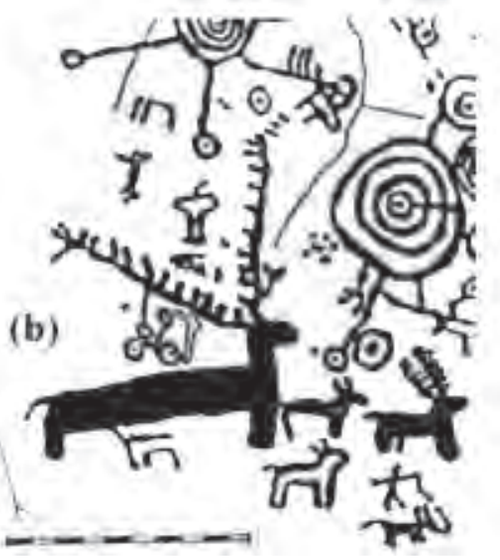
ARCHAEOLOGIA
BALTICA 10

ASTRONOMY AND COSMOLOGY IN FOLK TRADITIONS AND CULTURAL HERITAGE

Edited by Jonas Vaiškūnas

KLAIPĖDOS UNIVERSITETO LEIDYKLA

Klaipėda University Press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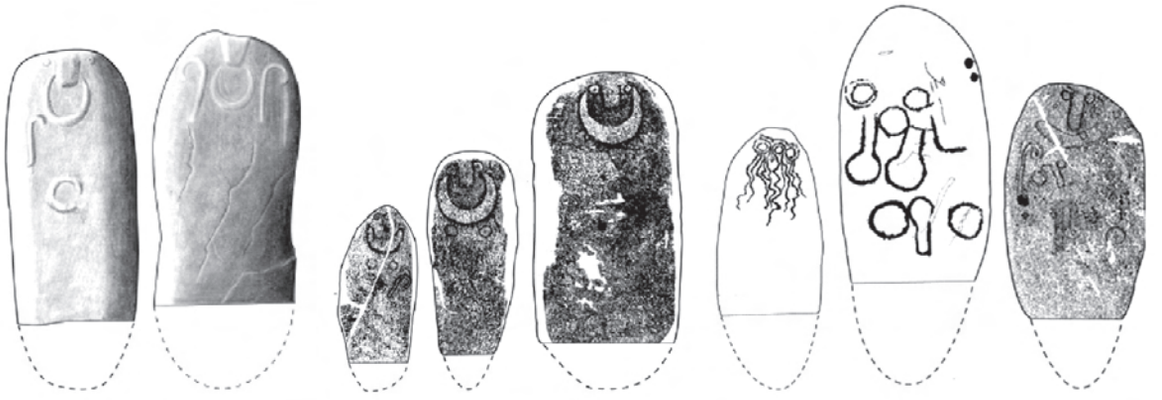

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INSTITUTE OF BALTIC SEA REGION
HISTORY AND ARCHAEOLOGY

LITHUANIAN INSTITUTE OF HISTORY

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Edited by Jonas Vaiškūnas

ARCHAEOLOGIA BALTICA 10

Klaipėda, 2008

UDK 902/904
Ar 46

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Archaeologia Baltica volume 10 was prepared by Klaipėda University Institute of Baltic Sea Region History and Archaeology and Museum of Molėtai district

Published with a grant from the Ministry of Education and Science of The Republic of Lithuania

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ISSN 1392-5520

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PREFACE

The tenth volume of *Archaeologia Baltica*, "Astronomy and cosmology in folk traditions and cultural heritage," is dedicated to the scientific work of the interdisciplinary research fields of archaeoastronomy and ethnoastronomy that have developed in the second half of the 20th century. The publication is based on the presentations of the international SEAC 2007 and OXFORD VIII conference "Astronomy and cosmology in folk traditions and cultural heritage." At the initiative of SEAC (La Société Européenne pour l'Astronomie dans la Culture) and ISAAC (The International Society for Archaeoastronomy and Astronomy in Culture), the conference was held on 22-31 July, 2007 and organized in Klaipėda by Klaipėda University in collaboration with the Molėtai District Museum. Forty-two of the best conference presentations were evaluated by specialists in these fields and selected according to how well they corresponded to scholarly requirements and dealt with appropriate research questions in cultural astronomy.

The object of research in cultural astronomy is not that of heavenly bodies and the universe in themselves, but rather the traditional knowledge of the celestial bodies and the universe developed by various peoples and cultures. Two research approaches are characteristic of cultural astronomy: archaeoastronomy and ethnoastronomy. Archaeoastronomy is directed toward the investigation of the astronomy of prehistoric cultures based on archaeological evidence, while ethnoastronomy also investigates present-day communities' ethnic knowledge about heavenly bodies, using modern ethnographical and ethnological research methods. However, the field of cultural astronomy is commonly called archaeoastronomy and the scientists who engage in it – archaeoastronomers.

