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– thesis book of dissertation –

Geoarchaeological and environmental historical survey prospects on kurgans in the eastern part of the Great Hungarian Plain

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1. Introduction, aims

Unfortunately, only a few medieval architectural monuments remained in the central region of the Great Hungarian Plain. Destructions by invaders like the Tartars and the Turkish demolished numerous important buildings that could not been rebuilt later. However, there are still some unique 5000 year-old treasures existing in this very area, these are mounds (kurgans).

Mounds can be found at the banks of not-longer existing rivers and at some points of higher altitude areas. The oral tradition of the Great Hungarian Plain marked the man-made, artificial, conical rises in the landscape that are associated with ancient, archaeological periods as mounds.

Although, these kurgans are important features of the Hungarian landscape, we still do not have enough information of them. Many hypotheses exist that blurs the current point of views. But mounds have high importance, as they hide numerous information dating back to tha past thousand years. Each mound keeps valuable information from ethnological, onomastical, local historical, botanical, zoological, hydrological fields.

Due to the constant agricultural cultivations in these areas, most of the mounds are endangered. Many have permanently disappeared, the remainings are struggling from being destroyed. Therefore, research of mounds in the Great Hungarian Plain is highly important and indispensable. We need to act now to perform scientific data collections, surveys and cadasters to protect the cultural heritage of these earth monuments.

In 2012, it was possible that scientific process of Ecse-halom can begin in the Hortobágy National Park. We present in this complex environment geoarchaeological and environmental historical research. The scientific methods used and the available historical documents, try using more detailed and nuanced picture of the past five thousand years of an investigation.

Our goal was do complex geoarchaeological and environmental historical survey on the Ecse-halom mound (kurgan) in Hortobágy region, with geomorphology, landscape history, geoinformatics, botany, sedimentology, geochemistry, archaeological stratigraphy, micromorphology, fitology, pollen analysis, and natural condition survey.

The other goal was do an overall archaeological topographical and environmental historical survey on the mounds of the Middle Tiszántúl region. The primary goal of the survey was to map mounds of natural protection and landscape value, and to search for previously unknown ones. Therefore, while registering the mounds, we surveyed their current natural conditions and also considered their archaeological and landscape archaeology viewpoints.

The survey results fits well the research program that we have carried out by proxy and with the support of the Körös-Maros National Park Directorate (the Middle Tiszántúl region of the Graet Hungarian Plain). The program has worked towards mapping each mound located in the jurisdiction of the directorate support. The work was conducted in adjacent regions, having mapped particular areas in Csongrád county (fall 2007), the Csanádi-hát (spring 2008), the Békési-hát (fall 2008), the Nagy-Sárrét (spring 2009) and the Kis-Sárrét in Békés county (spring 2010). We were surveying mounds in 114 settlements between 2007 and 2011 (sum total 8000 km^2). During the study we usually collect all the available sources (handmade maps from the 18-19th centuries, medieval and later archives and archaeological documents) and scientific publications (local history, archaeology, folklore, onomatology, botanics, natural science, etc.).

Due to the constant agricultural cultivations in these areas, most of the mounds are endangered. Many have permanently disappeared, the remainings are struggling from being destroyed. Therefore, research of mounds in the Great Hungarian Plain is highly important and indispensable. We need to act now to perform scientific data collections, geoarchaeological, environmental historical and quartergeological surveys and cadasters to protect the cultural heritage of these earth monuments.

2. Methods

Handmade maps from the 18th and 19th centuries and modern printed maps provide the primary dataset for the geomorphological and landscape historical research. From these, landscape changes of the last two and a half centuries were documented and mapped. Archived documents were also consulted. Since the Ecse-halom mound stood on the borderline between two settlements for many centuries, there are documents of border-passing charters available from the Middle Ages and the Early Modern Period, which retained very valuable records not only about the kurgan as a border-point, but the surrounding landscape and land use as well.

An high accuracy satellite positioning equipment was used to create a contour map of the Ecse-halom mound and for the field modeling. With the help of this tool, we were able to assess the entire superficies of the kurgan and its immediate surroundings (buffer zone) in detail. Data evaluation and editing of the two and three dimensional geomorphological field models were conducted using geoinformatic programs. We have also reconstructed the status of the kurgan before the 20th century disturbances.

Each vegetational patch was documented by phytocoenological analysis to examine the interactions and interrelations between vegetation, climate, topography, soils and anthropogenic impacts to the mound. A vegetation map was created from the topographic and botanical data, and shows the locations of sampling units.

