THE ASTRONOMICAL ASPECTS OF THE ORIENTATION OF THE GRAVES IN THE BURIAL SITE OF ICLOD

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Abstract

The paper deals with research into the orientation of graves and other remains, found in Transylvania, Romania, whose alignment was mainly done on the basis of astronomical considerations (solar phenomena).

We start with the presentation of the graves found in the ancient (4200 BC) burial site at Iclod, where 72% of the graves were oriented within the solar arc defined by the annual migration of the sunrise's direction.

Similar research was carried out at the burial sites discovered at Tiszapolgár and Bodrogkeresztúr (Hungary), Gomolova and Mokrin (Yugoslavia) and Cernica (Romania)

These results indicate the existence of a Sun-cult.

Introduction

Funeral rites have plaid an important part in the everyday life of Neolithic societies, as shown by the findings made at the excavation of the Neolithic cemetery at Iclod near Cluj-Napoca (Kolozsvár). The astronomical problem of the orientation of the graves found in the Iclod burial site is identical to the problems presented by the Neolithic cemeteries excavated at Cernica (Romania) [3], [4], [5], at Vésztő-Mágordomb, Kisköre, Villánykövesd and Zengővárkony, Tiszapolgár and Bodrogkeresztúr (Hungary) [1], [3] and at Gomolova and Mokrin (Yugoslavia) [2], [19].

The graves and skeletons were very often oriented relative to the cardinal astronomical directions (N, S, E, W) observable on the date of the burial [1], [2]. In this paper we aim to draw some conclusions regarding the possible existence of a Sun-cult during the Iclod culture (4200 BC, according to our deductions), by calculating the positions of the sunrise at the winter and summer solstices and relating them to the orientation of the graves [12], [13], [8], [9], [10], [11].

The Neolithic settlement at Iclod was first explored by Márton Roska (1942) at around the turn of the century. There were two burial sites. Site 'A' is on the banks of the river Someş (Szamos). Site 'B' lies between the villages of Iclod and Livada, and extends as far as the road and the railway line. So far 40 graves were discovered in site 'A' and 53 graves in site 'B'. The area of site 'B' includes the whole village. The arrow shows the north.

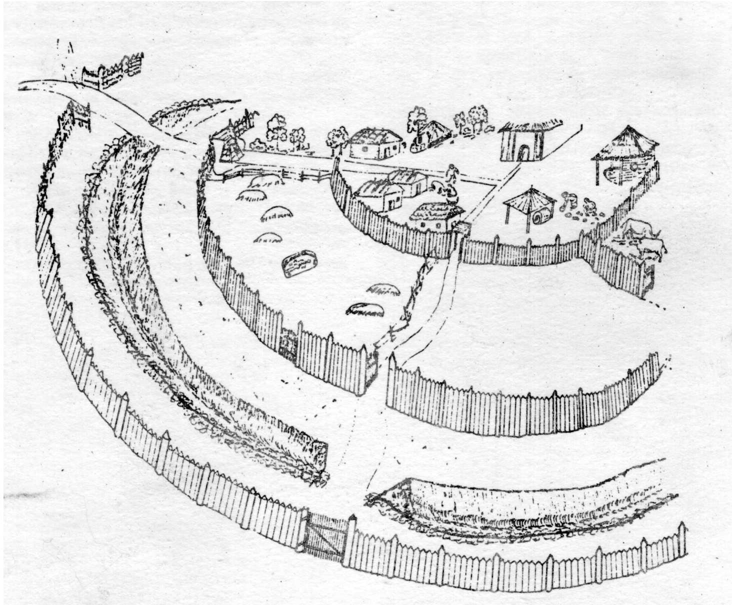

Figure 1: **Reconstruction of the settlement (after Lazarovici,1991).**

It is assumed that site 'A' is the earlier one, but it also contains graves of later origin. The graves in this site are well preserved. With the exception of a few graves, the bodies were laid down on their back. Their look is directed towards the rising sun (except graves M: 9, 12, 13, 18, 23, 26, 27, 28, 22, 38, 39). The graves also contained ceramic cooking utensils, four to five in the graves of site 'A', one to four in site 'B' and four to ten in the earliest graves.

