR 2009, 75, 78, 86). However, these different cultural traits are rarely linked to each other and do not reveal specific territorial groups. Katalin Tóth managed to show the organization of a subcluster, which may be related to the spread of the Bell-Beaker package (TÓTH 2001, 21. kép 1–2, 22. kép 1; TÓTH 2002, 12. kép 1), but which did not solidify in the later periods of the Bronze Age. For the importance of the stability of communication networks, see: ROGERS 1983, 294.

83 Here the ratio of the Makó/Somogyvár sites to the Nagyrév ones is 18:44. The sites of the Makó culture are traditionally dated to the Early Bronze Age I–IIA, and the ones of the Nagyrév culture to the Early Bronze Age IIB–III. According to the calibrated ¹⁴C data, the calendar dates of the former are 2600–2300 BC, and 2300–2100 BC of the latter (PUSZTAINÉ FISCHL et al. 2015, 505). Thus, far fewer Makó sites have emerged in at least one and a half times as much time than Nagyrév ones. In addition, based on recent ¹⁴C data, we may take account of Makó sites in the Early Bronze Age III (ENDRÓDI – REMÉNYI 2016, 221–227).

84 Assuming that the groups using Somogyvár style ceramics migrated to the southern edge of the Mezőföld, the ratio of the sites is still 4:14 = 1:3.5 in favor of the autochthonous Makó population. There is a consensus that the Nagyrév style developed within its later distribution area, consequently we can expect at most the internal migration of the groups using the Nagyrév style during the subsequent events.

85 Kulcsár 2011, 185, footnote 28. About the process and its effects in general: P. FISCHL – REMÉNYI 2013; PUSZTAINÉ FISCHL et al. 2015, 513–517. The growth is well traceable in the volumes of the *Archaeological Topography of Hungary*.

86 BARTHÉLEMY 2011; BARTHÉLEMY 2014.

cally located at the edge of the Mezőföld. The centre of gravity of the Nagyrév sites, on the other hand, is along the Danube. The denser settlement structure reduces the average distances between the nodes, therefore the maintenance cost of the long-distance relationships.⁸⁷ Thus, the densifying and clustering of the settlement network facilitated the keeping in contact with the settlements located beyond the immediate neighbourhood, which created favourable conditions for the development of the small world of the Nagyrév cluster. Some settlements had grown significantly in size,⁸⁸ and those which had been established in the right place and had done their job well had been inhabited for centuries.⁸⁹ These hubs became the tells⁹⁰ that played an important role in organizing long-distance connections, accelerating the spread of information,⁹¹ while stabilizing the structure of the network through their spatial and temporal persistence. The distribution of these hubs/tells alongside the Danube suggests that there were long-distance connections between the settlements that bypassed smaller settlements. Within the chain of the Nagyrév sites forming a cluster along the Danube, smaller clusters can be observed on certain sections (Százhalombatta, Adony,

87 The significantly sparser settlement network of the Makó–Somogyvár culture did not encourage them to keep in touch with residents of settlements beyond their immediate neighbors: the larger the space that separates two people, the less likely they are to encounter each other (BARTHÉLEMY 2011, 4). The spatial situation influences the structure of social network even with the communication possibilities of the 21st century (BARTHÉLEMY 2011, 29).

88 VLADÁR 1966, 254–255; KALICZ 1981; KOÓS 1998; KOÓS 1999; SZATHMÁRI 1999; TÓTH 2003b, 79–80; TÓTH 2004, 82–83; HORVÁTH et al. 2005; KÓVÁRI – PATAY 2005; DANI et al. 2006, 9–11.

89 In addition to network theory, biology can also help interpret the complex process. Since there have been well-recognizable size differences between settlements since the Early Bronze Age IIA, the creation of larger settlements cannot be explained simply by general group loyalty and greater reproductive success (PAREJO ET AL. 2006). A settlement hierarchy can only be established if certain settlements attract the population of other ones as well. For animals, the behaviour of their conspecifics is important information that determines their own behaviour: they prefer to settle near more successful individuals. The phenomenon is called “habitat copying” and, naturally, leads to the creation of animal colonies: if several conspecifics settle in one place, this indicates that it is a habitat that provides favorable conditions, from which individuals can benefit if they settle there (DANCHIN et al. 2004, 488; PAREJO et al. 2005; REDMOND et al. 2009).

90 O’SHEA 1996, 359–361 also emphasized the importance of function (gateway communities or trade centers) in connection with the tells of the Maros (and tangentially the Nagyrév) culture. Although it is radically different from the Bronze Age tells, the function explains the birth of the Neolithic settlement and its tell in Tiszapolgár-Csőszhalom as well (the huge single-layer settlement has a special function for the Neolithic exchange network; the tell has a special function for the single-layer settlement) (RACZKY et al. 2007, RACZKY 2018). Both examples are hubs. Paul Duffy lists several possible reasons for the differences in settlement size (DUFFY 2015). The reason he defines as regional functional specialization provides an explanation for the creation of hubs. Agreeing with Duffy, this phenomenon does not automatically mean the emergence of a political hierarchy, nor is it the only reason for the formation of larger settlements. Duffy’s words (“a functionally specialized center can perform integrative functions in the absence of a regional political hierarchy”) can be used without any modification to describe a hub. Adequate economic performance is certainly a prerequisite of the settlements existing in the same place for several centuries. But if the higher level of agricultural production and lifestyle of southern origin assumed by the migration model alone were the reason for the formation of the tells, then all settlements of the Nagyrév culture would be a tell.

91 According to SOLÉ et al. 2003, 30, decreasing the distance between nodes – an important feature of small-world networks – can be achieved in two ways around the percolation point: a) increasing the average connectivity, and b) hub formation. The advantage of the latter is that there is no need to add additional links. For the importance of hubs with many connections: STROGATZ 2003, 251–268. According to Watts’ 2002 model, the nodes with the most connections can be the triggers of cascade-like events in a sparse random network. In a more wired network, the nodes with an average number of links may play the same role, while the vertices with a higher degree rather play a stabilizing role. For the concepts of the sparse network, community: BARABÁSI 2016, 2.5, 9.8.

Kulcs – Rácalmás, Dunaújváros – Kisapostag area).⁹² This suggests a fractal organization of society.⁹³ With the help of archaeological finds, Emma Blake has shown that in the later Etruscan and Latin areas, the regional social networks that led to the formation of ethnic groups in the first millennium B.C. began to organize as early as the Bronze Age. She uses the term “interactionist theory of identity formation” to describe the process. Within the unified material culture, the artefacts from a foreign cultural environment provided the opportunity to detect the forming networks.⁹⁴

Objects from a foreign cultural context may also provide an opportunity to map the relationship systems within the Makó culture. In the middle of the Carpathian Basin, the characteristic objects of the Somogyvár and Bell-Beaker cultures occur in the area of the Makó culture in the Early Bronze Age IIA.⁹⁵ Their spread suggests that the formation of the later Nagyrév network started in parallel with population growth. Some models of network research assume that certain variable properties of nodes influence the relationships between them, so the state of the nodes and the evolution of the network are part of a certain coevolutionary process.⁹⁶ In contrast, it seems that the process we examined can be divided into two chronological horizons: 1) the formation of the Nagyrév network, 2) the formation of the Nagyrév style within the network. Thus, in this case, the formation of the network was a crucial earlier process, followed by the development of the Nagyrév style,⁹⁷ which in retrospect may have confirmed the separation of the network from its environment, but did not play a role in the initial stage of its formation. This suggests that population growth gave a decisive impetus to the formation of the network.⁹⁸

92 The conditions under which topological and spatial clusters are formed in a growing network: KAISER – HILGETAG 2004. The cliques formed around each hub further increase the clustering coefficient and reduce the connection costs (BARTHÉLEMY 2011, 40). The population growth and the evolution of settlement clusters did not stop at the end of the Early Bronze Age. Microregional research in the Benta Valley shows that by the Late Bronze Age, four clusters had formed on both banks of the river (EARLE – KOLB 2010, 69–78, Fig. 3.3–5). As for the issue of chiefdoms, I agree with KIENLIN (2012) and DUFFY (2015): having a structure does not automatically mean the existence of a hierarchical organization.

93 For the fractal-like organization of human societies, see CSERMELY 2006, 38, 43–44. The emergence of the idea in the Bronze Age archeology without the use of the mathematical term: P. FISCHL – REMÉNYI 2013, 729.

94 BLAKE 2013.

95 According to PUSZTAINÉ FISCHL et al. 2015, 506, the network of proto-Nagyrév settlements along the Danube facilitated the spread of the Bell-Beaker pottery to Ostrikovac. Their approach differs from mine in several aspects. On the one hand, I do not see the existence of the proto-Nagyrév culture and the spread of the proto-Nagyrév groups as proven. On the other hand, the elements of the Bell-Beaker package spread not only in the supposed settlement zone of proto-Nagyrév groups along the Danube, but also in a significantly larger area.

96 CENTOLA et al. 2007; BARRAT et al. 2008, 238–241. Neither model takes into account the growth of the network and that this expansion has an impact on the structure of the network.

97 Duncan J. Watts distinguishes between the dynamics *of* the network and the dynamics *on* the network. The former refers to the formation of the structure of the network, the latter to the processes taking place on the network (WATTS 2004, 54–55). We also see the justification for the distinction between the two dynamics in the process of the formation of the Nagyrév network and the Nagyrév style.

98 According to HOLME – NEWMAN 2006, there are three models for explaining the convergence of opinions in social systems: 1) in a social network of personal acquaintances, individuals form their own opinions based on the opinions of neighbors, 2) the network is formed between people of similar beliefs, 3) the two processes simultaneously shape the beliefs of individuals and the structure of the network. They think that the third model describes the real world more accurately. The final result is a random graph that goes into a consensual state. (See footnote 96) The model is not unknown to sociologists (COLEMAN 1965). The present archaeological example also shows that different models are not mutually exclusive and that one or the other prevails under different circumstances. For similar models, see also ZANETTE – GIL 2006; EHRHARDT et al. 2006.

