

## FROM BONES TO HUMAN BEINGS

## New Advances in the Study of Neolithic Burials in the Polgár Area I

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*In the strict sense, bioarchaeology refers to the biological and chemical examination of human remains, but in a wider sense, it involves the analysis of all organic archaeological remains. The results of these analyses contribute to the reconstruction of former populations as well as to a better understanding of individual dietary habits and behaviours, possible migrations, diseases and pathologies, and various activities and workloads, while a wider application sheds light on the period's animals and plants, land use and lifeways. This study is based on the interim results of the Hungarian and international bioarchaeological research projects focusing on the Middle and Late Neolithic burials uncovered at Polgár and other neighbouring sites and seeking answers to the questions of whence and when did these people arrive, how tall they were, how healthy they were, what they ate, and how they worked.*

A total of 314 burials were uncovered at four major sites dating from the Middle and Late Neolithic (5500–4500 BC) on the outskirts of Polgár and Hajdúnánás in Hajdú-Bihar County during the salvage excavations preceding the motorway construction projects begun in the 1990s.<sup>2</sup> (Fig. 1) Although this does not seem a

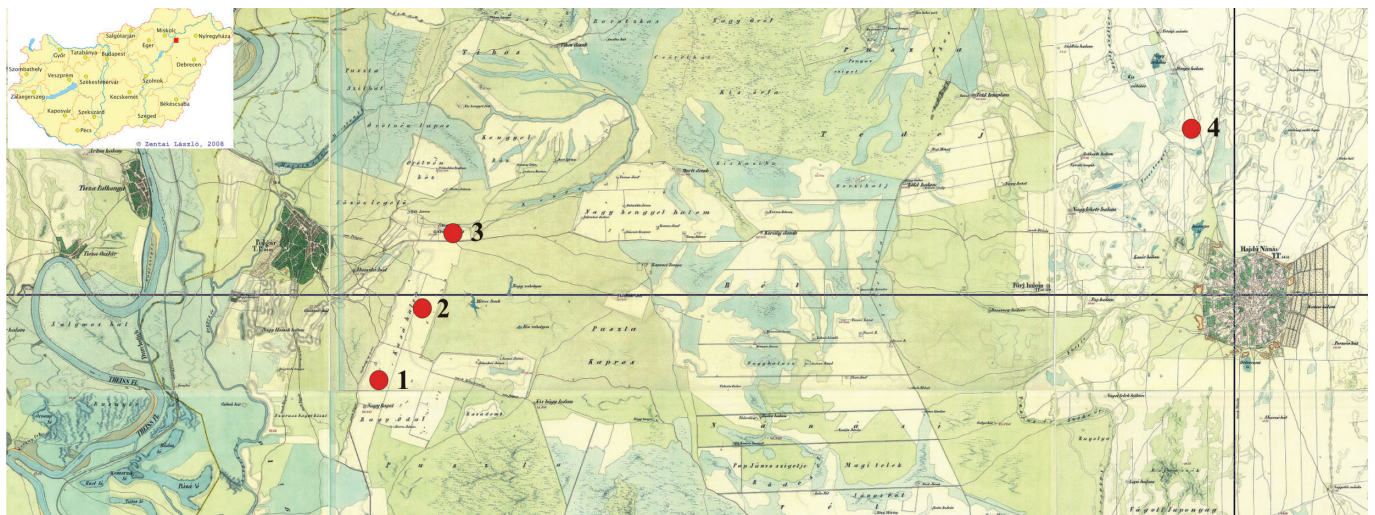


Fig. 1: The sites mentioned in the study on the map of the Second Military Ordnance Survey  
1: Polgár-Piócási-dűlő, 2: Polgár-Ferenci-hát, 3: Polgár-Csőszhalom, 4: Hajdúnánás-Eszlári út