During the later stages other artifacts make their appearance, such as objects made of stone, bones, flint, obsidian and slate. There were also some vessels made of paste of poor quality. We also want to mention graves in cemetery 'B': M18, M39 and M45, which are of special interest on account of some strings of pearls found attached to the skeletons' arms, legs and necks.

The ceramic vessels were placed either in groups, or arranged in rows, next to the corpses' feet, knees, waist or shoulder. Coupled vessels were an interesting feature of the graves buried in site 'A'. In graves of later origin other kinds of artifacts, such as pearls, spatulas, blades, tools made of bones or horns, implements made of flint, shale, opal or obsidian, and axes made of chiselled stone made their appearance.

One interesting skeleton of later origin was laid out in the NS direction, was 1.75 m tall, wore strings of sea shells around his ankles, wrists and neck. Next to his left foot there were four bradawls, made of horn, an obsidian splinter, a deer's thighbone and an axe. Consequently we may assume that it was a final resting place of a hunter.

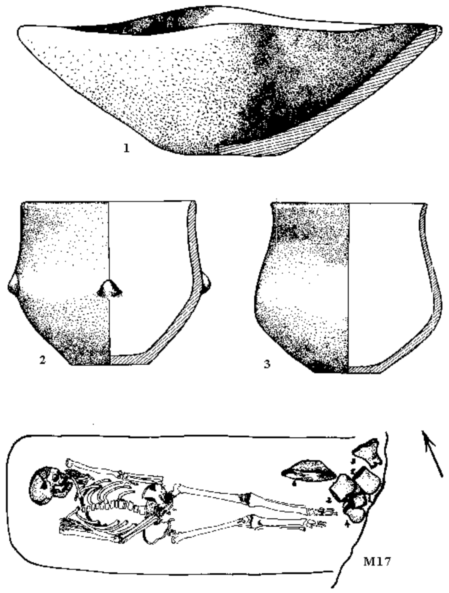

Figure 2: **Some vessels of characteristic type in the grave M17. 1.6 m tall skeleton, the angle of orientation is 95°. The arrow shows the north direction.**

Figure 3: **Grave of a teenage woman (M32); 1.30 m tall skeleton, orientation angle: 61°.**

Our explorations at Iclod show that these sites were established cemeteries, operated according to well established customs, rules and rituals, indicating a well developed burial culture.

The distribution of the orientation of the graves at Iclod

In order to verify our assumption that the angles of orientation of the graves fall within the solar arc, we calculated the value of the orientation angles projected to year 4200 BC. The actual points of sunrise and sunset, as seen in our time, differ from the points seen in 4200 BC. This well known effect is caused by the precession of the equinoctial points. During a full year the "sunrise" points describe an arc, whose extreme points define the (summer or winter) solsticial points. For the calculation of the azimuth (A) we used the following formula:

$$\cos A = \frac{\sin \delta}{\cos \varphi}$$

where δ = the Sun's declination, φ = the geographical latitude of Iclod = $46°59''.8$. (The h height of the Sun on the horizon is 0.)

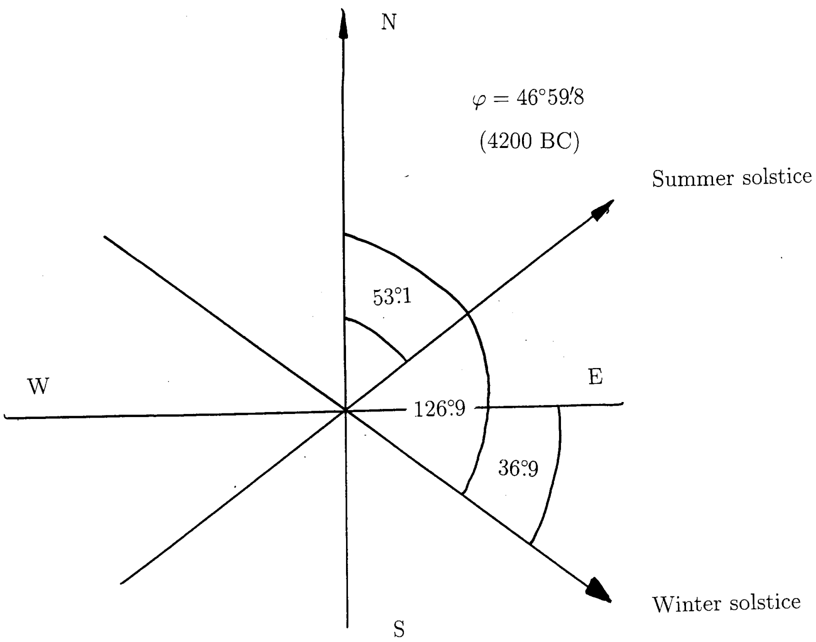

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Figure 4: **The solar arc at the latitude of Iclod.**