Examination of the ceramic material also suggests that the change of the Makó–Nagyrev styles was not caused by migration. The material analyses completed so far show that no significant technological change can be expected during the Early and Middle Bronze Age, as it only happened in the vessels of the Tumulus culture.⁹⁹ The most typical vessels of the Nagyrev style (pots, bowls, jars, cups, jugs, mugs, hanging vessels etc.) can be derived from the Makó style.

Based on the artefacts found in waste pits in the settlement in Iváncsa, the slow and continuous change of the pottery style is quite noticeable. In some of the pits processed so far, there are only Makó style vessels, while in other pits, Makó and Nagyrev style artefacts are mixed in different proportions. Artefacts of a different cultural context (Bell-Beaker and Somogyvár style) were only sporadically found.¹⁰⁰ These could not be the cause of the style change; therefore diffusion in the archaeological sense did not play a part in the shift of the pottery style. The four ¹⁴C tests done so far dated the pits with the Makó style artefacts to 3849±28 and 3834±26 BP and the pits with the mixture of Makó and Nagyrev styles to 3677±27 and 3655±27 BP.¹⁰¹

During physical and biological processes, synchronization occurs abruptly. This rapid change is called phase transition.¹⁰² A similar tipping point,¹⁰³ according to sociological research, occurs when community members change their behaviour at a certain threshold.¹⁰⁴ The consequence could be an information cascade.¹⁰⁵ Based on ethnoarchaeological research¹⁰⁶ and archaeological data,¹⁰⁷ the change could happen rapidly during one or two generations.¹⁰⁸ Not just in Iváncsa, but also in other sites, the change of pottery styles is probably parallel to their continuous use.¹⁰⁹

99 KREITER 2007, 154–155, 160, 162.

100 The stylistic distribution of the artefacts so far: 875 uncharacteristic pieces, 318 Makó pieces, 163 Nagyrev pieces, 3 Bell-Beaker pieces, 2 Somogyvár pieces, and 1 Kisapostag piece. This means we are dealing with a community that was in contact primarily with groups using the same ceramic style. There is no indication that any culturally alien group played an active role in the change.

101 Animal bones, DeA–5599, 5601–5603 BP.

102 STROGATZ 2003, 54; WATTS 2004, 46.

103 The term used in physics was first used by GRODZINS 1957 to describe a sociological process. According to the 2011 model by XIE et al., a tipping point can occur under certain conditions even if only 10% of the total population is committed to promoting their own opinion. According to ROGERS 1983, 245, if 10 to 20–25% of a society adopt an innovation, it is probably impossible to stop its spread.

104 GRANOVETTER 1978; VALENTE 1996.

105 WATTS 2002; MALKIN 2011, 38.

106 GRAVES 1981, 289; STARK 1991, 209.

107 MONTGOMERY – REID 1990.

108 The gradual, mosaic spread of ceramic styles is consistent with research on the diffusion of innovations. The process, which requires a longer time, can now be detected in the archaeological material with the help of ¹⁴C data (HAKENBECK 2008, 14; HORVÁTH 2012; KULCSÁR 2013; KULCSÁR – SZEVEÉNYI 2013; PUSZTAINÉ FISCHL et al. 2015, 505; ENDRŐDI – REMÉNYI 2016, 26–28; HORVÁTH 2016, 71–80, 95–97). The typo-chronological method was not suitable for the same purpose. Thus, a rapid change at the same rate throughout the affected region could be inferred from the findings. This also supported the likelihood of a migration model.

109 Such sites may be, for example, Budapest-Kőérberek, Tóváros-Lakópark (HORVÁTH et al. 2005; KÓVÁRI – PATAY 2005, 101; KULCSÁR 2009, 184; KULCSÁR 2011, 188), Cegléd-4/12. lelőhely, Intézeti- és Bába-Molnár-dűlő (RAJNA 2006, 219), Hódmezővásárhely-Barci-rét (KULCSÁR 1997; KULCSÁR 2009, 192), Igar-Vámpusztá-Galástya (BÁNDI 1982, 171, Abb. 6–7), Maroslele-M43-3. lelőhely (PALUCH 2010, 278), Mezőkomárom (KALICZ-SCHREIBER 1975, 289, Abb. 2; BÁNDI 1982, 171, Abb. 8–9; SCHREIBER-KALICZ 1984, 143, 147, 150–151), Nagykőrös-Alsófüzes marhajárás (BÓNA 1963, 13, Tab. VI, 5–16), Sióagárd-Gencs (SZABÓ 1992, XLVII, 8–9, L, 1–3, 10, LI, 4–5, LII, 7, LIV, 14, 16, 18, LXX, 1, 4–5, LXXI, 1), Tát-Sportpálya (HORVÁTH et al. 1979, Site 21/3; Tab. 10, 6–12), Tolna-Mözs M9-es autópálya, 10/B. lelőhely (ÓDOR 2007, 19; KISS – KULCSÁR 2001, 8. tábla 2; KULCSÁR 2009, 399), Tolna-Mözs M9-es autópálya, 32. lelőhely (KULCSÁR 2009, 399; ÓDOR 2007, 19).

In the next part of the chapter, I analyse the mechanisms that could result in the emergence and spread of the new style elements. According to the former archaeological concept, cultures are basically static phenomena which only change due to effects from the outside¹¹⁰ (migration,¹¹¹ diffusion,¹¹² and environmental change).¹¹³ The main reason for looking for external stimuli is that we tend to interpret culture as a static phenomenon, which can only change if it receives external impulses.¹¹⁴ Another reason for the perception of static, balanced cultures may be that the rate of cultural change is not uniform but varies according to the punctuated equilibrium,¹¹⁵ a phenomenon first observed in biology.¹¹⁶ The processual approach takes into account internal factors,¹¹⁷ such as the role of population growth, but in its view, population pressure mainly results in adaptive changes,¹¹⁸ and the emergence of new style elements within a closed area is not the case.¹¹⁹ Cognitive explanations of postprocessual archaeology are also questionable.¹²⁰

According to the general theory of evolution, every system is an evolutionary system through which energy flows and parts of which are replicating at an accuracy rate between 0 and 1.¹²¹ As culture is an evolutionary system,¹²² external effects are not needed to change it. The formation of

- 110 Anthropology was born in an age when the relationships between different cultures became increasingly diverse, consequently the traditional societies studied by anthropologists underwent a rapid transformation. On the other hand, the object of anthropological research is usually the foreign, autochthonous culture, which to the outside observer always seems to be ancient, balanced, and stationary. In Europe, this has been compounded by the search for “national traditions” and the intention to protect them: what is ancient is valuable, and the threatening change that destroys tradition comes from the outside world.
- 111 SHENNAN 2000, 811; HAKENBECK 2008, 20; GRAMSCH 2009, 10–11; GRAMSCH 2015, 342–343; RENFREW – BAHN 2016, 477–478.
- 112 ROGERS 1983, 41–50; SHENNAN 2000, 811; GRAMSCH 2009, 11; GRAMSCH 2015, 343–344; RENFREW – BAHN 2016, 478–479; HEITZ – STAPFER 2017, 12–16. Explanations using other names (changes in cultural relationships, acculturation, and colonization) (GRAMSCH 2009, 11–13; GRAMSCH 2015, 344) can basically be considered as variants of these two reasons.
- 113 SHENNAN 2000, 811; KNAPPETT 2013b, 5; GRAMSCH 2015, 344–345.
- 114 ROGERS 1983, 49; REBAY-SALISBURY 2011, 56; HEITZ – STAPFER 2017, 12–16.
- 115 ELDREDGE – GOUL 1972.
- 116 According to Connie J. G. Gersick, the phenomenon can also be observed in different areas of human culture (GERSICK 1991). Harry Fokkens describes a similar phenomenon when he examines the pace of cultural change in the wake of ROGERS 1983: when the proportion of those who adopt an innovation reaches a critical mass, the hitherto slow change suddenly accelerates (FOKKENS 2008). ROSENBERG 1994 uses the terms “punctuated evolution / change”. He also analyzes the causes of stasis between rapid changes (Bauplan). The process cannot be ruled out for the change of ceramic styles either (BENTLEY – MASCHNER 2001). The phenomenon (a cascade-like change after a long state of equilibrium) has an explanation of network theory (WATTS 2004, 241–244). And it might seem obvious to explain cascade-like change by migration.
- 117 RENFREW – BAHN 2016, 481–485.
- 118 SHENNAN 2000, 813; GRAMSCH 2009, 13.
- 119 Changes in the style of dishes (changes in the size of vessels and new forms of artefacts) can also be caused by internal and social changes (changes in the number of people eating together and new eating habits) (SHENNAN 2000, 811). However, this theory does not explain the mechanism of the emergence and spread of new style elements.
- 120 SHENNAN 2000, 812.
- 121 CSÁNYI 1989, 160–161, 184–185.
- 122 “Change appears as the inevitable product of time and [does] not require explanation.” (SOMMER 2001, 248). For evolutionary cultur(al) theory, see: BOYD – RICHERSON 1985; DURHAM 1992; ROSENBERG 1994; SHENNAN 2005a; SHENNAN 2005b; EERKENS – LIPO 2007; SHENNAN 2009; RENFREW – BAHN 2016, 487–489. The main difficulty of the theory is that the mechanisms that control the selection of individual cultural traits have not yet been clearly identified (RIEDE et al. 2012; BRADIE – BOUZAT 2016). (With different formulations HERBICH – DIETLER 2008, 224 have a similar view). However, this does not alter the fact

the new style elements can be caused by several mechanisms: learning errors (replication errors),¹²³ individual motivation to innovate (mutation and agency theory).¹²⁴ According to ethnoarchaeological observations, the change in the size of the entire population or cohorts dealing with pottery making¹²⁵ may cause a rapid change in the pottery style.¹²⁶ Consequently, population growth has several, partly independent, effects which all point in the same direction: creating new network structures on the macro level, transforming the social relationships within each community on the micro level, therefore changing the hierarchy,¹²⁷ and finally increasing the number of potters and creating population pressure.