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<sup>2</sup> Polgár-Piócási-dűlő: Nagy, Emese Gyöngyvér – Kaczanowska, Małgorzata – Kozłowski, Janusz K. – Moskal-Del Hoyo, Magdalena – Lityńska-Zajac, Maria: Evolution and environment of the Eastern Linear Pottery Culture: a case study in the site of Polgár-Piócási-dűlő. *Acta Archaeologica Academiae Scientiarum Hungaricae* 65 (2014), 217–284; Polgár-Ferenci-hát: Whittle, Alasdair – Anders, Alexandra – Bentley, A. – Bickle, Penny – Cramp, Lucy – Domboróczki, László – Guba, Zsuzsanna – Fibiger, Linda – Hamilton, Julie – Hedges, Robert – Kalicz, Nándor – Marton, Tibor – Oross, Krisztián – Raczky, Pál: Hungary. In: *The First Farmers in Central Europe: Diversity in LBK Lifeways*, ed. Whittle, Alasdair – Bickle, Penny (Oxford: Oxford University Press, 2013), 49–100; Polgár-Csőszhalom: Anders, Alexandra – Nagy, Emese Gyöngyvér: Late Neolithic burial rites at the site of Polgár-Csőszhalom-dűlő. In: *The Lengyel, Polgár and related cultures in the Middle/Late Neolithic in Central Europe*, ed. Kozłowski, Janusz K. – Raczky, Pál (Kraków, 2007), 83–96; Hajdúnánás-Eszlári út: Anders Alexandra: Hajdúnánás, Eszlári út. In: *Régészeti Kutatások Magyarországon 2004 — Archaeological Investigations in Hungary 2004*, szerk. Kisfaludi Júlia (Budapest: Kulturális Örökségvédelmi Hivatal, Magyar Nemzeti Múzeum, 2005), 252.

particularly high number at first glance, it must be borne in mind that no more than five hundred burials had been discovered across the entire territory of the Hungarian Great Plains during the preceding one hundred years—viewed from this perspective, this figure is quite remarkable. Moreover, not only has there been a growth in the number of burials, but the information obtained from the remains has also increased considerably. There were no formal cemeteries during the Neolithic in this region and the burials were all found in settlements, in the broader area of various houses. Most of the newly discovered graves came to light during investigations conducted over extensive areas, where they formed distinct clusters across the area of 3-4 hectares. Thus, we were not only able to study a particular burial's relation to its immediate environment and to other burials further away, but also how it fitted into the settlement's overall layout and its relation to the spatial patterning of the settlement's houses and pits. We took particularly great care in uncovering the burials and thus collected as much information as possible on the burial rite, resulting in a broadening of our interpretative framework.

However, these quantitative and technical changes would have been insufficient in themselves for providing a suitable springboard for a re-assessment of Neolithic burials. New advances in the natural and social sciences, their impact on each other and their joint application have opened entirely new vistas in archaeological scholarship. Among the analytical procedures of the natural sciences, radiocarbon dating, genetic (DNA) and stable isotope analyses, and new analytical research fields in physical anthropology must be mentioned, which jointly led to the emergence of the new discipline of bioarchaeology.<sup>3</sup>

The traditional archaeological approach treated the human remains and artefacts recovered from burials as finds that could principally provide information on chronology. The spread of processual and post-processual archaeology in Europe and, though more slowly, in Hungary,<sup>4</sup> eventually led to a shift in archaeological perspective. The anthropological finds recovered from burials are no longer viewed as a mere collection of bones, but as the remains of once lived individuals, each of whom had a personal life history, was part of various social organisations, and was eventually buried as a member of his/her community according to the latter's customs, norms and wishes.<sup>5</sup>

During the past decades, several Hungarian and international research projects have been devoted to the bioarchaeology of the Neolithic in the Carpathian Basin.<sup>6</sup> In the following, I shall present the most important findings of these projects regarding the Middle and Late Neolithic anthropological material from the Polgár region and review the answers we have gained to our many new questions.