The extreme values of the declination of the Sun and the solstitial points were calculated using the method discussed in detail in this volume in the paper about the Parţa shrine p.12, (see [6], [18], [20]). The calculated values of angle of sunset and sunrise (measured from the North) are shown in Table 1:

The graves' orientation was determined from the oriented map of the site, using rulers and protractors. The data of the graves were analysed. We assume that the error of the determination was between 1° and 2°.

Available data of the graves are listed in Table 2/A and Table 2/B.

The distribution of the graves according to their azimuths has been constructed. In the analysis we made use of 20 graves from Site 'A' and 43 from Site 'B'. The result-

Table 1

	Summer Solstice (A_1)	Winter Solstice (A_2)
Azimuth – Sunrise	$53\overset{\circ}{.}122$	$126\overset{\circ}{.}878$
Azimuth – Sunset	$306\overset{\circ}{.}878$	$233\overset{\circ}{.}122$

ing diagrams of the alignment angles are shown in Figs. 5–8. Using the data of both cemeteries, 'A' and 'B', the combined distribution of the graves can be given in Fig. 9.

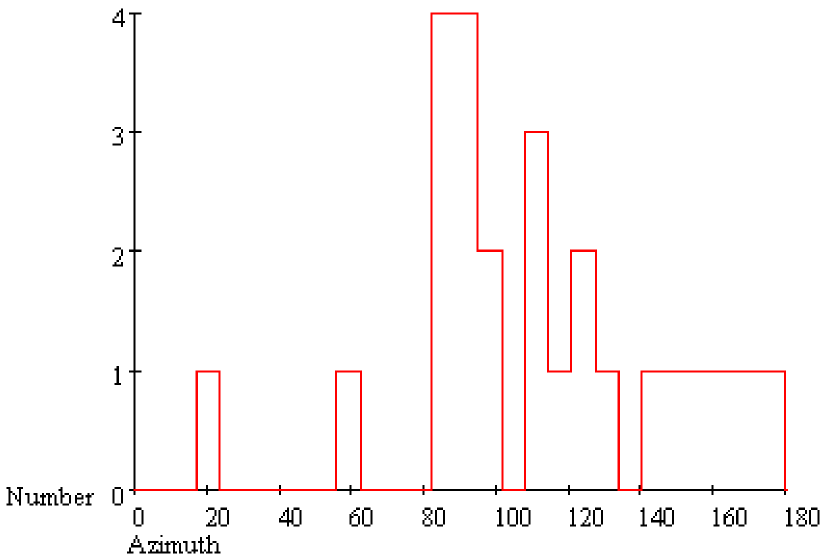

Figure 5: **Distribution in the 'A' cemetery given in 1° distances in azimuth.**

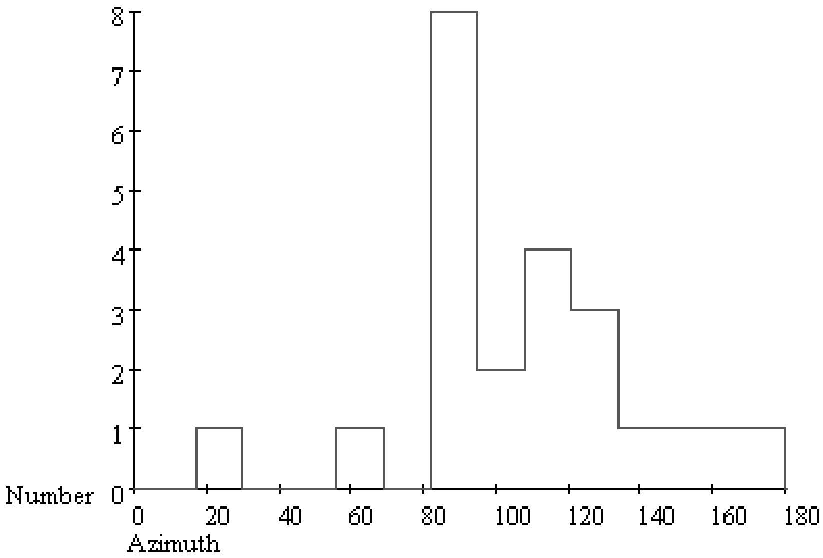

Figure 6: **Distribution in the 'A' cemetery given in 10° distances in azimuth.**