Mechanized drilling was carried out at the highest point of the mound. We used a hydraulic roto-percussion drilling rig with a 10 cm diameter double wall pipe for continuous coring with a thin-wall sampler. The complete length of the core was 10 m; 99.7% of the core was removed intact. Samples were taken from the core at 8 cm intervals on average. Altogether, 116 samples were subjected to sedimentological, magnetic susceptibility, soil organic matter and carbonate analyses. In addition, micromorphological samples were taken from the core. Organic matter and carbonate content determination were based on the loss on ignition methods. Sediment samples were treated with hydrogen peroxide to disperse clay aggregates prior to analysis.

6 piece radiocarbon test (AMS: Accelerator Mass Spectrometry) was carried out in the United States, operating in the city of Seattle DirectAMS laboratory. AMS test was used in all cases and the layers of the kurgan detected among herbivorous snails. The results of the raw physical measurements (uncal BP) was calibrated calendar years, and reconstructed in the trenches before Christ (BC) and after Christ (AD), when used in the Christian calendars.

Soil micromorphological analysis was conducted on eight thin sections taken from two sections within the Ecse-halom mound. Four samples were analyzed from the upper construction layer, from 250-270 cm depth. Four other samples were taken to examine the paleo Holocene B-horizon, from 550-570 cm depth. Prior to their removal, locations to be sampled were examined for provenience, structure, and association with other stratigraphic units. Samples were air dried, impregnated with resin, cut, ground, mounted and polished. Thin-section slides were examined under plain polarized and cross-polarized light on a petrographic microscope, and described using accepted terminology. Digital images were taken and processed simultaneously with the microscopy work and were also analyzed.

The phytolith analysis of soil, sedimentary units, archaeological objects, as well as in identifying samples from different parts of their experiences following a modified method was used, which is based primarily on the international proven methods provided. The 44 identified geological segmented pattern fitological placed under investigation.

The phytolith tests were performed on samples highlighted the spore pollen tablets analytical analysis. The standard test to measure the amount of material on the double, the sample was fortified. According to international standards, the statistical minimum set at 300-500 pollen grains/sample, however, the kurgan upper level has been prepared only numbers less than 100 grains pollen sample of the analysis is unique.

Our archaeological topographical and environmental historical research field is the surveying, identification and field studying of mounds in the Middle Tiszántúl region. During the study we usually collect all the available sources (handmade maps from the 18-19th centuries, medieval and later archives and archeological documents) and scientific publications (local history, archeology, folklore, botanics, etc.). So, we established a novel, flexible and complex database that is capable of integrating the upcoming scientific information.

As for our methodology, data collection from scientific literature and various archives was carried out simultaneously with field surveys. Therefore, if any new data or site reference emerges we make an effort to ground control it as soon as it is possible. Consequently, a continually growing database is being developed. We aim to collect data on each mound and investigate them from multiple perspectives. The significance of the hand-drawn maps must be particularly stressed. We attempted to search for and analyze each of the relevant maps that could potentially provide direct or indirect data on the mounds in the study area.

Each identified mound was ground controlled and their major characteristics were recorded during which their condition, the vegetation cover, and its quality were described. Central coordinates were taken by GPS, and their relative heights and diameters were estimated. In accordance with the original research goal, natural protection aspects prevailed in the course of these surveys.

3. Results

(1) The Ecse-halom is a burial mound in the Hortobágy region of Hungary. It now stands on the border between two modern settlements (Karcag and Kunmadaras). A road of medieval origin runs along this border and cuts deeply into the body of the mound, it shows also the geoinformatical survey. The southern half of the mound was plowed and used as a rice field, and later a military observation tower was built on top of it. Despite this disturbance, the surface of the mound is in decent condition and provides a home for regionally significant, species-rich loess steppe vegetation.

(2) The kurgan built in the Late Copper Age/Early Bronze Age (the end of the third millennium B.C.) by nomadic peoples from the east (Yamnaya culture).The mound comprises two construction layers as indicated by magnetic susceptibility and thin-section analysis. Examination of organic compounds and carbonate content at various levels showed different values. Grain size distribution within the section is characterized by mid-sized aleurite fraction. The layers originate from the immediate vicinity of the mound, but have different characteristics than present-day soils. These mounds contain a valuable record of cultural and environmental conditions at the time of their construction, as well as serving as a refuge for ancient loess vegetation, and their conservation is highly recommended.