### WHENCE DID THEY COME?

One of the issues explored by recent archaeogenetic research is the origin of Europe's population and the rate at which the continent was colonised. The spread of the Linear Pottery culture representing the first food-producing communities of Central and Western Europe plays a crucial role in answering this ques-

<sup>3</sup> One of the most significant and innovative multidisciplinary research projects was led by Marek Zvelebil, which focused on the human remains from the Neolithic site of Vedrovice in Slovakia. For a comprehensive overview, see Lukes, Alena – Zvelebil, Marek – Pettitt, Paul: Biological and cultural identity of the first farmers: Introduction to the Vedrovice bioarchaeology project. *Anthropologie* 46 (2008)/2–3, 117–124.

<sup>4</sup> For an overview, see Siklósi, Zsuzsanna: *Traces of social inequality during the Late Neolithic in the Eastern Carpathian Basin*. *Dissertationes Pannonicae Ser. IV. Vol. 3* (Budapest: L'Harmattan, Eötvös Loránd University, Institute of Archaeological Sciences, 2013).

<sup>5</sup> For a recent discussion, see the introduction to the following study: Fülöp, Kristóf – Váczi, Gábor: Late Bronze Age Cremation Burials: A Complex Event with Few Remains. *Hungarian Archaeology*, 2016/ Spring, (last accessed 24.05.2016).

<sup>6</sup> The two most important research projects were directed by Alasdair Whittle: Whittle, Alasdair – Bickle, Penny (eds): *The First Farmers in Central Europe: Diversity in LBK Lifeways* (Oxford: Oxford University Press, 2013); see also Whittle, Alasdair – Anders, Alexandra – Bentley, A. – Bickle, Penny – Cramp, Lucy – Domboróczki, László – Guba, Zsuzsanna – Fibiger, Linda – Hamilton, Julie – Hedges, Robert – Kalicz, Nándor – Marton, Tibor – Oross, Krisztián – Raczky, Pál: Hungary. In: *The First Farmers in Central Europe: Diversity in LBK Lifeways*, ed. Whittle, Alasdair – Bickle, Penny (Oxford: Oxford University Press, 2013), 49–100. [Ron Pinhasi's ERC](#)-funded research focuses on similar issues.

tion.<sup>7</sup> Viktoria Keerl, who took DNA samples from five individuals from among the burials representing the early phase of the Middle Neolithic (ALP 1) uncovered at Polgár-Piócási-dűlő, found that three could be assigned to haplogroup K, one to haplogroup T, and one to haplogroup N1.<sup>8</sup> All three were part of the so-called “Neolithic package”,<sup>9</sup> meaning that the ancestors of these individuals had been members of the very first food-producing communities and originated from the distant regions of the Near East and Anatolia, whence they made the long journey to the northern fringes of the Hungarian Plain.

### WHEN DID THEY LIVE?

There are few archaeological sites in Europe for which we have so many radiocarbon measurements as the Late Neolithic settlement at Polgár-Csőszhalom. Given the site’s outstanding importance, samples were submitted for radiocarbon measurements from the 1950s onward and the available series of data has since been continuously enlarged. Thanks to the still ongoing research project, we now have 109 AMS data for determining the settlement’s occupation; 45 of these measurements have been performed on samples collected from burials, since these are particularly suitable for modelling various chronological processes. Radiocarbon data yielded by human skeletons provide information on the approximate date of death; as the Polgár graves did not suffer any disturbance later, these data can be regarded as accurate. Owing to the settlement’s general layout, the burials also provide information on the period of use of the settlement’s buildings because most of the burials lay in their immediate vicinity and were aligned to them. The evidence of the burials is consistent with the radiocarbon data gained from the animal bones and, at the same time, it reflects a peculiar dynamics: there were fourteen funerals during the brief period between 4800 and 4690 BC.