Researchers interested in issues regarding cultural astronomy gather at this field's conferences every year. The international organization SEAC arranges annual conferences that examine the most relevant problems in cultural astronomy. The founder of this organization was astrophysics Professor Carlos Jaschek (1926-1999) of Strasbourg University. He had suggested founding an organization that would take on researching European archaeoastronomical and ethnoastronomical problems during an archaeoastronomy and ethnoastronomy conference in Strasbourg in 1992. The first SEAC conference was held in 1993 in Smolyan, Bulgaria. The goal of these conferences is to unite together scientists from various countries all around the world for broad interdisciplinary discussions regarding the fields of archaeoastronomical and ethnoastronomical research, with the aim to present and discuss the newest achievements and opportunities in the investigation of knowledge regarding heavenly bodies, astronomical practice, and reflections of world conception in old and current ethnocultural traditions. Fourteen international conferences had been organized before 2007. The SEAC conference in Lithuania was the fifteenth.

In addition to the annual SEAC conferences, the Oxford conferences on archaeoastronomy are held on average every four years. These conferences acquired their name from the first conference that occurred in 1981 at Oxford University. Seven Oxford conferences had been organized before 2007. Originally an International Steering Commitee organized these conferences, under the leadership of Michael Hoskin and Anthony Aveni. At Oxford 7 in 2004, the role of conference organizer was taken on by a formal international organization, ISAAC, which had been founded in 1995. In 1999 a joint conference was organized by the two international organizations, SEAC and ISAAC, in the Spanish Canary Islands. The conference in Klaipėda was the successful continuation of the collaboration that began in the Canary Islands between these two international organizations of researchers in cultural astronomy.

Conference participants.

The next, 16th SEAC conference is planned for 2009 in Alexandria, Egypt, while the 9th Oxford conference is planned for 2011 in Lima, Peru.

Conference moments.

The first archaeoastronomy conference in Lithuania was organized in 1988 together with Latvian and Estonian scientists at the Molėtai Astronomical Observatory. It was decided to arrange such conferences annually, taking turns with hosting their locations in the three Baltic countries. The initiators of these meetings were Libertas Klimka (Lithuania), Heino Eelsalu (1930-1998) (Estonia), and Jānis Klētnieks (Latvia). Several such conferences took place during the span of 1989-1991. However, when the Baltic states regained their independence, the tradition of organizing these conferences broke off.

Lithuanian researchers' ties with the SEAC began to form in 1995 when, for the first time since the fall of the Soviet Union, J. Vaiškūnas and S. Lovčikas, representatives of the Lithuanian Ethnocosmology Center, attended the SEAC conference in Sibiu (Romania) (Rastenienė 1996) and became members of the SEAC. Since then, at least one representative from Lithuania has attended the SEAC conferences almost every year. At the general assembly of the SEAC in Gdansk in 1997, it was suggested that the 2000 SEAC conference take place in Lithuania, at the Ethnocosmology Museum. However, due to unfortunate circumstances, the conference did not take place in Lithuania, but rather was transferred to Moscow.

During the SEAC conference of 2002 in Tartu, an offer was made to Jonas Vaiškūnas to organize the 2007 SEAC conference in Lithuania. Later it was decided that this would be a joint SEAC and OXFORD conference. Organizing a conference of this scale became possible only with the agreement of Klaipėda University's Baltic Sea Region History and Archaeology Institute to collaborate in its organization, together with the Molėtai District Museum.

On 22-31 July, 2007, over the course of eight days, researchers from different countries all over the world engaged in extensive discussions of interdisciplinary scope in the new and modern auditorium and service complex of "Studlendas" at Klaipėda University. Eighty-two scholars participated in the conference and 72 of them gave presentations. The presenters represented 26 countries: those of the European Union, the United States of America, Argentina, Norway, Israel, Australia, Russia, Belarus, and other countries. Representatives of various humanistic and scientific disciplines participated in the conference: historians, archaeologists, anthropologists, astronomers, physi-

Discussion "Archeology, Folklore and the Recovery of Past Astronomy and Cosmology". Speeches of Izold Pustylnik (Estonia) (left photo) and SEAC president Juan Antonio Belmonte (Spain) (right photo).

cists, mathematicians. The aim of the research: the search for astronomical knowledge and traces of the practice of observing celestial bodies in spiritual and material cultural heritage, striving to comprehend the worldview of both ancient and current societies. The following themes were examined in the conference:

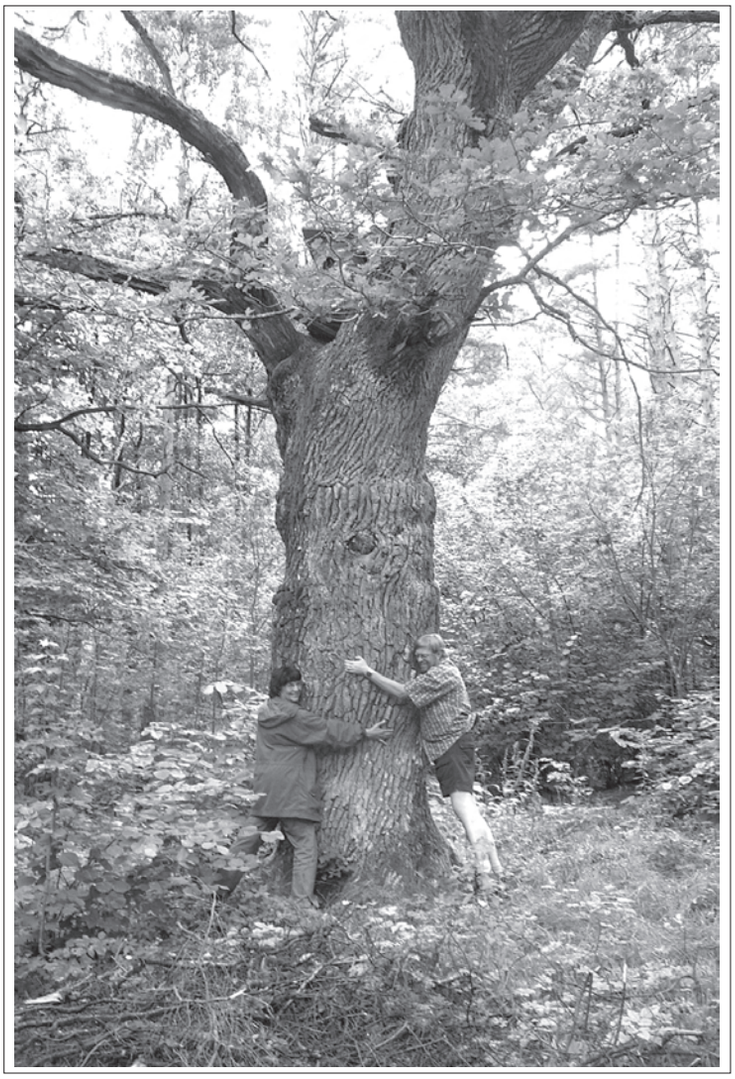
- Reflections of astronomical and cosmological knowledge in folk culture;
- Astronomical and cosmological knowledge in religion, mythology, and literature;
- Reflections of astronomical and cosmological knowledge in monuments and landscapes;
- Landscape archaeology and archaeoastronomy;
- Archaeology, folklore, and the recovery of past astronomies and cosmologies;
- History of the constellations;
- Astronomical and cosmological iconography;
- Calendars in artefacts, folklore, and literature;
- History of astronomy;
- History of astrology;
- The protection of remnants of interest for the history of astronomy: problems and propositions.

Attention also was paid to archaeoastronomical research methodology; a roundtable discussion entitled "Archaeology, folklore, and the reconstruction of the astronomy and cosmology of the past" was organized. The limits and possibilities of the application of astronomical and cosmological information gleaned from folklore, archaeological material, and historical sources were critically evaluated in the discussion. The question was raised: In what way can we, and, indeed, can we at all really reconstruct astronomical practices and cosmological knowledge using the limited facts that fall into our hands? A collection of abstracts of the conference's presentations were published as a separate publication before the conference (Vaitkevičius and Vaiškūnas 2007).

Prof. Dr. Jan Erick Solheim and Sami actor and musician, Ante Mikkel Gaup. Presentation at planetarium show "The Sami hunt of the celestial elk"..

Ritual folk group "Kūlgrinda"; Presentation of Baltic programme for conference participants.

The conference participants had the opportunity to tour the Curonian Spit in-between conference sessions. A two day excursion to get acquainted with Lithuanian cultural heritage monuments was arranged after the conference. Conference participants from Norway presented the Klaipėda and Molėtai community with an original cultural-educational program dedicated to Sami mythical narratives about heaven. Sami story tellers Ante Mikkel Gaup and Øistein Hanssen showed the traditional Sami northern hemisphere constellations in the mobile planetarium and told Sami legends about the starry sky, accompanying the picturesque stories with Sami folk music dedicated to the constellations – *yoik* sounds. This program was presented three times in Klaipėda and six times in Molėtai.



USA scholars Prof. Roslyn M. Frank and Gregory E. Munson receiving powers of the Lithuanian oak.

The first global archaeoastronomy conference in Lithuania was a success, although not without the usual difficulties and misunderstandings. The organizers and participants provided a generally creative, industrious, and elated spirits at the conference.