In the debate on the birth of the Nagyrév style, the question of the geographical area where the characteristic stylistic elements first appeared played an important role.¹²⁸ Searching for a core

- ▷ that cultural evolution exists – it took a long time in biology as well, after recognizing the existence ▷ of evolution for Darwin to find the most basic selection mechanisms (natural and sexual). Cultures are usually compared to biological species in evolutionary metaphors. Perhaps it would be more appropriate to equate interconnected cultures with populations of a single species within which individual cultural traits (genes) can flow freely under appropriate conditions. Fully isolated cultures (e.g., American cultures before 1492) that, after the establishment of the relationship, become involved in the flow of cultural traits (genes) can be considered subspecies.
- 123 According to the theory of social learning (SHENNAN 2005b) – and observations – copying behaviour patterns is never perfect (ROGERS 1983, 304). The biological equivalent of this phenomenon is gradual change (FUTUYMA 2005, 506–508): in the course of learning and copying, a “replication error” occurs, using the words of the theory of biological evolution, which can be fixed under favorable conditions. For the mental background of the phenomenon, the computer modeling of the process and the comparison of the results with changes observed in well-dated groups of objects, see: EERKENS – LIPO 2005. According to ethnoarchaeological research, there may be other complex reasons for the changes observed in pottery (aesthetic factors, the personality of the innovator, political and cultural milieu) (STARK 1991, 211).
- 124 GIDDENS 1979, 49–95; EMIRBAYER – MISCHE 1998; DOBRES – ROBB 2000; SILLIMAN 2001; HODDER – HUTSON 2003; BARRETT 2005; PATTERSON 2005; GRAMSCH 2009; BOURDIEU 2013, 159–171; ROBB 2005; RENFREW – BAHN 2016, 490–491; HEITZ – STAPFER 2017, 17–20. For the agency of objects: HODDER 2012. The biological background of the phenomenon is that exaggerated conformity would suppress the possibility of innovation, so maintaining some individuality has evolutionary benefits (HERBERT-READ et al. 2013, 1–2). Thus, biological mechanisms ensure that there are always nonconformists in a human society who develop new behaviour patterns (e.g., a new pottery style). The new behaviour patterns behind these innovations correspond to the mutations in the evolutionary theory (FUTUYMA 2005, 165–170). What is a conscious, intentional act at the level of the individual is a random event at the level of the system: it is not possible to predict who, where, when, why and how will change its behaviour, and what the consequences will be (WATTS 2004, 72). The motivation of the individual that results in innovation may be varied (increasing prestige, building relationships, attracting customers, etc.). HERBICH – DIETLER 2008, 234 report that the hostile relationship between two potters may also lead to the development of a new way of decoration.
- 125 For the relationship between population size change and cultural transmission, see: SHENNAN 2000, 815.
- 126 GRAVES 1981, XVIII, 218–242, 287–290, 301, 307; KRAMER 1985, 89.
- 127 Innovation may also be stimulated by changes in the social hierarchy (HEGMON 2000, 133). From the Early Bronze Age II onwards, the social change is well observable in the grave goods, which is also discernible in the Bell-Beaker and Nagyrév communities (DANI et al. 2016). According to Connie J. G. Gersick, one of the main components of the punctuated equilibrium paradigm is deep structure. “Systems with deep structure share two characteristics: (1) they have differentiated parts and (2) the units that comprise them ‘work’: they exchange resources with the environment in ways that maintain – and are controlled by – this differentiation.” (GERSICK 1991, 13–14). In our case, the deep structure is the potters (along with their knowledge and their working-learning network), and their environment is the people who use their products and their expectations. The increasing number of potters, the growth of the community and the transformation of the social hierarchy, fundamentally affect this deep structure and its environment. “According to punctuational paradigms when basic premises change, all the premises contingent on them are affected.” (GERSICK 1991, 21).
- 128 CSÁNYI 1983; SZABÓ 1992; SZABÓ 1994; BÓNA 1992a, 18; KALICZ-SCHREIBER – KALICZ 1999, 87; SZABÓ ▷

area is inherent in the cultural-historical approach: according to the idea, the style is started by an ancient proto-community and there is a “homeland” from where descendants emigrated and spread the new style and the entire culture. The network model outlined above presents a different approach: the formation of the Nagyrév style is the end result of a self-organised process,¹²⁹ a transformation without a centre.¹³⁰ It is highly probable that the different types of vessels representing the Nagyrév style were not designed by the same potter in the same settlement but were spread by the same network.¹³¹ The organization of the network was not started in a single node; instead, some of its elements (settlements and the people living in them) were given, and primarily it was the relationships connecting them that changed.¹³² It can be assumed that the large settlements of the Makó culture played a major role in the change of style, which is supported by general considerations of the network theory rather than by archaeological arguments.¹³³

Synchronization is a common phenomenon in networks,¹³⁴ starting from the lifeless environment through the biosphere¹³⁵ up until the human behavioural complex.¹³⁶ In the process, individual decisions pointing in the same direction appear as collective behaviour driven by homophily.¹³⁷ The homogenous pottery style is nothing more than the synchronization of human behavioural patterns necessary for its production in space and time, which is manifested in a material form (embodied knowledge).¹³⁸ The diffusion network¹³⁹ is not necessarily the same as the network of the community in which the given innovation is spreading.¹⁴⁰ For the nodes to change their status, namely to accept

- ▷ 1999; V. SZABÓ 1999, 55–56; KULCSÁR 2009, 30; REMÉNYI 2009, 233–235. For the present, none of the assumptions are supported by scientific age determination.
- 129 A substantial element of synchronization is self-organization (COUZIN – KRAUSE 2003; STROGATZ 2003, 34; BODE ET AL. 2011, 301). The examination of style change as a self-organizing process: BENTLEY – MASCHNER 2001.
- 130 For decentralized diffusion systems in which innovations come from different sources: ROGERS 1983, 333–338. The idea of transformation without a center was formulated by Philip Karsgaard in his analysis of the Halaf–Ubaid transformation (KARSGAARD 2010). The problem of the Nagyrév style is somewhat similar to the Mesopotamian example: the northern Mesopotamian appearance of the Ubaid has been explained by a southern migration and diffusion, which conveyed the cultural traits developed in southern Mesopotamia to the less developed areas (CAMPBELL – FLETCHER 2010).
- 131 “What if small events percolate through obscure places by happenstance and random encounters, triggering a multitude of individual decisions, each made in the absence of any grand plan, yet aggregating somehow into a momentous event unanticipated by anyone, including the actors themselves?... In a multitude of systems from economics to biology, events are driven not by any preexisting center but by the interactions of equals.” (WATTS 2004, 52–53). The same mechanism works in the peer policy interaction model (RENFREW – CHERRY 1986; CHERRY 2005).
- 132 “Rather than having to pinpoint – and then argue away – specific “southern” and “northern” features of culture in the fifth millennium, we can see the creation of new culture(s) *in the framework of intensive networking* without having to concern ourselves with asymmetrical influences and the problems they create with cores and peripheries. Rather than becoming enmeshed in identifying local versus southern elements in the Ubaid material pottery repertoire, *we should look at the Ubaid transformation as a whole* – not as a northern phenomenon influenced by the south, but as a larger-scale transformation that could only have happened if the regions concerned were all in contact with each other.” (KARSGAARD 2010, 60, italics added).
- 133 For the role of the centers in innovation, see: VAN DER LEEUW 2013, 340–341.
- 134 STROGATZ 2003, 108–109; BARRAT et al. 2008, 136–159; CSERMELY 2006, 82.
- 135 STROGATZ 2003.
- 136 BARRAT et al. 2008, 216–241. Synchronization ability is a component of the human behavioral complex and a determinant of cultural behavioural patterns (CSÁNYI 1999, 209–222; CSÁNYI 2015, 159–180). In other words, conformity is an essential feature of human culture (HENRICH – BOYD 1998).
- 137 ROGERS 1983, 18–19, 82, 274–277; MCPHERSON et al. 2001; CENTOLA et al. 2007.
- 138 SOFAER – BUDDEN 2012.
- 139 ROGERS 1983, 293–304.
- 140 From a population perspective, SHENNAN (2000, 815) draws attention to the fact that the groups ▷

a new cultural trait, it is not necessary for the receivers to be in absolute majority within the entire network. For the change it is sufficient that the immediate vulnerable network neighbours choose to change,¹⁴¹ therefore, the evolved, relative majority could percolate through the entire network.¹⁴² Etnoarchaeological observations demonstrate that this may happen regardless of the potters' gender and the circumstances of mastering pottery skills. However, the greater the heterogeneity of the members of a network in terms of their relationship to innovation, the greater the chance of a cascade. In larger settlements, due to their larger population, this greater heterogeneity can be assumed from the outset, as opposed to smaller, more closed communities. The leading role of larger centres in the spread of the new style is also indicated by the fact that keystone individuals who have a greater influence on the behaviour of their community than others play a decisive role in any transformation.¹⁴³

At the end of the chapter, I review the relative chronological system of the Early Bronze Age I–III comparing it with the latest results of the ¹⁴C tests. It seems that, based on these data, it is possible to follow the process in which the Nagyrév network absorbed the cluster of the Bell-Beaker network in the region of Budapest.¹⁴⁴ The Bell-Beaker communities around the Csepel Island gradually joined the Nagyrév network in a south–north and east–west direction. The process started in the southernmost groups¹⁴⁵ of the Bell-Beaker network in the Csepel Island, and for the longest time they kept their separation and relative isolation from the Nagyrév network in the vicinity of the

▷ responsible for the transmission of certain cultural traits are significantly smaller than the entire society. For a summary of the data about Bronze Age specialists, see: P. FISCHL et al. 2013.