The location of the graves and the radiocarbon data provided by the burials also shed light on the site’s spatial and chronological dimensions: the various segments of the 38 hectare settlement—the tell settlement, the enclosures, the single-layer horizontal settlement<sup>10</sup>—were used simultaneously, even if not with the same intensity. Earlier we had assumed that the earliest section of the horizontal settlement lay in the site’s northern part, close to the Tisza river, and the settlement expanded southward. The currently available radiocarbon data, however, offer a more varied picture. It appears that the one-time inhabitants of Polgár-Csőszhalom used the huge area dynamically; they occupied all of the ample spaces and continuously filled them with life, even if with differing intensity. Although at the distant locations, lying far from each other, sometimes up to 800 metres apart, different types of activities and events took place during the same period, we also found evidence for the successive events of several periods in a smaller space.<sup>11</sup>

<sup>7</sup> For a recent discussion of this issue, see Bánffy, Eszter: German-Hungarian bioarchaeological research project in the Archaeological Institute of the Research Centre for the Humanities, Hungarian Academy of Sciences. *Hungarian Archaeology*, 2013/Summer, (last accessed: 07.06. 2016); Szécsényi-Nagy, Anna – Mende, Balázs Gusztáv: New trends in the archaeogenetic research of the Institute of Archaeology, Research Centre for the Humanities, Hungarian Academy of Sciences. *Hungarian Archaeology*, 2016/Spring, (last accessed: 07.06. 2016).

<sup>8</sup> Keerl, Viktoria: *A River Runs Through It: Ancient DNA Data on the Neolithic Populations of the Great Hungarian Plain*. Dissertation zur Erlangung des Grades Doktor der Naturwissenschaften am Fachbereich Biologie der Johannes Gutenberg Universität Mainz (Mainz, 2014), 7172. (last accessed: 07.06. 2016).

<sup>9</sup> Haak, Wolfgang – Balanovsky, Oleg – Sanchez, Juan J. – Koshel, Sergey – Zaporozhchenko, Valery – Adler, Christina, J. – DerSarkissian, Clio S. I. – Brandt, Guido – Schwarz, Caroline – Nicklisch, Nicole – Dresely, Veit – Fritsch, Barbara – Balanovska, Elena – Villems, Richard – Meller, Harald – Alt, Kurt W. – Cooper, Alan – the Genographic Consortium: Ancient DNA from European early neolithic farmers reveals their near eastern affinities. *PLoS Biology* 8 (2010)/11, (last accessed 07.06.2016).

<sup>10</sup> For the most recent data on the site’s extent, see Raczky, Pál – Anders, Alexandra – Faragó, Norbert – Márkus, Gábor: Short report on the 2014 excavations at Polgár-Csőszhalom. *Dissertationes Archaeologicae* Ser. 3 (2014)/2, 363–375. (last accessed: 07.06. 2016).

<sup>11</sup> Raczky, Pál – Anders, Alexandra: *The chosen ones. Unconventional burials at Polgár-Csőszhalom (NE Hungary) from the fifth millennium BC.* (Oxford, forthcoming).

## WHAT WERE THEY LIKE?

### HOW TALL WERE THEY?

Childhood conditions essentially determine body size in adulthood. Altogether 407 male and female skeletons from Central and Southeast Europe spanning the period from the Mesolithic to the Migration period were examined as part of a British research project led by Ron Pinhasi in order to track changes in body height and body mass. Samples for the project were taken from eight male and two female skeletons unearthed at the Middle Neolithic site of Polgár-Ferenci-hát, whose results were consistent with the overall trends identified after the assessment of all the 131 Neolithic burials that had been sampled, namely that women were shorter than men in the first food-producing communities. This difference could not be attributed merely to sexual dimorphism, a characteristic trait of humans, but also to women's poorer health conditions and deficient diet, which had probably determined their life already in childhood.<sup>12</sup>

### HOW HEALTHY WERE THEY?

The skeletons of fifty individuals were examined from among the 113 burials uncovered at Polgár-Ferenci-hát as part of the LBK Lifeways project.<sup>13</sup> There was a high incidence of pathological alterations reflecting diseases of the blood-forming organs in childhood and porosity in the eye orbits (*cribra orbitalia*), an indication of a deficient diet, which was much higher among women than among men. The proportion of dental caries was more frequent among women than among men, suggesting that women consumed higher amounts of carbohydrates through foods rich in starch such as cereals and legumes. Some of the front teeth in older women's upper mandible bore alterations, indicating that these women used their teeth as a working tool and they may have been chewing some fibrous material. (Fig. 2)

The findings of the research project directed by Ron Pinhasi have been recently published. One of the most interesting observations regarding the Polgár-Ferenci-hát site was that dental enamel hypoplasia was much more frequent among young individuals than among adults, indicating a deficient diet, one possible cause being breast-feeding that lasted until the child was 2–3 years old, which deprived them of important nutrients<sup>14</sup>.