Table 2/A

Grave	Azimuth	No. of findings	Contents
M1	-	2	vessels
M2	-	5	vessels
M3	-	3	vessels
M4	-	2	vessels
M5	-	2	vessels
M6	-	4	vessels
M7	-	3	vessels
M8	-	3	vessels
M9	-	5	vessels
M10	122	7	vessels
M11	90	7	vessels
M12	89	4	1,7 m (skeleton), vessels
M13	147	2	1,1 m (child), vessels
M14	121	4	1,7 m (woman)
M15	-	-	(aged man)
M16	114	5	1,7 m (skeleton, sick), vessels
M17	95	3	1,6 m (skeleton), vessels
M18	112	6	1,7 m (man), vessels
M19	96	2	1,6 m (skeleton), vessels
M20	-	1	(man), vessels
M21	-	2	vessels
M22	92	5	2,6 m (skeleton), vessels
M23	-	-	-
M24	-	1	vessels
M25	90	1	2,1 m (skeleton), spoon
M26	88	5	1 m (skeleton), vessels
M27	-	5	vessels
M28	82	8	(aged man), vessels
M29	57	6	2,1 m (skeleton), vessels
M30	84	1	1,7 m (skeleton), vessels
M31	117	3	1,8 m (skeleton), vessels
M32	-	1	vessels
M33	-	-	-
M34	-	-	aged man
M35	84	-	-
M36	112	2	1,9 m (skeleton), vessels
M37	17	-	(teenage woman), vessels
M38	130	3	1,9 m (skeleton), vessels

Table 2/B

Grave	Azimuth	No. of findings	Content
M1	80	-	-
M2	0	-	-
M3	176	-	-
M4	90	-	-
M5	71	-	-
M6	78	-	-
M7	73	-	-
M8	158	-	-
M9	158	-	-
M10	39	-	-
M11	39	-	-
M12	158	-	-
M13	81	-	-
M14	78	-	-
M15	72	-	-
M16	83	-	-
M17	64	-	-
M18	10	7	1,75 m (skeleton), animal bone, vessels, spondylus, pearls
M19	44	-	-
M20	69	-	-
M21	70	-	-
M22	12	-	-
M23	74	-	-
M24	79	-	-
M25	70	-	-
M26	95	-	(aged woman)
M27	107	-	(aged man)
M28	160	-	(teenage woman)
M29	70	-	(aged woman)
M30	66	7	1,65 m (skeleton), animal bone, 6 years old boy, vessels
M31	55	-	(woman, child)
M32	61	1	1,30-m teenage woman
M33	68	-	aged woman
M34	75	-	1,8-m man, landslip
M35	-	6	1,55 m, aged
M36	110	4	1,25 m, teenage
M37	90	7	-
M38	10	2	1,10 m (skeleton)
M39	132	2	-
M40	90	-	aged

Table 2/B (cont.)

Grave	Azimuth	No. of findings	Content
M41	-	1	man crossing a house of phase II/III
M42	-	3	1,45 m (skeleton)
M43	-	2	1,50 m (skeleton), house crossing
M44	64	3	Mutilatu
M45	68	2	Gabriela
M48			
M49	-	-	7-8 years old girl
M50	-	-	35 years old man
M51	163	7	animal bone, vessels
M52	-	5	animal bone, vessels
M53	33	6	animal bone, 5 clods of ochre at the feet