141 GRANOVETTER 1978, 1431–1433.

142 WATTS 2002; WATTS 2004, 204–241.

143 Such individuals are referred to by a variety of names (dominant individuals, alpha individuals, opinion leaders, influencers, etc.). For the role of opinion leaders: ROGERS 1983, 27–28, 271–311; MODLMEIER et al. 2014; PRUITT – PINTER-WOLLMAN 2015. For the significance of the pattern of social interactions, see: PINTER-WOLLMAN et al. 2016. For the role of social structure in individual decision making, see: GRANOVETTER 1978, 1428–1430. Higher centralization accelerates the spread of innovation (VALENTE 2005, 104, Fig. 6.1.3).

144 In the examination of the evolution of the Nagyrév style, we studied the formation of a new subnetwork within the Makó network and how the new vessel style appeared within this cluster. A different process is how this cluster integrates into itself another network. The two processes differ not only in their nature but probably also in their duration.

145 The 1σ age of the animal bones found in features 62 and 166 containing only Makó-style ceramics in Ivánca was calibrated to 2430–2210 BC and 2340–2210 BC, respectively. The similar data of feature 43 and 55 objects, which also contain finds of Nagyrév culture, are from 2130–2020 BC, 2120–2090, and 2040–1970 BC, respectively. Based on calibrated ¹⁴C data, Róbert Patay dates the use of the Bell-Beaker cemetery in Szigetszentmiklós between 2500–2200 BC; the graves of the Nagyrév culture found next to the cemetery can be dated to after this period (PATAY 2009, 224, PATAY 2013). Thus, the Nagyrév style may have appeared roughly in the same period in Ivánca and Szigetszentmiklós, after 2200 BC. In Budapest-Albertvalva, the earliest calibrated 1σ ¹⁴C data came from features 245 (ENDRÓDI – REMÉNYI 2016, Pl. 17, 3) and 369 (ENDRÓDI – REMÉNYI 2016, Pl. 58, 1–3; 59, 4–6) containing elements of the Bell-Beaker package (2470–2350 BC, ENDRÓDI – REMÉNYI 2016, 221–222). Thus, the settlement undoubtedly belonged to the bell-shaped network around 2400–2300 BC. Only late Makó vessel types were found in the features 2020/354 (ENDRÓDI – REMÉNYI 2016, Pl. 102), 2002/65 (ENDRÓDI – REMÉNYI 2016, Pl. 101), and 286 (ENDRÓDI – REMÉNYI 2016, Pl. 52) dated between 2300–2100/2040 BC, and the elements of the Bell-Beaker package were missing. The explanation of the phenomenon is either a coincidence or the fact that the settlement's relations with the northern Bell-Beaker groups were severed by the early Bronze Age IIB, thus, the object types that indicated the relatedness to the same network lose their symbolic significance and ceased to be used. After 2000 BC, the population of the area was integrated into the Nagyrév network.

Szentendre Island.¹⁴⁶ The phenomenon is consistent with the observation that the closer someone is to the edge of a group, the easier it is to leave it.¹⁴⁷ The process may have been facilitated by the fact that Bell-Beaker groups belonged to two overlapping networks:¹⁴⁸ the Central European Bell-Beaker network and the local Makó network, which the Nagyrév network itself developed from.

The use of the human skull for cultural purposes in the Nagyrév culture

The topic of the third chapter is the modified human skull that was found in feature no. 52 next to the ceramics of the Nagyrév style. The artefact is still a unique piece in the Early Bronze Age. At the beginning of the chapter, I review the ideas related to the souls of the dead. There is a general conception that people have soul or souls¹⁴⁹ and one out of them preserves its entity even after death, and after leaving the body it could have a rather diverse fate.¹⁵⁰ The souls of the dead must have influenced the fate of the living in every way imaginable¹⁵¹ so the latter tried to get in the dead's grace with various methods.¹⁵² Through a properly chosen body part of the deceased the living could get in touch with the soul and benefit from its activity. This method was applicable to a deceased belonging to the group or to outsiders. Certain body parts were particularly appropriate to play a role in the commu-

146 Some data suggest that Makó-style vessels were used around Budapest even during the Early Bronze Age III (PUSZTAINÉ FISCHL et al. 2015, 505). Based on the lack of sites of Nagyrév culture, the high number of sites of the Makó and the Bell-Beaker cultures, and the long, 5–600 years of use of the Csajerszke cemetery, András Czene concluded that the sites of the Bell-Beaker and the Makó cultures remained in use until the Middle Bronze Age in some places (CZENE 2017, 195–197). According to Anna Endrődi, the sites of the Bell-Beaker culture around Budapest can be divided into two chronological horizons, which are separated from each other territorially as well: into an earlier southern (Csepel Island) and a later northern (Northern Pest) group (ENDRŐDI 2013a; ENDRŐDI 2013b; ENDRŐDI 2014). The wrist-guards of Tiszainoka and Tószeg-Laposhalom from the context of the Nagyrév culture can also be interpreted in such a way that the use of the elements of the Bell-Beaker package can still be expected in the Early Bronze Age III. The Nagyrév style jug in Pomáz (DINNYÉS et al. 1986, Site 23/7; 10. Tab. 14) and the finds of Tiszainoka and Tószeg may be the evidence of the connections between the Nagyrév and the latest Bell-Beaker groups.

147 MCPHERSON et al. 2001, 436.

148 For the concept of overlapping networks, communities (in our case, the overlapping networks of the Bell-Beaker culture having Western European connections and the Makó culture with local roots): CSERMELY 2006, 39; BARABÁSI 2016, 9.5. Irad Malkin suggests the term “middle ground” to describe regional, microregional networks that are jointly created by the indigenous population of a given area and a newly arrived colonist community and have significant long-distance connections. He considers the terms “creolization”, “hybridity” and “contact zone” as alternative but less satisfactory terms (MALKIN 2011, 45–47).

149 ONIANS 1951; HERTZ 1960, 34–35; GILLESPIE 2002, 68, 70–71.

150 HARLEY 1950, 8; ONIANS 1951; HERTZ 1960, 35–37, 61; GOODY 1962, 361–378; HARNER 1972, 135–152; MCKINLEY (1976) 2015, 454–458; HUNTINGTON – METCALF 1979, 69–81; EVANS 1985, 127–128; TRIGGER 1987, 51, 87, 506; GILLESPIE 2002, 68, 70–72; HAYDEN 2003, 95–97, 117–121; CAUQUELIN 2004, 51; LOVISEK 2007, 54; OWSLEY et al. 2007, 162; ARMIT 2006, 11; ADAMS – KING 2010, 4; SCHERER 2015, 52; SCHERER 2018, 62; CHÁVEZ BALDERAS 2018, 142.

151 WILDSCHUT 1960, 77, 80–84; VAN BAAREN 1968, 24, 32; BLOCH – PARRY 1982; DEMAREE 1983; FINKEL 1983–1984; GOODALE 1985; VIJFHUIZEN 1997; OGDEN 2001; DUNAND – ZIVIE-COCHE 2004, 164–173; FARONE 2005; CHACON – DYE 2007a, 16–18; CHACON – DYE 2007b, 620, 623; HOOPES 2007, 446–447; MENDOZA 2007a, 587; ARNOLD – HASTORF 2008, 113–114; EDWARDS et al. 2009; ABUSCH – SCHWEMER 2011; BONNEY – CLEGG 2011, 54–56; BONOGOFKY – GRAHAM 2011, 82, 88–89; O'DONNABHAIN 2011; SCHULTING 2013, 36; BREMMER 2015; KAPCÁR 2015; ABUSCH – SCHWEMER 2016; KING 2020, 63, 89–127.

152 The “do ut des,” i.e., the principle of reciprocity, formulated by the Romans in relation to the gods and the dead souls (KING 2020, 45–46, 78–81) can be detected among other peoples as well (UNGER – UNGER 1997, 18–22; VIJFHUIZEN 1997, 40; DUREAU 2000, 79; SCHAAFSMA 2007, 115; BARRAZA LESCANO 2009, 105; BOMMAS 2011).

nication between the material and spiritual worlds, such as the head, the skull or any of their parts.¹⁵³ Culturally modified skulls, more precisely the use of the viscerocranium with some parts of the neurocranium, are known from archaeological finds from various cultures of the Andean region,¹⁵⁴ Mayan territories,¹⁵⁵ Aztecs,¹⁵⁶ and the United States.¹⁵⁷ Their use among the Maya¹⁵⁸ and the people of the Huarochiri region¹⁵⁹ is described by ethnohistorical sources. In North Africa, a specimen was found in a Mesolithic grave.¹⁶⁰ In Europe, similar finds from settlements, caves and an artificial basin occur from the Neolithic¹⁶¹ through the Bronze Age¹⁶² until the Late Iron Age.¹⁶³ Architectural elements were also found in the South of France that could be used to exhibit such kinds of skull fragments.¹⁶⁴ They may have been made from the skulls of group members and strangers. Although the literature usually refers to them as “skull masks, Schädelfmaske, Gesichtsmaske, masque facial, and masques faciaux”, their exact function and circumstances of use are not always clear.¹⁶⁵

The depiction of heads occurs only sporadically in the fundamentally aniconic art of the Nagyrév culture.¹⁶⁶ We have examples of the use of whole crania from the Buda Castle. One of them was