The conference's success was ensured by the good will and support of Klaipėda University's Rector Vladas Žulkus and the enthusiasm of the dedicated workers of the Baltic Sea Region History and Archaeology Institute. We thank the most active conference organizing assistants, the members of the conference's Organizing Committee: M.A. Jurga Žukauskaitė-Alvarez Romero, Dr Vykintas Vaitkevičius, Prof. Dr Algirdas Girininkas, Dr Vytautas Tumėnas, and M.Sc. Jonas Marozas. Thanks also to Prof. Dr Roslyn Frank, Prof. Dr Arnold Lebeuf, Prof. Dr Clive Ruggles, Prof. Dr Steve McCluskey, Dr Michael Rappenglück, Dr Arkadiusz Sołtysiak, and the other members of the conference's Scientific Committee and reviewers who worked very hard so that the scholarly level of the conference could be the highest possible. We thank our colleagues from Norway, Prof. Dr Jan Erick Solhaim, as well as Ante Mikkel Gaup and Øistein Hanssen who enlivened the intensive scientific program of the conference with a very fine cultural program.

For their material and economic support we are thankful to the Directorate for the Commemoration of the Millennium of Lithuania under the Auspices of the Office of the President of the Republic of Lithuania, the Lithuanian State Science and Studies Foundation, and the Ministry of Education and Science of the Republic of Lithuania.

References

SEAC 2007 & OXFORD VIII conference website: http://muziejus.moletai.lt/seac

SEAC official website: www.archeoastronomy.org

ISSAC official website: www.archaeoastronomy.org

RASTENIENĖ, D., 1996. Archeoastronomija, Etnoastronomija: pradžia. *Liaudies kultūra*, 1, 1-6.

VAITKEVIČIUS, V., VAIŠKŪNAS J., eds. 2007. *Astronomy & Cosmology in Folk Traditions and Cultural Heritage*. Abstracts. Klaipėda: Klaipėdos universiteto leidykla.

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SECOND PARTS CAN ALWAYS BE BETTER!

In June 1999, nearly a hundred specialists in the field of cultural astronomy met at the *Museo de la Ciencia y el Cosmos* in Tenerife (Spain) on the occasion of the Oxford VI International Symposium on Archaeoastronomy, which coincided with the 7th Annual Meeting of SEAC. This was a great chance for an important group of researchers from all five continents to meet on the Atlantic coast of Africa and to exchange knowledge and personal impressions throughout a very busy week. In subsequent years, SEAC has continued to hold annual meetings in different European venues (Moscow, Stockholm, Tartu, Leicester, Kecskemet, Isili and Rhodes) and, on most occasions the vast majority, if not all, of the participants came from European countries. On the other hand, most of the participants at the Oxford VII Conference in Flagstaff (Arizona) came from North America, with only a handful from Europe and other areas of the Old World. It was indeed time to repeat the 1999 experiment and to find a good location for it.

The Canary Islands have for a long time formed a bridge straddling Europe and the Americas with strong roots in the African continent. Our venue for the Oxford VIII International Symposium and the 15th Annual Meeting of SEAC also straddles East and West. It is the University of Klaipėda on the Baltic coast of Lithuania. For many centuries during the Middle Ages, this land formed the frontier between Christians and pagans; later, under the framework of the Polish-Lithuanian Commonwealth, it stood at the limits of three expanding worldviews – Catholic West, Orthodox East and the Muslim power of the Ottoman Empire. In the present day Lithuania has become the furthest frontier of the European Union. It would have been difficult indeed to find a better place!

At this new opportunity to form a bridge between cultures, the joint Oxford-SEAC Conference has opened the minds of the participants to a marvellous variety of cultural aspects of astronomy, not only from East and West but worldwide, from the deserts of Australia to the steppes of the Chaco. The conference programme, and the subsequent Proceedings that the reader now has in his or her hands, demonstrate the ability of societies worldwide to deal with the sky and its motions, incorporating these in their folk traditions and deriving from them the facility to produce "artefacts" varying from monumental buildings down to modest wooden calendar sticks, which can be counted among the precious jewels of human heritage. The researchers, who come from all five continents, were skilful in introducing the audience to the minds of these people, not at all an easy task!

I am not going to offer a summary of what we saw and heard throughout six very intensive days of sessions in Klaipėda, since this task was performed marvellously well at the event (and is now presented in this volume) by my colleague Prof. McCluskey, President of ISAAC. However, I should not end without offering our most special acknowledgements to the organizers of the conference. Thanks go to Jurgita Žukauskaitė, our excellent secretary, Vytautas Tumėnas, our "guide", Vykintas Vaitkevičius, our "public relations officer", and Algirdas Girininkas for making our stay in Klaipėda, and our lengthy and densely packed excursion across the beautiful lands of Lithuania, an intimate and unforgettable experience. Jonas Vaiškūnas was the spirit and motive force of the conference. He wanted his colleagues to join him in his country, something he had worked hard towards for many years, and he managed to do so in a marvellous way. Congratulations to all of you who gave us the chance to get to know at least part of the soul of Lithuania. Notwithstanding, this volume is the final prize for all of these efforts. Please enjoy it!