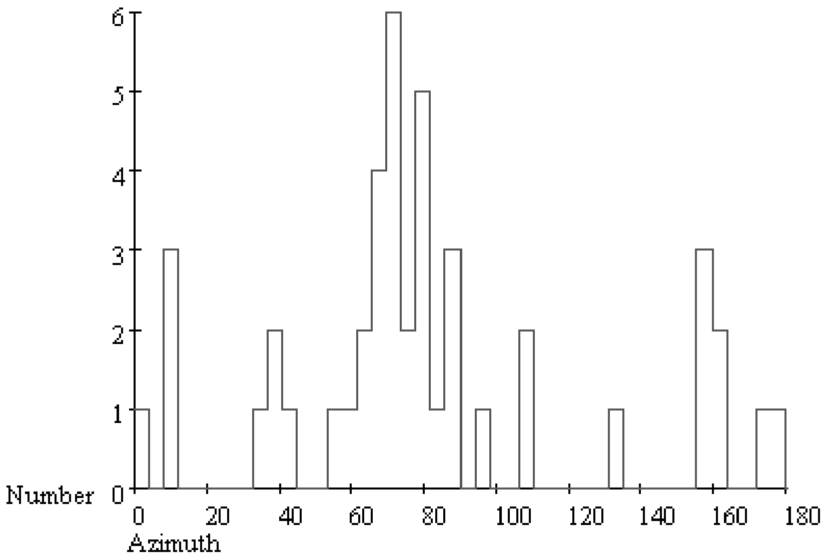

Figure 7: **Distribution in the 'B' cemetery according to 1° distances in azimuth.**

Inferences

Funeral rites plaid an important role in the life of Neolithic societies and the findings at Iclod strongly support this assumption. The graves can be divided into three groups, according to the time of their origin (Phases I - III). The earliest graves of phase I are found within the boundaries of the present day settlement, near the defensive earthworks. During phase II the burial ground spread to about 200 m in the SW direction. Towards the end of phase II and in phase III the burial place was re-transferred to the settlement area.

The graves usually contained some utensils buried with the body. It was noted that

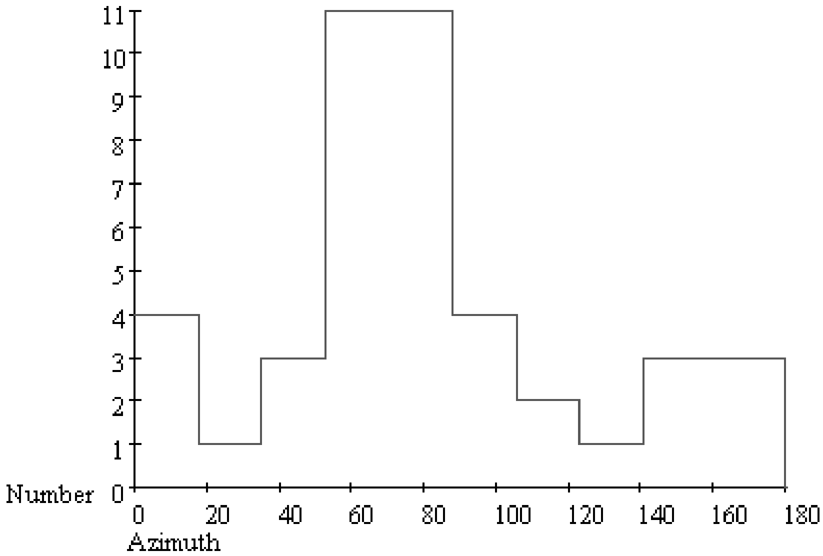

Figure 8: **Distribution in the'B' cemetery according to 10° distances in azimuth.**