- 153 RIVERS 1914, 258–291, 404–423, 511–512; HERTZ 1960, 56–57; WILDSCHUT 1960, 76–89, Fig. 37–39; VAN BAAREN 1968, 69–70, Pl. 1–3; RUDENKO 1970, 104, 221; NEVIZÁNSKY 1985; GORING-MORRIS 2000; ▷ BUISSON – GAMBIER 1991; VERANO et al. 1999; MURPHY et al. 2002; BONOGOFKY 2004; MANIA – MANIA 2004; BONOGOFKY 2005; ARMIT 2006; ČURNÝ et al. 2006; BERRYMAN 2007, 380; CHACON – DYE 2007a, 7–21; JACOBI 2007, 316–318, 321–324; LOVISEK 2007, 55–56; MENDOZA 2007a; MENDOZA 2007b, 413, 428; MENSFORTH 2007; OGBURN 2007, 520; PETERSEN – CROCK 2007, 567; SCHAAFSMA 2007; TUNG 2007; WAHL 2007; WILLIAMSON 2007; ZEEB-LANZ et al. 2007; AOUDIA-CHOUAKRI – BOCQUENTIN 2009; BONDÁR 2009; BOULESTIN et al. 2009; ZALAI-GAÁL 2009; Вадецкая 2009; GUICHARD – TEEGEN 2010; HÄRTL 2010; KAISER 2010; TEEGEN 2010; BELLO et al. 2011; VON BERG 2011; BONOGOFKY 2011; BONOGOFKY – GRAHAM 2011; BRAUN 2011; MÜLLER 2011; ORSCHIEDT 2011; SCHLOTHAUER 2011; WAHL 2011; ZEEB-LANZ 2011; ARMIT 2012; BOULESTIN 2012; BOULESTIN – DUDAY 2012; SHAPLAND – ARMIT 2012, 103–107; ŠEFČÁKOVÁ 2015; MELLER – SCHUNKE 2013; SCHULTING 2013; ZEEB-LANZ 2013; SCHULTING 2015; GEORGIEVA – RUSSEVA 2016; PILLOUD et al. 2016; ZEEB-LANZ et al. 2016; GRESKY et al. 2017; TIESLER – LOZADA 2018b; DARÓCZI 2018.
- 154 Paracas culture (VERANO 1995, 203–204), Nazca culture (VERANO 1995; PROULX 2001; WILLIAMS et al. 2001; TUNG 2007; VERANO 2018), Wari culture (TUNG 2008; TUNG – KNUDSON 2011), La Ramada culture (LOZADA et al. 2018), and Huarochiri province (GIGLIOLI 1891a; GIGLIOLI 1891b, 11).
- 155 KIDDER 1947, 61–62; WELSH 1988, 35, 64, 81, 192–193, 196, 216, 232–233, Tab. 40, 111, VII, X; HIRTH 1989, 76; HAMMOND et al. 2002; HARRISON-BUCK et al. 2007; MILLER 2007, 173–181; TIESLER et al. 2010, 372, 374–376; STOREY 2014, 128–130; SCHERER 2015, 100, 102, Fig. 2.62a–b, Fig. 1.7a; WROBEL et al. 2019.
- 156 PIJOAN et al. 2001; CHÁVEZ BALDERAS 2007; CHÁVEZ BALDERAS 2010; CHÁVEZ BALDERAS et al. 2015; RAGSDALE et al. 2016; CHÁVEZ BALDERAS 2018.
- 157 BABY 1956; ROSS-STALLINGS 2007, 360, 362; COOK – MUNSON 2015.
- 158 GILLESPIE 2002, 69; BERRYMAN 2007, 380; CHACON – DYE 2007b, 624
- 159 AVILA 1966, 247; OGBURN 2007, 517, 520; BARRAZA LESCANO 2009.
- 160 AOUDIA-CHOUAKRI – BOCQUENTIN 2009.
- 161 BAUDOIN 1923; BAUDOIN 1927; VONDRÁKOVÁ 1990; VONDRÁKOVÁ 1991; CHEBEN 2000, 90–91; ION et al. 2009; TEEGEN 2010, 129, 135, Abb. 2, Abb. 7, Abb. 12; ORSCHIEDT 2011, 58; SEIDEL 2013; SEIDEL – REGNER-KAMLAH 2018.
- 162 BÁRTA – VLČEK 1958; FURMÁNEK – JAKAB 1997, 17, 20, Fig. 3, 2; ŠEFČÁKOVÁ 2015; SPATZIER 2017; PANY-KUCERA et al. 2020.
- 163 LYNN 1977; BRUNAUX et al. 1985, 148–149, 161–162, 181; BRUNAUX 1995, 56–66; HAHN 1999, 141; BONNABEL – BOULESTIN 2008; GUICHARD – TEEGEN 2010, 55; HÄRTL 2010, 227; ROUSSEAU 2010, 180; TEEGEN 2010, 135–136; VON BERG 2011, 75–76; BOULESTIN – DUDAY 2012, 149, 151–152; ROUSSEAU 2012, 123; COURTAUD – ROUSSEAU 2016, 496.
- 164 CIESIELSKI et al. 2011, 129, 141; ARMIT 2012, 95, 148–149, 152–156, Ill. 5.18, Ill. 19–20; COURTAUD et al. 2016.
- 165 TEEGEN 2010, 134, Tab. 1.
- 166 SCHREIBER 1984, 8. kép 5, 11. kép 1.

found in a feature defined as a sacrificial pit,¹⁶⁷ another under the floor of a building and is therefore considered a foundation sacrifice.¹⁶⁸

When assessing the Ivánca find, I aim at a systematic examination to be followed for other artefacts as well. Thus, I go through the stages of acquisition, preparation, use, maintenance, and deposition, supplementing the five basic processes with the issue of possible transportation and storage.¹⁶⁹

Human body parts used for cultural purposes may typically come from two sources: individuals belonging to the group or those outside the group.¹⁷⁰ An important aspect in the interpretation of the find is, therefore, the problem of the identity of the deceased. Identification may help understand the aspects of selection and would also be crucial in understanding the preparation, use and final deposition of the object. Due to the fragmentary nature of the find, the biological data of the deceased cannot be determined with absolute certainty. According to Tamás Hajdu, the owner of the skull may have been a man aged 20–35. These data are not conclusive on the issue of group identity.¹⁷¹ The uniqueness of the artefact type can be explained by the rarity of the behavioural pattern that required it, or by the practices associated with the deposition, or we may encounter an innovation applied in a special situation. In the Nagyrév culture, there is no sign of manipulating burials. The lack of certain body parts had been observed in some cremation graves in eastern Hungary,¹⁷² but these cannot be related to the habit of directly modifying the skull.¹⁷³ It suggests that the deceased may not have belonged to the community.

On the periphery of the cemetery of the Nagyrév–Vatya culture at Kisapostag–Dunai-dűlő,¹⁷⁴ we found skeletons from corpses that had begun to putrefy in deep pits. Among them was one that lacked limbs. At Érd–Hosszúdűlő, the remains of 38 people were found in 26 pits of a settlement of the Vatya culture. In two cases, perimortal trauma was observed on the bones. According to the calibrated C¹⁴ data, the depositions of the bodies took place on several occasions approximately between 2000 and 1450 BC.¹⁷⁵ The two sites share a common feature beyond the well-observed manipulation of the skeletons. The man without limbs at feature 48 in Kisapostag probably suffered from tuberculosis.¹⁷⁶ At Érd, the dead probably belonged to a low-status social group who were in poor health. The hands of the dead were tied in several instances. At both sites, it can be assumed that the dead in question were not, at least conceptually, full members of the community. In Makó,

167 HANNY 1997; HANNY – REMÉNYI 2002, 246.

168 HANNY – REMÉNYI 2002, 238–239, 245–246.

169 SCHIFFER 1972, 158; WALKER 1995, 71; KIRÁLY 2019.

170 ARMIT 2012, 99–103. In the case of isolated finds, it is particularly difficult to decide whether the object is related to the soul of a respected relative or a stranger (SEEMAN 2007, 181).

171 There are examples of both female and male trophies in the ethnographic and archaeological literature. In the archaic period of Northeast America, nine victims of 13 scalplings are male, and three are female (MENSFORTH 2007, 262). This means that if the skull of Ivánca might have belonged to a woman, that would not rule out the possibility that she belonged to an alien community.

172 SZATHMÁRY 1981, 45; SZATHMÁRY 1990, 135, 138, 142; SZATHMÁRY 1997, 73–75; KULCSÁR – SZABÓ 2000, 37; NÉMETHI – DANI 2001, 95, 103; SZATHMÁRY 2001, 128–130.

173 MELIS 2017; MELIS 2020.

174 The site is the same as the Kisapostag–Zsellér-dűlő one (POLGÁR 1934; BÁLINT 1935; MOZSOLICS 1942; PÁSZTOR 1997; KESZI 2018).

175 SZEVEÉNYI – KISS 2017, 45–46; SZEVEÉNYI et al. (2020, 366–372) mention 24 features. In the latter article, the name of the site is Érd–Hosszúföldek. The deposition has been repeated for a long time, which rules out the possibility of a genocidal one-off act of war, but it allows us to infer a lower-intensity, periodically renewed warfare. A female skeleton from a similar cultural context at Sósút is mentioned by EARLE et al. (2014, 5) and SZEVEÉNYI et al. (2020, 373). The reports do not contain a more detailed description of the finding.

176 Here again I would like to thank Tamás Hajdu for the information.

five pits of a settlement of the Maros culture contained human remains. These also involved cutting off the head and limbs and tying people up.¹⁷⁷ In Kaposújlak, the skeleton of a 17–19-year-old man was found in a settlement feature of the Somogyvár culture, and there were four perimortal injuries on his body. A woman of 37–41 years was found with a healed injury to her skull that could have affected her mental state. Parts of another female skeleton were also found. In none of the cases did the circumstances suggest a human sacrifice.¹⁷⁸ The tying, torture, and mutilation of war prisoners is well known in the ethnographic literature. On the other hand, the exclusion of a mentally handicapped person from the community to which they belonged through their birth or marriage is inconceivable. These marginalized people were not given the right to be buried in the community cemetery.¹⁷⁹ According to ethnographic parallels, the spirits of the dead are not equal; their strength is related to the position they held in society.¹⁸⁰ Therefore, the likelihood that the skulls of low-status individuals marginalized in their own community was used is less likely than that of a person from a foreign community, especially if he was a reputed warrior.