The anthropological material from the horizontal settlement at Polgár-Csőszhalom was analysed by Zsuzsanna K. Zoffmann;<sup>15</sup> here, I shall only cite her conclusions regarding lifeways and general health conditions. She too found that *cribra orbitalia* was more frequent among women than among men; she also noted that pathologies of the spine were widespread in both sexes; diseases of the joints mostly occurred on the mandible, the elbows and the hips, and exostoses were similarly quite frequent. Enthesopathy on the site of attachment of muscles and tendons reflecting overburdening was another frequent occurrence, as were post-cranial bone fractures and injuries to the skull, with some healing without inflammation.

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<sup>12</sup> Macintosh, Alison A. – Pinhasi, Ron – Stock, Jay T.: Early Life Conditions and Physiological Stress following the Transition to Farming in Central/Southeast Europe: Skeletal Growth Impairment and 6000 Years of Gradual Recovery. *PLoS ONE* 11 (2016)/2, (last accessed 07.06.2016).

<sup>13</sup> The physical anthropological and palaeopathological assessment was done by Linda Fibiger. The entire anthropological material was analysed by Zsuzsanna K. Zoffmann.

<sup>14</sup> Ash, Abigail – Francken, Michael – Pap, Ildikó – Tvrđý, Zdeněk – Wahl, Joachim – Pinhasi, Ron: Regional differences in health, diet and weaning patterns amongst the first Neolithic farmers of central Europe. *Scientific Reports* 6 (last accessed: 12.07.2016.).

<sup>15</sup> K. Zoffmann, Zsuzsanna: A Polgár M3/6 jelzésű lelőhelyen feltárt kései neolitikus temető embertani vizsgálatának eredményei (Results of the anthropological investigation of the Late Neolithic cemetery marked Polgár M3/6). *A Debreceni Déri Múzeum Évkönyve* (2011–2012 [2012]), 105–126.