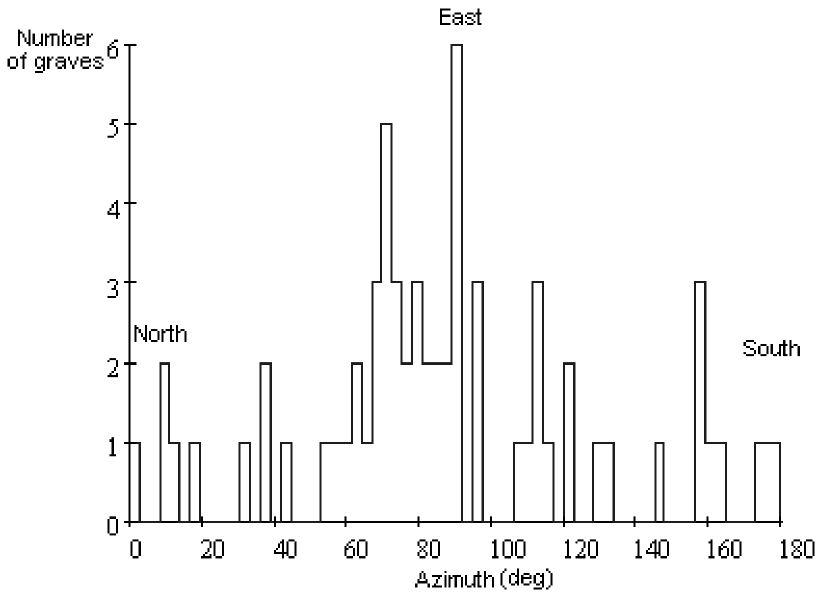

Figure 9: **Combined distribution of both cemeteries 'A' and 'B' according to 1° distances in azimuth.The 72% of the graves are to find within the solar arc, which here is about 73°.**

right from phase I the vessels found in the graves were arranged in a uniform manner. From the end of phase I graves yielding rich findings made their appearance. In these later times the custom was to place unused vessels (painted ornamental vessels, which, after firing could not be used for any household purpose) in the grave. Some vessels of a distinct type were repeatedly found, but their significance has not been as yet established.

The Iclod groups were found generally in the riverbed, or on the banks or shoals of the river Someş (Szamos). The settlements are quite extensive, as big as 80 hectares in

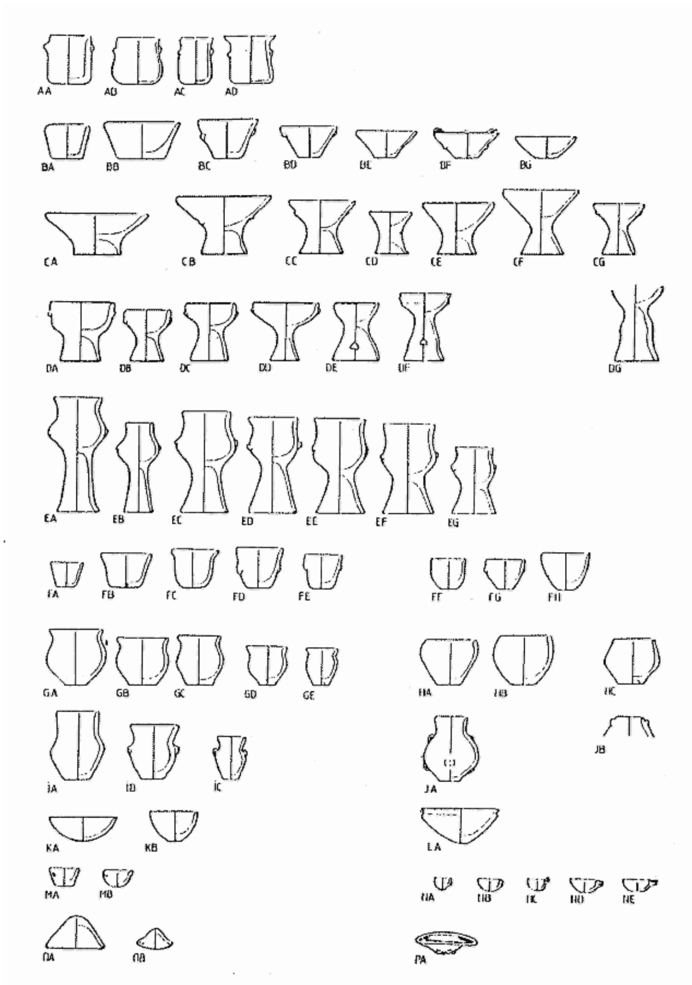

Figure 10: **Vessel types (after Lazarovici, 1991, p. 33).**

county Cluj, or four to five hectares for each phase at Iclod[1].

On the basis of our findings we can infer that the economy of the Neolithic inhabitants of the area was based on agriculture, hunting, fishing and animal husbandry.