From the Early Bronze Age, we have only sporadic data on inter-communal conflicts. As part of the Bell Beaker package, in this period stone arrowheads and wrist guards appear in the graves. These artefacts, also found in the settlement in Ivánca,¹⁸¹ are considered to be an expression of warrior identity.¹⁸² The halberds, also appearing during the Early Bronze Age II, are considered a means of ritualized warfare.¹⁸³ The weapon is a rather rare find in this region,¹⁸⁴ but Ivánca lies roughly halfway between Szigetszentmiklós and the Dunaújváros section of the Danube, from where we have two specimens.¹⁸⁵ In some areas of the world, ritualized warfare is a way to get trophy heads.¹⁸⁶

According to ethnographic data, in general, any member of the community could collect and use human body parts if they were capable of killing the enemy.¹⁸⁷ According to the finds, in the Early Bronze Age, this custom was not very common. Consequently, it can be assumed that the material-spiritual processing¹⁸⁸ and use of the object was also tied to a religious specialist.¹⁸⁹

177 SZEVEÉNYI – KISS 2017, 45; SZEVEÉNYI et al. 2020, 362–366.

178 SOMOGYI 2002; K. ZOFFMANN 2002.

179 For the question of “irregular, atypical” burials found in settlements, see: RITTERSHOFER 1997; MURPHY 2008; MÜLLER-SCHEESSEL 2013; GLIGOR 2014; GOGÁLTAN – AILINCĂI 2016; RACZKY – ANDERS 2017. For the deposit processes of human remains: WEISS-KREJCI 2011.

180 VAN BAAREN 1968, 49, 52, 53. Most of the Greek heroes earned their post-mortem “official” veneration with some outstanding performance in their life beyond the family limits (EKROTH 2007; MALKIN 2011, 23).

181 KESZI 2017.

182 SZEVEÉNYI – KISS 2017, 38.

183 O’FLAHERTY 2007; O’FLAHERTY ET AL. 2011; HORN 2014; HORN – SCHENCK 2016. For the relationships between ritualized warfare, specialized weapons, archery, and social status, see: TUREK 2015; TUREK 2017.

184 SZEVEÉNYI – KISS 2017, 39.

185 PATAY 2013; KESZI 2019a.

186 KNUDSON et al. 2009, 246; HELMKE 2020, 29–30.

187 In this case as well, there are certainly exceptions (SCHAAFSMA 2007, 100, 113; ARNOLD – HASTORF 2008, 65–66).

188 MCKINLEY (1976) 2015; RUBENSTEIN 2007, 363–365; CLEARY 2005, 33; ARMIT 2012, 55–56. Religious specialists often play an important role in reopening tombs and processing bones, even within the framework of the ancestor cult (BONOGOFKY – GRAHAM 2011, 85). Denise Schmandt-Besserat suspects that the plastered skulls of the Near East were also made by specialists (SCHMANDT-BESSERAT 2013, 235). Their production was actually associated with a kind of rite of passage (VAN GENNEP 1960).

189 CAUQUELIN 2004, 139; MENDOZA 2007a, 587; SCHULTING 2013, 36. At the time of the Classical antiquity, the summoning ceremonies were typically performed by specialists (e.g., witches) or people in desperate, hopeless situations because of the obvious danger caused by the spirits (OGDEN 2001, 251–257).

It cannot be decided how the soft tissues were removed from the skull. Cooking may be ruled out, but on the skull, there are no traces of cuts or chews either. However, anthropological studies and experiments prove that this does not exclude the possibility of defleshing¹⁹⁰ or that scavenger birds¹⁹¹ contributed to the process. However, the “death pits” mentioned earlier suggest that soft tissues were rotten in a controlled manner. The slow, monitored process may have had a strong symbolic meaning in a culture that either buried or cremated the dead.¹⁹² Unnecessary bone fragments were removed from the skull while the tissue was still fresh. There is no data suggesting that the artefact was plastered.

The skull’s owner could basically use the object to ask for the help of the spirit associated with it, either for themselves or for a fellow who turned to them, or for the sake of the whole community. The help could apply to any area of life. There are no traces of use on the artefact to suggest that it was kept outdoors for a long time (on a fence, pediment, post, etc.). According to Tamás Hajdu, the bone tissue became so dry that the thin layer of tissue of the maxilla surrounding the teeth broke off due to the pressure on the teeth, but apart from that, the find is in good condition. As according to some researchers, bones remain fresh for several years after death,¹⁹³ it is likely that the object was not made for a single use. According to the ethnographic literature, the use of skulls can be accompanied by damage to bone tissue and breaking teeth.¹⁹⁴ In the case of the Iváncsa facial skull, the root of one tooth remained in its place, which means that it did not fall out accidentally, but was probably broken intentionally. In some places, faint light spots resulting from use are seen on the forehead. There are data on rubbing and touching the trophy containing the soul of the dead during use.¹⁹⁵ Smoothing the forehead of the skull may have played a role in activating the soul or giving them the opportunity to temporarily move into the patient’s body.¹⁹⁶ The condition of the object thus suggests that we may suppose longer-term occasional, possibly periodic, but not continuous use.

The artefact might also be a mnemonic device.¹⁹⁷ The skull symbolizes the soul, which can move into

190 During the examination of the trophic heads of Borneo, traces of cuts of varying degrees were observed ▷ on the skull bones (OKUMURA – SIEW 2013, 688–689). 141 skulls from the islands of the Torres Straits were examined. In these cases, only traces of cuts were found on the lower jaws (BONNEY – CLEGG 2011, 62). The phenomenon is not limited to human remains. In the case of the cattle found in Balatonöszöd, there were specimens of which only certain parts were found. Despite processing, there were no traces of cuts on the bones (HORVÁTH 2011, 126).

191 PILLOUD et al. 2016.

192 WEBER (2014) examines the relationship between the smell of decaying human bodies, social death and oblivion.

193 ION et al. 2009, 51, footnote 7. According to WILLIAMSON (2007, 203), the skull discs he examined had such high levels of lipid and collagen content even a year after death that they did not crack when drilled. BEHRENSMEYER (1978) identified six weathering stages of bones based on the examination of animal carcasses found on the ground surface in Africa. The state of the skull fragment found in Iváncsa may correspond to stage 1, into which he classified bones 0–3 years old. WIEBERG – WESCOTT 2008 studied the degradation of soft tissues and the condition of bones for 141 days in a temperate continental climate on surface animal carcasses in a place protected from carnivores. In their experience, the moisture content of the bones decreased rapidly in the first two months, after which the decline continued at a slow pace. The process may indicate the rate of collagen decomposition. Before the 141st day after death, the bones had not yet shown definite “postmortem” characteristics. These results are, of course, difficult to interpolate for a bone that is presumably venerated and stored under protected conditions. In any case, the skull fragment must have been used for several years before it was completely decicated.

194 OPPENHEIM 1956, 128; WILDSCHUT 1960, 80, 87–88; BONNEY – CLEGG 2011, 55.

195 VAN BAAREN 1968, 46; FINKEL 1983–1984, 14; CHACON – DYE 2007b, 620; MENDOZA 2007a, 587.

196 VAN BAAREN 1968, 48.

197 FOWLER 2001, 145; TEEGEN 2010, 135; BONOGOSKY – GRAHAM 2011, 89–90. The Crow people occasionally placed the skulls of members of their own group in medicine bundles. After that, for up to 150 years, ▷

the skull through appropriate ceremonies. Therefore, and because of the shape of the object and the assessment and identification of similar finds, it should be examined whether the skull was used as a mask. Detaching the face bone from the neurocranium makes little sense from a spiritual standpoint. Performing the procedure may be related to the usage of the object. As the eye sockets were not completely broken, the artefact could not be worn on the face: at most it may have been held in front of it. However, it may have been attached to the body, clothing, or headdress.¹⁹⁸ There are no traces on the object to suggest the latter, although a soft cord passed through the eye sockets, if used briefly or occasionally, probably did not result in any traces of wear noticeable even today. According to ethnographic data, the mask may be worn not only in front of the face, but also on the forehead.¹⁹⁹

The first data on anthropomorphic masks have survived from the Neolithic.²⁰⁰ According to the ceramic figurines, we can reckon with their use in the Carpathian Basin since that time.²⁰¹ Significantly fewer real masks have survived in Europe.²⁰² We also know of ceramic objects that can be defined as masks from the Copper,²⁰³ the Bronze,²⁰⁴ and the Iron Ages.²⁰⁵ Some of the finds may have been worn in front of the face (Uivar/Újvár²⁰⁶ and Bad Schussenried), in the case of others this is unlikely (Sechelbach, Tiszalök, Balatonőszöd, and Ostrov). Their common feature is that all were found in settlements. Some Bronze Age vessels in the Carpathian Basin represent bird and human body parts together which led to the idea that they might symbolize people wearing animal masks.²⁰⁷ A similar possibility has arisen in connection with some of the incised motifs of the Nagyrév culture, which can also be interpreted as people wearing bird-shaped masks.²⁰⁸ There is currently no evidence of anthropomorphic masks.²⁰⁹ The uniqueness of the Ivánca facial skull may be only apparent and may be due to its special material, as in the case of the Balatonőszöd mask. It is conceivable that the purpose of the unusual choice of material in both cases was to produce a particularly strong cult object,²¹⁰

▷ they remembered the person's identity and his deeds, both in his life and after his death as a spirit (WILDSCHUT 1960, 76–89).