Juan Antonio Belmonte, President of SEAC

CONFERENCE SUMMARY: A HISTORIAN'S PERSPECTIVE

I imagine all of us have different perspectives on this week's discussion of "Astronomy and Cosmology in Folk Traditions and Cultural Heritage." My perspective is that of a North American historian of science, who seeks to understand the astronomies of past cultures and observes those past cultures from the perspective of an outsider. As it turned out, the difference between the perspective of outsiders and insiders was one of the biggest differences of the conference. Many of the workers in Europe are seeking their own past by studying their own culture, while most archaeo- or ethnoastronomical research in previous Oxford conference had concerned the astronomies practiced in other cultures. No matter how great one's emotional investment in the Navajo or the early Britons – and we should always remember that anthropologists and archaeologists do develop an attachment to the peoples they study – this professional bond is of an entirely different order from the strong affective ties that develop in the course of studying one's own community.

Besides this difference in attachment, the historian (and for that matter, the archaeologist) is used to looking at evidence from the past to illuminate the period when that evidence was created. Students of European cultures often look to evidence from the present – or from the recent past – for the light that it sheds on presumed traditions of the distant past. Rather than deal with the whole conference, let me deal with a few topical examples that reflect the historian's concern with historical evidence.

One recurring theme in a number of papers concerned the limits of the oral tradition. Jarita Holbrook provided a marvelous example of how the contemporary people she was studying said their elders knew many more stars than the ten that they themselves knew, while earlier ethnographic literature reports that their elders only knew the same ten stars. That should be a cautionary warning for our faith in the wisdom of the ancients; they may have known more, but as Stanisław Iwaniszewski warned us, the myth of a past Golden Age is a common element of fringe archaeology. Let me add a further version of that myth which I recently came across (Silberman 1995, p.251-3). The Golden Age, according to this version of the story, is followed by a period of suppression by its opponents, after which the culture and its wisdom is reborn (or resurrected) through the actions of an archaeologist or historian who plays the mythic role of hero. To what extent are we seduced by this attractive role in our attempts to reconstruct ancient knowledge?

Several of our presenters spoke of the diversity of traditions we are trying to reconstruct. Ray Norris reminded us that in Australia there are some 400 different aboriginal linguistic groups; Alejandro Martín-López carried this diversity farther, noting that even within a single community there are diverse – and sometimes competing – subtraditions through which Mocovi cosmology becomes a field of dispute and negotiation. These important insights into the multiplicity of traditions cannot be neglected in future ethnoastronomical work.

Some of the papers built on material more familiar to the historian of astronomy. Examples of this are the papers of Arkadiusz Sołtysiak and Krzystof Jakubiak detailing elements of Mesopotamian astronomy and of Vito Polcaro and Antonelli Ghignolli using medieval historical material to gain data for interpretation of astronomical theory. Two papers that impressed me for their use of iconographic evidence were Audrius Beinorius's paper on the iconography of Indian astronomy and Jonas Vaiškūnas's on the iconography of a Lithuanian zodiacal bowl. As Beinorius pointed out, Indian iconography demonstrates the transmission of Greek astronomical ideas to India, while Vaiškūnas's example provides a nice illustration of how a living Lithuanian culture absorbs and transforms elements from the zodiac, a zodiac which is in turn transformed as the Christian tradition literally obscures the earlier pagan one. As a historian, incidentally, I'm disappointed that the Christian overpainting that covered the original writing was apparently lost through the modern restoration; it's a reminder that we should not privilege any period in a culture's history.

Flavia Pedrosa Lima reminds us that astronomical interpretation of myths (and interpretation of astronomi-

cal myths) goes back to the 19th century, but she raises the important question of whether those interpretations reflect the point of view of the indigenous mythmaker or of the western interpreter. To what extent are we less than critical in using ethnographic sources that share our values? Arnold Lebeuf, in his study of his clerical antiquarian namesake, alluded to how the interchanges among gentlemen-scholars give insights into seventeenth and eighteenth century scholarship and conceptions, illustrating that an awareness of the historical background of those who wrote our ethnohistorical sources is essential if we are to properly interpret of those sources. Furthermore, we should be conscious of our own tendency to project twenty-first century world views on the people we study. Thus when the philosopher José Fernandez Quintano used the lack of sufficient economic surplus to support a priesthood to explain the apparent lack of ritual on his sites, we seem to have a situation that substitutes Paleolithic secular philosophers for the engineer Alexander Thom's megalithic proto-engineers.

While we're speaking of the Thom paradigm, let me raise one issue that concerns me: the ways in which we gather data that extends over the entire world. I really don't know how to interpret iconographic or folkloric elements, such as those presented by Michael Rappenglück, Roslyn Frank, and Thomas Pedersen, that are distributed widely across the world. On the one hand, one might argue that this wide distribution is a sign of the general acceptance of the astronomical concepts embodied in those elements. On the other, one could argue that by selecting those elements from the whole iconographic and folkloric corpus that are susceptible to astronomical interpretations, we might be engaging in the same kind of data selection for which Alexander Thom was strongly criticized. Have ethnographers, iconographers, and folklorists addressed this question? Perhaps they have, but in such an interdisciplinary forum those methodological questions should be formally addressed.