(3) The cross section of the particle size distribution of from 0.002 to 0.06 mm silt, was also within the dominance of fine silt fraction of particles from 0.002 to 0.02 mm in diameter is typical. Based on the particle composition, carbonate and organic matter content, as well as the magnetic susceptibility values of kurgan body shaping effect of water meadows, chernozem nature and saline soils are used as well.

(4) The mound of people in the developing Yamnaya culture changed the local geology, hydrogeology, geomorphology relationship cookies, as a follow up to a virtually continuous dry, isolated terrain have created a periodically flooded marsh environment. As a result of the geological and hydrogeological conditions of soil formation and biological options (such as vegetation cover) fundamentally changed. These effects of the extralocal level about 5 acres of land constitutes only had, but in this area have been completely changed the geological, hydrogeological, geomorphological conditions.

(5) The developed dry mound body surface soil formation has taken place during the Late Bronze Age (the end of the second millennium B.C.), but a more prominent position in relation to the original environment, the result of accumulated soil organic matter, rock fluor rich geological environment. On surface of the kurgan the soil formation has taken place during the Late Bronze Age as well (the end of the second millennium B.C.). Characterize the period immediately preceding the kurgan building, and thereafter until the present environment of open vegetation, dry and wet prairies, marshes and saline mosaics. After the Ecsehalom was built the natural geomorphologic conditions have fundamentally changed, and a man-made island-like, dry habitats formed with a portion weedy to today’s ever-increasing human impacts as a result and eroded surface-morphology also suffered a powerful transformation. Probably after the establishment of the mound settled in the kurgan loess steppe surface elements of the flora and vegetation conditions developed chernozem formation, forming a closed loess steppe lawn. Part of this weedy vegetation to today’s ever-increasing human impacts and eroded as a result, surface morphology, also suffered a powerful transformation.

(6) We have field surveyed altogether 2335 mounds (kurgans). The names of the mounds of the Middle Tiszántúl derive from ancient hydrology, topography, vegetation, modes of cultivation or animal husbandry. Through the names of the mounds we gain a better understanding of historical changes (e.g. the subsequent owners of a given mound), hence, we emphasize the importance of the originality of the toponyms. 982 out of the 2335 registered kurgans have names (42%), while 1353 have not (58%). The numerous and various natural, environmental historical and geological values of the mounds make the establishment of specific categories necessary for classifying them. Since the primary goal of the survey was to map previously unknown mounds valuable from natural protection and environmental perspectives, the classification by their significance was governed by this aspect as well. The establishment of a value-classification is inevitable prior to protection works, for it facilitates in the prioritization of mounds. We elaborated a scale with seven grade to rating mounds. The important mounds make up the Category of 1, 2 or 3, the unimportants make up the Category of 4 or 5, and the disappeared mounds make up the Category of 6 or 0. The number of important mounds (Category 1–3) is 564 (24.2%), the number of unimportants (Category 4–5) is 1133 (48.5%) and the number of distroyed mounds (Category 6 and 0) is 638 (27.3%). The practical conservation work is very urgent, because most of the small mounds will disappear undoubtedly within 5-15 years due to the weighty agricultural machines and the extensive agricultural work. Hence, following the best possible data collection and survey, each mound must be provided with an individual lot number, they must be back-swarded, bushes and trees must be removed, crossing roads must be detoured, and in the long run, they must also be reconstructed (i.e. to complement the quarried parts, to fill in the recent cuts and canals etc.). The only long-term solution is to take the mounds out of cultivation.

(7) The burial kurgans consistently positioned according to the geological conditions, the former bed of rivers and lakes has edges trajectories followed. The bedrock and geomorphology are basically determined by the position of the mounds.

(8) Nature conservation is the most valuable aspects of their mounds, which have retained their original primary loess vegetation, for example wall steppe vegetation (*Agropyron cristata-Kochietum prostratae* Zólyomi 1958) and the structure and elements of loess steppe vegetation (*Salvio nemorosae-Festucetum rupicolae* Zólyomi ex. Soó 1964) show the characteristics of species composition. The still existing stacks in 1697, only 57 kurgans (3.3%) in the wall steppe character species of Agropyron cristatum. In addition, another 52 kurgans (3.1%) as the primary interface guarded loess or very good condition, regenerated fallow land. Test our area may therefore be considered a total of 109 kurgan vegetation of major importance, it's all still existing mounds of 6.4%.

4. Main publications in the subject of the dissertation

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