198 BERRYMAN 2007, 382, Fig. 13.2; CHACON – DYE 2007a, 16; VALENTIN – ROLLAND 2011, 114.

199 TEEGEN 2010, 137, Abb. 13.

200 SCHWARZBERG 2010, 61–66; TEEGEN 2010, 134–135; HERSHMAN 2014; DIETRICH et al. 2018. Some consider the Middle Paleolithic find in La Roche-Cotard a human or animal mask (MARQUET – LORBLANCHET 2003). Others doubt that everything that looks like a face actually represents a face (FLOSS 2010, 49, footnote 1). The Upper Paleolithic female head from Dolní Věstonice, carved in mammoth ivory, and the stylized face of the famous Venus may also depict a mask (MÜLLER-BECK 2010, 26; FLOSS 2010, 52–53).

201 CSALOG 1976; FÜZESI 2018; LAZAROVICI – LAZAROVICI 2014, 197–205.

202 Sechelbach, Germany (HORVÁTH 2004, 209, Fig. 14,3); Tiszalök-Hajnalos, Hungary (FÜZESI 2018); Uivar/Újvár, Romania (SCHIER 2010); Bad Schussenried, Germany (SCHLICHOTHERLE 2016).

203 Balatonőszöd, Hungary (HORVÁTH 2004).

204 Ostrov, Czechia (HRALAL – ŠPAČEK 2002); Siefersheim, Germany (HORVÁTH 2004, 209–210, Fig. 14, 1; MARASZEK 2010, 145); Bretzenheim, Germany (MARASZEK 2010, 145, 148, Abb. 3a); Worms, Germany (HORVÁTH 2004, 210, Fig. 14, 2).

205 Caberg, The Netherlands (MARASZEK 2010, 148); Middelstum, The Netherlands (HORVÁTH 2004, 210; MARASZEK 2010, 148).

206 According to Tünde Horváth, it is a mask attached to a house, which burned out only when the house was destroyed (HORVÁTH 2010a, 121; HORVÁTH 2010b, 13).

207 REICH 2005, 234; GUBA – SZEVEÉNYI 2007.

208 KESZI 2016a, 64, 68; KESZI 2017, 16, 24.

209 Nevertheless, the use of masks may have been much more common, as they can also be made of organic material (MELLER 2010, 9). In Europe, there are data from the Romans on the use of wax masks in processions held during funeral rites (KING 2020, 57–58, 134–135; POLYIOS 6.53). Wax was also used for making other statues that housed dead souls (OGDEN 2001, 184–187). In the Near East as well, a much larger number of mask representations are known from the period 7000–3000 BC as real masks (GARFINKEL 2018, 162). An obvious explanation may be that some of them are also made of organic material.

210 “In form, or in substance, or both, the fetish embodies the implication of hidden power. It is either ▷

or possibly masks made of different materials were used in different contexts. It is noteworthy that there is no sign of attachment on the Balatonőszöd mask either. The question whether the Ivánca artefact was used as a mask cannot therefore be decided before further data become available.

According to ethnographical research, human trophies and other ritual equipment were hidden from view and carefully stored between two uses to prevent their contamination and misuse.²¹¹ For the time being, we do not know of any building or part of a building in the Nagyrév culture that may have been used specifically for the storage of objects related to cult;²¹² thus, its owner may have kept it in their own house.²¹³ Historical and ethnographical researches report on a variety of storage methods for trophies and other human body parts.²¹⁴ The detachment of the skull may also be related to the storage method. The shape of the artefact enabled it to be placed in front of a flat surface, such as a wall, or in a wall niche.²¹⁵ It is also conceivable that it was placed in a bag similar to the medicine bundles of Indigenous American people. This bag was suspended, and its owner could keep the flat pack comfortably, protected from injury, and hidden from the uninitiated eye.

The ghosts kept close to the living had to be cared for unless people wanted to anger them.²¹⁶ Care may have meant the delivery of drinks and food,²¹⁷ which, naturally, leaves no observable traces on the bones. There are historical and ethnographical data of cases when the skulls were anointed with some kind of oil or fat.²¹⁸ There is no trace of this type of treatment on the Ivánca skull. The failure of the spirit to function as expected may have resulted in sanctions.²¹⁹ This might have been the reason for breaking out the teeth.

There may have been several reasons for the deposition of the skull.²²⁰ One possible explanation

▷ shaped to represent some potent being, or it is *composed of highly potent material... But a truly great fetish* would contain substances from the human body, preferably from the heart, forehead, and larynx.” (HARLEY 1950, 6–7, italics added).

211 VAN BAAREN 1968, 30; MENDOZA 2007a, 586–587. The exceptions to this were the trophies deliberately placed on public display, but as has been noted earlier, there was no trace of similar use on the skull of Ivánca.

212 In Melanesia, the skulls used for the initiation of boys were stored between two uses in the house of the initiates, that is, in a public facility (BONOGOFKY – GRAHAM 2011, 82). In the Caribbean, temples and ceremonial caves were used for similar purposes (PETERSEN – CROCK 2007, 558). For huts made for Korwars: VAN BAAREN 1968, 46. Joint storage of wooden images of ancestors and heads obtained during campaigns displayed on columns in the young men’s house: VAN BAAREN 1968, 66. Storage of artificial “mummies” in Siberia in mortuary houses: Вадецкая 2009, 99.

213 Storage of skulls in residential buildings: PETERSEN – CROCK 2007, 558; BONOGOFKY – GRAHAM 2011, 90.

214 They could be kept in textile (ARNOLD – HASTORF 2008, 48), in a leather bag (WILDSCHUT 1960, 78, 80; MENDOZA 2007a, 585; DE GRUMMOND 2011, 325–328, Fig. 10.6, 8–9, Pl. XXII B, 39. note), in a basket (VAN BAAREN 1968, 69; CHACON – DYE 2007b, 620; MENDOZA 2007a, 585; BONNEY – CLEGG 2011, 54; BONOGOFKY – GRAHAM 2011, 78, 83), in a chest (ARNOLD – HASTORF 2008, 72; BONOGOFKY – GRAHAM 2011, 81; GRYPEOU 2019, 15), in bowls (BONOGOFKY – GRAHAM 2011, 85), wrapped in material made of barks (tapas) and suspended (VALENTIN – ROLLAND 2011, 99), in a pit dug into the ground (ARNOLD – HASTORF 2008, 71), under a bed (ARNOLD – HASTORF 2008, 72), or in a pot filled with honey (*Varia historia* 12.8; <http://data.perseus.org/citations/urn:cts:greekLit:tlg0545.tlg002.perseus-grc1:12.8>).

215 ARNOLD – HASTORF 2008, 72, 114. Placing a severed head used in necromancy in a niche, where the head then speaks in a whisper: GRYPEOU 2019, 4–5. The niches of Pillar C found in Roquepertuse still contained the crania that were fixed in their place with clay (ARMIT 2012, 148).

216 HARLEY 1950, 6; VAN BAAREN 1968, 61–62; CHACON – DYE 2007b, 620.

217 VAN BAAREN 1968, 47–48; MCKINLEY (1976) 2015, 465–466; BONOGOFKY – GRAHAM 2011, 85.

218 ABUSCH – SCHWEMER 2011, 354; OGDEN 2001, 133; FARAONE 2005, 275–277.

219 VAN BAAREN 1968, 27, 32; OGDEN 2001, 212; FARAONE 2005, 257–271.

220 BRÜCK 1995, 253–255; WALKER 1995; WALKER 1996; WALKER 1998; HILL 2000, 379; BURLACU-TIMOFTE – GOGÁLTAN 2016, 92.

is that the lack of teeth did not affect the magic power of the skull's spirit. In this case, the lack of teeth has nothing to do with the removal. Similar objects sometimes were discarded because they were no longer able to properly perform their task, the magic power of the spirit was inadequate.²²¹ To establish this disability, it was not even necessary to have a visual trace of the sacred object. In this case, the finding can be defined as ceremonial trash.

Another possibility is that, according to their beliefs, the condition of the teeth had an effect on the spirit's abilities. It is possible that the spirit's power residing in the artefact was broken and it was unable to fulfil the requests addressed to it if it lost its teeth. However, we have noticed that some of the teeth were intentionally removed. It is an unlikely assumption that the user of the artefact intentionally annulled the power of the sacred object, thus depriving themselves of an important means by which they were able to influence their and their companions' life situation. If the intentional removal of the teeth did not take place when in use, it must have happened during the ceremony accompanying the extraction in order to limit the spirit's future activity. The reason is the belief that a skull and its spirit with teeth pose threats, for which there is a lot of ethnographic data from different parts of the world.²²² In the Far East, intentional tooth extraction also occurs during reburial of ancestors.²²³ However, the opposite can also be observed. In the case of one of the "skull masks"²²⁴ and some skulls used during ceremonies,²²⁵ we see that the missing teeth were replaced with implants, which can be considered a maintenance operation.

In Ivánca, the base of the mandible of a man of 30 to 50-years was found in feature 74, where all the teeth were missing. In feature 173, a mandibular fragment of an individual aged between 25 and 35 years was found. The mandible was broken in at least three places and deposited in at least two separate places. Both cases can be classified as intentional fragmentation. Deliberate fragmentation is also observed on some human skulls²²⁶ and on the European masks, none of which can be fully assembled from their fragments.²²⁷

If the purpose of the deliberate tooth extraction was to limit the spirit's future activity, then at the time of the deposit there were no doubts about the power of the artefact, so we are encountering a kratophonous deposit.²²⁸ It is possible that its owner had died and the strong sacred power was not to be used by anyone else. There are examples that in such cases, sacral artefacts were

221 VAN BAAREN 1968, 27, 32, 35, 45.

222 PAASONEN 1909a, 346–347; PAASONEN 1909b, 3–12; CHACON 2007, 526; HOOPES 2007, 464; SMITH 2015, 272.

223 TSU 2000, 5–15.

224 AOUDIA-CHOUAKRI – BOCQUENTIN 2009, Fig. 1.

225 MILLS 1907, 164–165, Fig. 41; VERANO et al. 1999, 68; TIESLER et al. 2010, 372; ANDRUSHKO 2011, 275, 277, Fig. 11.9–10; BEGEROCK 2011, 239, Abb. 3. In Beisamoun (Israel), the teeth broke off the lower jaw of one of the skulls before modeling. Instead, symbolic teeth were formed by scratching them into the modeling material (PERSCHKE 2013, 101). These examples show that various methods can be used to achieve the goal (inserting a human tooth of the right size, cutting a human tooth to size, resizing an animal tooth, creating an artificial implant from organic [animal bone] or inorganic material [limestone], a symbolic tooth marked by scratching). That we are dealing with two sides of the same coin in this case, too, is well illustrated by a Chinese custom contrary to the aforementioned Taiwanese tradition: a sacrificial set of dentures made of paper that can be bought for the dead, along with the associated teeth-cleaning tools (SCOTT 2007, 126, Fig. 27).