Another issue related to interdisciplinary understanding stems from the historian's concern that the events and objects we study are produced by historical actors. Let me give a few examples to show what I have in mind. Marco García Quintela studied a well-defined set of sites with "anomalous deer" petroglyphs and found what – at first glance – seem to be indications that these sites were built at astronomically significant places. This seems to relate the celestial deer at these sites to astronomy. A slightly different picture is seen in the presentation of Dainius Razauskas and Vykintas Vaitevičius, which clearly showed that certain elements of horse harnesses can be interpreted as lunar, but to the historian, the crucial question is whether the people who made and used these harnesses did so because of their lunar symbolism, or merely because they considered them decorative. To the ethnographer, this may not be important, but to the historian, that is the crucial issue.

Turning from objects to performance, we have Rosalyn Frank's detailed study of the role of Bear and Bird symbolism in modern folklore and performance. There is no doubt that this concept was widespread, but historians would ask whether the authors of the folktale, and the persons who retell it, consider the folk tale as having an astronomical content and whether the present day performers of the ritual-play and their audience recognize the performance as embodying an astronomical metaphor. I don't know whether these questions can be answered definitively, but such questions are definitely worth asking.

References

SILBERMAN, N. A., 1995. Promised Lands and Chosen Peoples: The Politics and Poetics of Archaeological Narrative. In: P.L. KOHL AND C. FAWCETT, ed. *Nationalism, Politics, and the Practice of Archaeology.* Cambridge: Cambridge University Press.

Stephen C. McCluskey, President of ISAAC

I. ASTRONOMICAL AND COSMOLOGICAL KNOWLEDGE IN THE FOLK CULTURE

THE MILKY WAY AND ITS STRUCTURING FUNCTIONS IN THE WORLDVIEW OF THE MOCOVÍ OF GRAN CHACO

ALEJANDRO MARTÍN LÓPEZ, SIXTO GIMÉNEZ BENÍTEZ

Abstract

This paper analyses the structuring role that the Milky Way performs in the worldview of the Mocoví of the Southern Chaco (Argentina, South America). Since 1998, we have been working on a research project that involves anthropological fieldwork in order to understand Mocoví ethnoastronomy, its changes and variations, and its relationships with other regional indigenous systems of astronomy. Through an analysis of historical chronicles, early ethnographic literature and data from our own fieldwork, the present paper shows how the different interpretations the Mocoví give to the Milky Way relate to one another.

Key words: South America, Mocoví, Milky Way, structuring role.

The Mocoví

Originally hunters and gatherers, the Mocoví belong to the Guaycurú linguistic group. They inhabit the southern area of the Chaco region. In the 17th century the horse was introduced and they began to trade cattle. The Jesuits founded several missions among the Mocoví such as San Javier (1743), which were subsequently maintained by the Franciscans and Mercedarians (Nesis 2005). The abrupt changes brought about by the expansion of the Argentine state at the end of the 19th century gave rise to several millennial movements which ended in fierce repression. In the 1970s, Evangelical cults began to gain influence in the Mocoví communities. Today the Mocoví have a population of twelve thousand and survive by working as rural labourers in Santa Fe and Chaco provinces. Our research has been focused on the Chaco communities.

Mocoví Worldview

The analysis of the evidence collected by the first missionaries and chroniclers (Guevara 1969[1764]; Paucke 1942-44[1749-1767]) together with that gathered during the 20th century (Lehmann-Nitsche 1924, p. 78, 1927, p.145) (Terán 1998; Wilbert and Simmoneau 1988) and that provided by our own fieldwork reveals some of the key pillars of Mocoví worldview:

(a) their world consists of three levels;

(b) the central level of the world, '*laua*, is inhabited by the Mocoví themselves;

(c) the upper level, *piguem*, is related to power and plenty, and is inhabited by basically female beings;

(d) the great relevance of the powerful beings that are the "masters" or "owners" of the different animals, plants, places, or resources; and

(e) the central importance of relations between beings of very different power (asymmetrical power relations) and the concept of "alliance" as the characteristic mechanism of these relations.

In our opinion, certain notions should be taken into account when considering such a wealth of different sources. First of all, it should be acknowledged that the groups under study do not form a homogeneous block, neither do they share a monolithic cosmological corpus. Furthermore, the dynamics of interaction among various sub-traditions is a key factor in the way leaderships are established, strengthened, and challenged. Finally, Indian cosmologies have a history of their own and change over time, and this has not only been happening since the arrival of the Europeans. In this context, the interaction with European cosmolo-

gies does not necessarily imply the dismemberment of earlier cosmologies.

The Milky Way

For the Mocoví, the Milky Way holds many articulated meanings, which are highlighted according to the circumstances or the narrator. A common element throughout these meanings, however, is the structuring role that is played by the Milky Way in Mocoví topology, not only within celestial space but within the world as a whole.