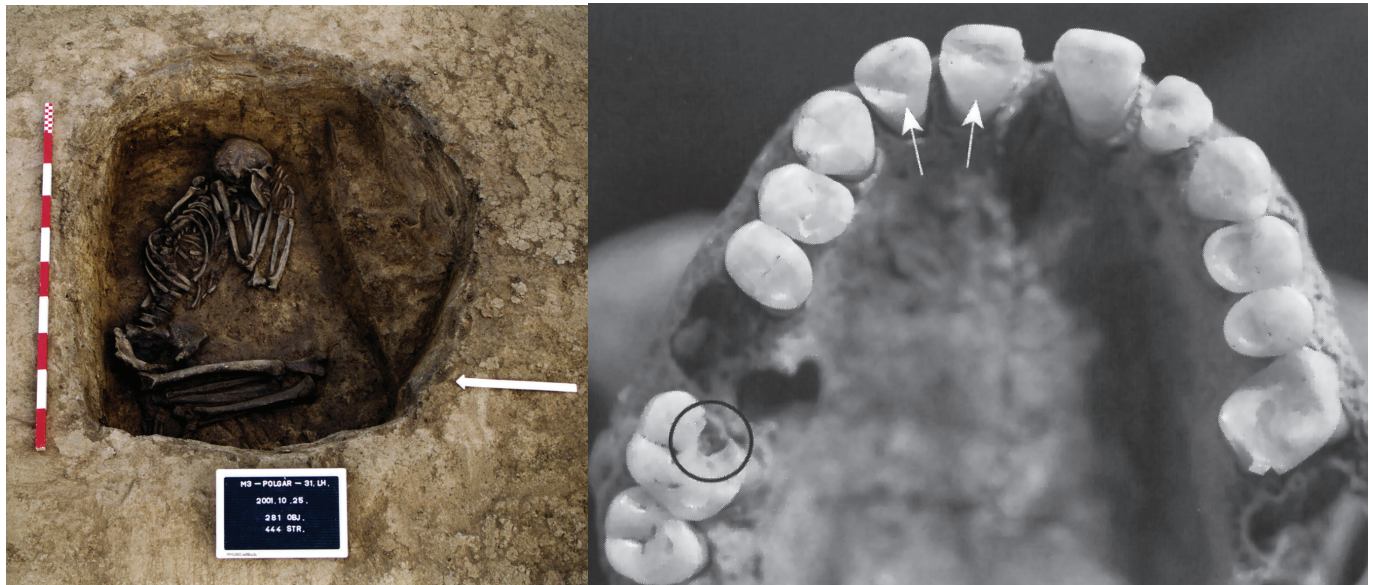


Fig. 2: Polgár-Ferenci-hát, Feature 281. Burial of a 37-46-year-old woman crouched on the left side (photo: Pál Raczky) and detail of her mandible: the arrows indicate grooves caused by use-wear, the circle a carious defect (photo: Linda Fibiger, after Whittle et al. 2013, Fig. 3.27)

## HOW DID THEY WORK?

Depending on their intensity, various activities involving the use of hands and arms can cause biomechanical alterations on the upper limbs, which leave their mark on the surface of the bones. A relatively new, non-destructive analytical procedure is the examination of the sites of attachment of muscles on the upper limbs, whereby both one and two-sided stress can be demonstrated. The upper arms of 174 adults from Neolithic, Bronze Age and Iron Age from Central Europe were examined to detect possible changes caused by farming and metalworking activities during this long period, and to answer the question whether there are any differences between the right and the left arm, and between the work activities performed by men and women. The upper arm bones of three men and two women from burials uncovered at Polgár-Ferenci-hát were also examined as part of this research project. The findings indicated major differences between male and female samples: the alterations were more pronounced on female upper arm bones, which was consistent with the results for other Neolithic sites included in the analysis. The differences were linked to the division of labour between men and women. It would appear that women performed a greater variety of tasks more intensely than men did during this period: they planted and harvested, ground cereals, made pottery, tended the livestock, etc. Since there were no apparent differences between the right and the left side, they probably used both their hands to the same extent during these activities.<sup>16</sup>

## WERE THERE DIFFERENCES IN DIET?

The analysis of carbon and nitrogen stable isotopes sheds light on the individual's diet, on his/her access to protein, and helps determine whether the person was born in the same geological environment where he or she grew up and was eventually buried. Samples from about one-third of the burials uncovered at Ferenci-hát were submitted to carbon ( $\delta^{13}\text{C}$ ), nitrogen ( $\delta^{15}\text{N}$ ), and strontium ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) analyses as part of the

<sup>16</sup> Macintosh, Alison A. – Pinhasi, Ron – Stock, Jay T.: Divergence in male and female manipulative behaviors with the intensification of metallurgy in Central Europe. *PloS ONE* 9 (2014)/11, (last accessed: 07.06.2016.)

LBK Lifeways project.<sup>17</sup> The findings indicated that there was no significant difference between men and women. However, the high  $\delta^{15}\text{N}$  values for four children suggest that they were still being breastfed, even though their ages were different (two were one-year-olds and two were older, around 2 to 3 or 2 to 4 years old). Similarly to other Central European LBK sites, the strontium isotope values were higher in the case of women, suggesting that they acquired foods containing strontium from a greater variety of sources.