The graves found outside the solar arc contain fewer artifacts (vessels) than those found inside. In these graves such utensils make their appearance as are usually found in the latest graves of the Iclod burial site, such as tools made of chiselled or carved stone. This fact led us to the tentative assumption that the third (last) phase was associated with a drastic change in burial customs, which manifested itself also in the changing of the graves' alignment to the NS direction. These changes in the spiritual and economic life of the community *seem to indicate the transition to the Bronze (Eneolithic) age.*

References

[1] Katalin Barlai, Ida Bognár-Kutzián, *Patterns of orientation in neolithic Cemeteries*, Current Problems and Future of Archaeoastronomy 2, (ed. Emília Pásztor), pp. 25-32, Budapest, 1995.

[1] Hectare is a Central European area unit. 1 hectare = 2.471 acres

[2] Katalin Barlai, *On the Orientation of Graves in Prehistoric Cemeteries*, Archaeoastronomy, VIII, pp. 29-32, 1980.

[3] Katalin Barlai, Ida Bognár-Kutzián, E. Zsoldos, *Rays of prehistoric sun*, Readings in Arhaeoastronomy, (ed. Stanistaw Iwaniszewski), Warsaw, 1992.

[4] Gh. Cantacuzino, S. Morintz, *Die Jungsteinzeitlichen Funde in Cernica (Bucharest)*, Dacia, NS, VII, pp. 27-30, Bucureşti, 1963.

[5] Gh. Cantacuzino, S. Morintz, *The prehistoric Necropolis of Cernica and its Place in the Neolithic culture of Romania and of Europe in the light of recent discoveries*, Dacia, 13, pp. 45-59, 1969.

[6] M.C. Castro-Cornide, M.S. Lopez Plaza, F.A. Romero, *Orientation Astronomique des Thombe mégalitiques a Couloir au Nord-Ouest de Peninsule Iberique*, Publ. Obs. Astron. Strasbourg, Ser. "Astron. and Sc. Humaines", pp. 108, 1992.

[7] E. Comşa, *Ritul şi ritualul funerar al purtătorilor culturii Boian şi Gumelniţa în Muntenia*, Acta Musei Napocensis, 32, I, pp. 257-268, 1995.

[8] Ida Kutzián, *The Copper Age Cemetery of Tiszapolgár - Basatanya*, Budapest, 1963.

[9] Ida Kutzián, *The Early Copper Age - Tiszapolgár Culture*, Budapest, 1972.

[10] Gh. Lazarovici, Zoia Kalmar, *Şantierul arheologic Iclod (1983-1984)*, Apulum, Alba Iulia, 23, pp. 25-41, 1986.

[11] Gh. Lazarovici, Zoia Kalmar, *Şantierul arheologic Iclod. vvCampania 1985*, Apulum, XXIV, pp. 9-39, 1987.

[12] Gh. Lazarovici, Zoia Kalmar, *Săpăturile arheologice de la Iclod. Campania din 1986*, Apulum, XXV, pp. 9-47, 1988.

[13] Gh. Lazarovici, Zoia Kalmar, *Săpăturile arheologice de la Iclod*, Apulum, XXVII- XXX, pp. 23-57, 1993.

[14] Gh. Lazarovici, *Şantierul arheologic Iclod (1977- 1981), Materiale şi Cercetări Arheologice*, Braşov, pp. 50-61, 1983.

[15] Gh. Lazarovici, Muzeul de istorie al Transilvaniei, *Grupul şi staţiunea Iclod*, Cluj-Napoca, 1991.

[16] M. Roska, *Erdély régészeti repertoriuma*, I., őskor, Kolozsvár, 1942.

[17] W. Schlosser, *Astronomy in Europe between 8000 and 1200 BC.* Ten years Archaeoastronomy at the Ruhr-University, Publ. Obs. Astron. Strasbourg. Serie "Astron. and Sc. Humanies", No. 3, pp. 79, 1989.

[18] A. Vince., *Astronomical Orientation of Skeletons in the Early Eneolithic Necropolis at Podlokanj*, Publ. Astron. Obs. Belgrade, No. 60, pp. 230-233, 1998.

[19] A. Vince, B. Jovanović, I. Vince, O. Vince, *Astronomical orientations of Graves and Skeletons in Gomolava and Mokrin*, Publ. Astron. Obs., 54, pp. 199-202, Belgrad, 1996.

[20] A. Wittmann, *The Obliquity of the Ecliptic, Astron. Astrophys.*, 73, pp. 129-131, 1979.