Not long ago, the different positions of the Milky Way in the sky were important for finding the way in woodland at night. Nowadays, owing to deforestation and the difficulty of accessing hunting areas, this use of the Milky Way is of less importance. However, its use as a temporal marker is still significant today. The Mocoví are able to indicate its direction both at several times throughout the year and at different times of night. Also, Mocoví world expectations (based upon both traditional ideas of world cyclical destruction and Christian millenarianism) appear to be connected to the anticipation of astronomical signs, among which a "new position" of the Milky Way is the most frequently mentioned.

The "Riches of the Sky"

Star brightness is related to the notion of the brightness of powerful beings, its magnitude being regarded as a particular entity's manifestation of power. The Mocoví understand power as a generic capacity for action, based on a sort of superabundance of being – this refers especially to remote actions and to fertilising and productive capacity as a whole. The "powerful" beings that shape the Mocoví cosmos are full of the sort of power that is manifested in the brightness of their physical manifestations – "golden horns", "bright" dwellings, lightning or rainbows. In this sense, the sky and the myriad of stars make up a space seen as extremely powerful. The Milky Way is an area in the sky displaying a remarkable concentration of such brightness, so that its white clouds are known as the "riches of the sky".

The Celestial Rhea

To the Mocoví, the master of an animal species may be manifested as a special animal of that same species, such as a snake-shaped being or a humanoid being (frequently a *criollo*). *Mañic* is the master of the South American rheas (*mañic*). It used to shelter in a number of burrows, under the roots of an *ombú.* One "powerful" man, decided to face it. To this end, accompanied by other Mocoví, he chased the *Mañic* throughout the world. The cornered *Mañic* climbed up the *ombú* trunk (the tree of the world) to the sky. Today, the *Mañic*, or rather its shadow-soul (*la'al*), can be seen as the Milky Way's dark clouds, with its head in the coal sack. Alpha and Beta Centauri are the dogs chasing it and biting its neck.

The Path

The representation of the Milky Way as a "path" structures the Mocoví's oral narrative about stars, and is one of the most popular Mocoví interpretations of the Milky Way. The Mocoví word *nayic* means "path", and it is related to the idea of going deep into non-human space. One such space is the forest, along which a sequence of markers unfolds, each one commemorating a pact with the ruling powers of the world. The Milky Way is seen as the path followed by Mañic as it flees to the sky or as the road of the powerful beings. The asterisms arranged along the Milky Way therefore represent encounters with powerful beings and the pacts between them and the ancient Mocoví. Stories about these events make up a kind of serial narrative linked to the history of the "hunting of Mañic" and "strung" on the Milky Way's connecting thread.

The River and the World Tree

As is mentioned by the first chroniclers and also found in the present-day fieldwork, the three planes of the Mocoví world are interconnected through a giant tree, *Nalliagdigua*. In some versions, there is a large river inside the tree, while in others a big river is reached by climbing the tree. It was in this river that humans originally obtained their food, painlessly. This happened during primordial times, when the humans also were in animal form. But this blissful situation came to an end because the humans refused to share the fish with an old woman. The old woman, in the form of a big rodent, felled the tree, thus freeing the waters and forcing the humans to rely upon hunting and gathering in the forest for survival.

Sponge World

Our research on the Milky Way has, in particular, revealed the relationship between the Milky Way and shamanic initiation. One of the typical modes in which initiation occurs is by sleeping under an *ombú* tree, which is identified with the tree appearing in the Mañic narrative; this is because during sleep the initiate sees how it turns into the tree of the world. There is a descent to the roots, where "gold caves" are found. The recruit must then climb up the tree, from the underworld to

the sky, while encountering the powerful beings inside the tree and establishing alliances with them. Thus, the tree is also a path marked with a series of alliances. The *pi'xonaq*, the specialists of the sacred, have a capacity to "see" the structure of the universe – the tree connecting the worlds, which used to be available to everyone, is now only visible to them. Their healing capacity is based on their capacity to travel around the world and build alliances with the entities governing it. Therefore, the Milky Way is strongly related to the means whereby the *pi'xonaq* exerted a certain degree of control over the other Mocoví. Today, just as in ancient times, the tree permits the coexistence of cosmic levels. Nowadays, this only occurs in an oneiric level or in encounters with powerful deities, which in a concentrated time and space dimension make it possible to experience the way of being of the origins, that is to say, they reveal the ontological importance of cosmic structure.

In this context, the dust devils formed by the wind on the Chaco savannah are seen as the visible manifestation of a series of "tunnels" or "paths" connecting various areas of the Mocoví world. Seemingly, it was through these tunnels indicated by the whirlwinds that the ancients were able to move rapidly from one place to the other. These "passages" or underground tunnels supposedly connecting the lagoons are regarded as "eyes" or windows used by the powerful beings to watch the earth. The tree of the world is mentioned by the informants as being like a big "whirlwind", the paradigmatic case of a system of "tunnels for communication" that run from one end to the other of the Mocoví cosmos. This communication is essential for the flow of resources from the sky to the Earth. The Mocoví universe thus resembles a "sponge": it is an interrelated world.