### WHAT HAVE WE LEARNED SO FAR?

The findings of the various analyses performed on samples from the Middle and Late Neolithic human remains from Polgár allow a glimpse into the life of the farming communities originating from the Near East and living on the northern fringes of the Hungarian Great Plains several millennia ago. It seems quite certain that life was hard with much backbreaking work, they suffered from different injuries and ailments, and there were periods when adequate amounts of good quality food were unavailable—there seems to be no difference between the region's areas and periods in this respect. At the same time, the preliminary findings also shed light on a major difference, namely the difference between the sexes. Men and women were demonstrably engaged in different activities: women used their hands and arms much more and used their teeth too for performing various tasks. Their diet also differed: girls and adult women had access to less food and less protein than men did. Their general health condition was further impaired by pregnancies and the increasing stress while breastfeeding children.

The analyses performed on the skeletal remains unearthed in the course of archaeological investigations offered us a glimpse into several dimensions of the daily life of the farming communities living in the region. Although some of our initial questions have been answered, these raised new questions, which can only be answered through future investigations. For example, we have no idea of why time was “compressed” at Polgár-Csőszhalom, and why so many funerals were held at roughly the same time. We know little about men's work at Polgár-Ferenci-hát; it is possible that hunting, woodcutting, and other traditional male tasks involved a more even, continuous stress that did not lead to alterations on their bones. We have no explanation for the dietary differences between men and women, with the result that women became disadvantaged in terms of general health in the sixth millennium. What we do know is that at the onset of their migration from Anatolia, there were no differences of this kind between the sexes.<sup>18</sup> We still lack the answer to the question whether women's higher strontium levels attest to their greater mobility and practices of virilocality/patrilocality at Polgár too, as it has already been observed at other sites of the Central European LBK.

These findings, which primarily shed light on prehistoric men and women as biological beings, in part take us closer to seeing these peoples as social creatures too. However, in order to gain a full picture, in other words, to speak about biosocial archaeology,<sup>19</sup> rather than bioarchaeology, we must also examine the grave goods and their contexts. The next part of our study will focus on the realm of human burials and grave offerings in order to discover other aspects of the lives of prehistoric peoples and get an insight into the lives of both individuals and their community.

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<sup>17</sup> Whittle, Alasdair – Anders, Alexandra – Bentley, A. – Bickle, Penny – Cramp, Lucy – Domboróczki, László – Guba, Zsuzsanna – Fibiger, Linda – Hamilton, Julie – Hedges, Robert – Kalicz, Nándor – Marton, Tibor – Oross, Krisztián – Raczky, Pál: Hungary. In: *The First Farmers in Central Europe: Diversity in LBK Lifeways*, ed. Whittle, Alasdair – Bickle, Penny (Oxford: Oxford University Press, 2013), 49–100.

<sup>18</sup> Hillson, Simon W. – Larsen, Clark Spencer – Boz, Başak – Pilloud, Marin A. – Sadvari, Joshua W. – Agarwal, Sabrina C. – Glencross, Bonnie – Beauchesne, Patrick – Pearson, Jessica, A. – Ruff, Christopher – Garofalo, Evan M. – Hager, Lori D. – Haddow, Scott D.: The Human Remains I: Interpreting Community Structure, Health, and Diet in Neolithic Çatalhöyük. In: *Humans and Landscapes of Çatalhöyük*, ed. Hodder, Ian (Los Angeles: Cotsen Institute of Archaeology Press, 2013), 339–396.

<sup>19</sup> Zvelebil, Marek – Pettitt, Paul: Biosocial archaeology of the Early Neolithic: synthetic analyses of a human skeletal population from the LBK cemetery of Vedrovice, Czech Republic. *Journal of Anthropological Archaeology* 32 (2012), 313–329.

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## RECOMMENDED LITERATURE

BÁNFFY, ESZTER

German-Hungarian bioarchaeological research project in the Archaeological Institute of the Research Centre for the Humanities, Hungarian Academy of Sciences. [Hungarian Archaeology](#), 2013/Summer, (last accessed 07.06.2016).

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Biosocial archaeology of the Early Neolithic: Synthetic analyses of a human skeletal population from the LBK cemetery of Vedrovice, Czech Republic. *Journal of Anthropological Archaeology* 32 (2012), 313–329.