226 CROUCHER 2006, 31; SANTANA et al. 2012; GRISSOM – GRIFFIN 2013; BECKER – ALCONINI 2018; VERANO 2018, 178. The teeth were broken out of the upper jaw of the viscerocranium found in pit 1983/61 at the Schleinbach site as well, but at least the tooth roots remained in their place (PANY-KUCERA et al. 2020, 29, Fig. 14). The authors do not mention whether these are perimortal or clearly postmortal injuries.

227 For the different types of fragmentation, including the ritual "killing" of objects: CHAPMAN 2000.

228 WALKER 1996; WALKER 1998.

buried in the grave of the dead,²²⁹ burned,²³⁰ or deposited in a suitable place.²³¹

The deposition took place in a peripheral, presumably less frequented part of the settlement, located between the villages of the living and the dead. In some ways, it is a liminal area that is already beyond residential buildings but does not yet belong to the wider environment. Examples of the disposal of human body parts in waste pits are known from all stages of prehistory.²³² In pre-industrial societies, waste, garbage, and stench did not carry such negative connotations as they do today.²³³ The excavated area was used for the final disposal of objects the community no longer needed, and their recycling was abandoned. The deposition of the artefact was probably not done with the intention that the object should continue to influence the fate of the living as an active agent; therefore, this is not a sacrificial deposit.²³⁴

Other human remains were found at the site that may contribute to the assessment of site use. Among them were three female skeletons. Based on the shape of the features used to place the bodies and the arrangement of the bodies, it seems that in each of the three cases the motive for the deposition was different. “Non-normative” living situations and causes of death may result in special, “non-normative” burials (Sonderbestattung, deviant burials).²³⁵ In fact, it is a matter of applying different standards depending on the circumstances.²³⁶ The full, intact skeletons of the women were found, whereas the three skull fragments belonged to either a man or, with a slightly higher likelihood, to a man than a woman. It seems that in Ivánca, men and women of the marginal group had different fates. This gender distribution coincides with what we know about archaic warfare.²³⁷

In addition to human burials, there was another mammal species whose entire skeletons were found in the waste pits; some types of canids. Zooarchaeological examination of the skeletons has not yet been carried out, however, it is probable that, as in other Bronze Age settlements, in Ivánca we also found dogs, including puppies. In the complex relationship between animals and humans,²³⁸ dogs occupy a special place.²³⁹ This special relationship is reflected in the deposition phenomena observed in relation to dogs.²⁴⁰ The deposition of dogs in Ivánca is quite different²⁴¹ from that of

229 HARLEY 1950, 8; HOOPES 2007, 447; RUBENSTEIN 2007, 364.

230 WALKER 1995, 75.

231 The visual representation of a deposition on a vessel: PROULX 2001, 130, Fig. 6.16. Special attention should be paid to the specialist performing the operation who is wearing a mask. One of the earliest similar deposits: GARFINKEL 1994.

232 Without wishing to be exhaustive, here are some examples: VON BERG 2011; ORSCHIEDT 2011; JELÍNEK – VARSÍK 2013. The Romanian researchers are particularly good at publishing the finds: KOGALNICEANU 2012 (Mesolithic–Copper Age), LAZĂR 2012 (Neolithic–Copper Age), URAK – MARTA 2011 (Late Bronze Age), GOGĂLTAN – AILINCĂI 2016 (Prehistoric–Middle Ages).

233 HAYDEN – CANNON 1983; SOMMER 1990; RATHJE – MURPHY 1993; BRÜCK 1995, 255. On odors associated with the production of food, beverages, industrial raw materials by fermentation and putrefying of the human body: HUNTINGTON – METCALF 1979, 55–57.

234 BRÜCK 1995; HAYDEN 2003, 200–201; CLEARY 2005, 34; ARMIT 2006; ARNOLD – HASTORF 2008, 132; ARMIT 2012, 120–163.

235 ASPÖCK 2008; ASPÖCK 2013, 26–27; CHAPMAN 2010.

236 TRIGGER 1987, 52; GILLESPIE 2002, 71; ASPÖCK 2013, 27–35; PECHTL – HOFMANN 2013, 136.

237 KEELEY 1996, 83–88; HARNER 1972, 186–187; TRIGGER 1987, 72; DUREAU 2000, 83; PETERSEN – CROCK 2007, 566; BONNEY – CLEGG 2011, 60–61.

238 CASELLA – CROUCHER 2011; CROUCHER 2006, 39; HILL 2013.

239 ARMIT 2012, 145; BARTOSIEWICZ 1994; JENNBERT 2003, 147–148; ZALAI-GAÁL 1994; RADOVANOVIĆ 1999; MOREY 2006; BREA et al. 2010; LOSEY et al. 2011; CHOYKE et al. 2004, 183; GRÜNBERG 2013; WALKER – WINDHAM 2014; SERPEL 2016; PERRY 2017; DARÓCZI 2018.

240 HILL 2000, 363–364; PERRY 2017.

241 Their bones are also often found in other Bronze Age sites without being broken for marrow, suggesting ▷

other animals²⁴² found at the site, which are represented at most by articulated body parts (spine), and is similar to some human deposits, even if the exact motivation for their deposition cannot be determined. The line between humans and animals does not separate rigid categories, and many examples can be cited worldwide reflecting that it is not impenetrable. There are also finds from the Bronze Age in the Carpathian Basin, the interpretation of which suggests a similar view. Such are the vessels representing hybrid creatures with human and bird body parts,²⁴³ the humanoid creature with horns on the vessel found at the Budapest-Pannonhalmi road,²⁴⁴ and the figures blending human and animal properties²⁴⁵ on the urns found at Kisapostag and Dunaújváros.²⁴⁶

In Ivánca, the location and character of the deposits suggest that there is some conceptual relationship between people and dogs found in the area used for waste disposal. Individuals of both species may have belonged to groups and social categories located on the margins of human society and, although possibly due to different motivations, were buried in the same place in a similar form in terms of their archaeological context. The artefact made of a skull and its spirit were thus given a similar classification for burial as some women and dogs. The “death pit” mentioned in association with the question of the acquisition of the skull and the women buried in the waste pits may provide examples of two types of treatment for the same marginal group. The independent life cycle of the culturally modified skull perhaps started in the former place and ended in the latter. Similar cultural norms were applied when disposing of already unusable fragments of objects and animal remains used in households, as well as at the disposal of already useless remains of living beings halfway between objects and people with full rights. These features were both spatially and conceptually separated from the areas where the houses and the dead of the full members of the community were located. Deposits were probably made on several occasions, so this use of the area was marked by a series of conscious decisions. The human remains buried here did not give the area any particular significance; on the contrary, the location indicates the significance of the people buried here.

▷ that dogs, along with horses, were less often considered a source of meat (CHOYKE 1984, 24). According to VRETEMARK – STEN 2010, 212, the treatment of dog remains found in Százhalombatta suggests that they were consumed on special ritual occasions. The age distribution of the disarticulated dog bones found on the tells along the Berettyó river also suggests that the dog was not or was only rarely consumed (BÖKÖNYI 1988, 127). The rarity of artefacts made from dog bones also suggests that the dog was not kept primarily for its meat like other animals (BARTOSIEWICZ 1994, 63–64).

242 There are also traces that are interpreted as a sign that dogs were used for food in the Bronze Age dogs (BÖKÖNYI 1974, 320; BÖKÖNYI 1980; BÖKÖNYI 1982, 123; BÖKÖNYI 1992, 71; CHOYKE – BARTOSIEWICZ 2000, 51; VRETEMARK – STEN 2010; TUGYA 2010, 99). Butchered dog remains have also been found on the tell of the Százhalombatta-Brick Factory, and archaeozoological research suggests that they were consumed. In this case again, we are grateful to Magdolna Vicze for the information. For dog remains in the processed zoological material: CHOYKE 2000, 99–100. It should be noted that opened dog skulls do not necessarily indicate brain consumption. It is conceivable that the goal was to divine from the brain. Use of whole dog skulls for medical and other magical purposes: FINKEL 1983–1984, 13. Attitudes toward dogs may have changed over time, and there may also have been differences between communities that existed at the same time.

243 GUBA – SZEVEÉNYI 2007.

244 KESZI 2018, 27–35.

245 There are many examples of composite beings pieced together from body parts of different animal species and humans, in addition to the creatures of Classical mythology (HARLEY 1950, 3–4, 35–36; ANTHONY – VINOGRADOV 1995, 40–41; Кузнецов – Семенова 2000, 123, Рис. 4; FOWLER 2001, 144; CHAPMAN 2010; CASELLA – CROUCHER 2011, 214; VALENTIN – ROLLAND 2011, 105; ARMIT 2012, 100–101, Ill. 3.6; CHAPMAN et al. 2014, 14–15, 41; HAYDEN 2018, 231).

246 KESZI 2018, 19–24.

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