Texts, Illustrations And Mocoví Reinterpretation

Generally speaking, a constant element in the Guaycurú reinterpretation of modern texts is some kind of exegesis based on the illustrations. In this context, it is very interesting to note the way Mocoví teachers have interpreted published illustrations of the solar system. Such drawings show the orbits of the planets, which accounts for their iconographic identification with the "whirlwinds" mentioned above. When interpreting the illustrations, the Mocoví teachers with whom we interacted emphasized the structural relationship between the Earth, "other inhabited worlds", and a "whirlwind-path" joining them. During their studies, the teachers spontaneously turned to their grandparents to identify such bridges. We observed that these processes of cosmological "transaction" involved strong feelings of uncertainty and precariousness, which were only overcome by a new synthesis.

In this Mocoví view of the solar system, the world's whirlwind keeps its tree identity and is explicitly called *Nalliagdiguá*. In fact, the narration is constructed on the basis of its felling, the point being that since the tree was cut it has been growing "towards us, towards the Earth." As soon as the tree touches the Earth again, the communication between these "other inhabited worlds" and the Earth will be restored once more, so that the sky beings will come down to the Earth. Who are they? The extraterrestrials. The tree is seen as a connection between these planes, and the overall communication between planes as a prelude to a new era for the world. In this context, stories about "extraterrestrials" heard on the media are incorporated.

Conclusions

In this paper, we have attempted to draw attention, above all, to the dynamic and heterogeneous character of cosmological conceptions among the Mocoví communities of the Chaco. We believe this is a general characteristic of cosmologies in several cultures that has been neglected in the interests of presenting the different cosmologies as a homogeneous whole. The Mocoví case demonstrates that the existence of an important common and characteristic axis does not imply a monolithic block of ideas and practices. Indeed, among the Mocoví cosmology is a matter of dispute and negotiation associated with leadership, given that Mocoví leaders are characterised by their ability to see the true structure of the world, to speak well, and to reach a consensus. Notwithstanding this flexibility, we can see that the cosmological ideas of these Mocoví communities share a series of general principles that coordinate the multiplicity of voices present. Our investigation has focused on one of these fundamental ideas: the central role of the Milky Way as a structuring element of the sky, as an articulation between the different levels of the world, and as a link between the central plane (*'laua*), inhabited by the Mocoví, and the power and plenty of the celestial plane. We have shown that a series of different and mutually influential meanings come together through this asterism. We have also seen that this asterism has links with shamanic activity because it constitutes a power-concentrating pole. This power-pole characteristic associates the Milky Way with the whirlwinds and tunnels that give a sponge-like appearance to the Mocoví cosmos.

Furthermore, we have emphasized the need to pay special attention to the ways in which the cosmological ideas of these communities interact with ideas intro-

duced by Western society from different sources – biblical stories, formal schooling, and the mass media. In this context, it is important to recognize the huge relevance of illustrations. In the case we studied, there is both an active concern for preserving certain pre-existing core lines – by which we mean dynamics and relations rather than "objects" – and the flexibility to include novel elements provided they can be structured around these core lines.

References

GUEVARA, J., 1969. Historia del Paraguay, Río de la Plata y Tucumán. In: Pedro de Ángelis ed. *Colección de obras y documentos relativos a la Historia antigua y moderna de las Provincias del Río de la Plata.* Tomo I. Buenos Aires: Plus Ultra.

LEHMANN-NITSCHE, R., 1924. La Astronomía de los Mocoví. In: *Revista del Museo de La Plata.* Tomo XXVIII (Tercera serie, Tomo IV), Mitología sudamericana VII, 1924-1925. Buenos Aires.

LEHMANN-NITSCHE, R., 1927. La Astronomía de los Mocoví (segunda parte). In: *Revista del Museo de La Plata.* Tomo XXX (Tercera serie, T. VI), Mitología sudamericana XII. Buenos Aires: Coni.

NESIS, F., 2005. *Los grupos Mocoví en el siglo XVIII*. Colección Tesis de Licenciatura, Sociedad Argentina de Antropología, Argentina.

PAUCKE, FLORIAN, S.J., 1942–1944. *Hacia allá y para acá*. (1749–1767. Una estada entre los indios Mocovíes). Tucumán: Nacional Universidad de Tucumán.

BUENAVENTURA, T., 1998. El cambio del año y el tiempo cíclico en la cosmovisión Mocoví. In: *II Congreso Argentino de Americanistas. 1997*. T. I. Buenos Aires: Sociedad Argentina de Americanistas.

JOHANNES, W., and SIMMONEAU, K., ed. 1988. *Folk literature of the Mocoví indians*. Los Angeles: UCLA.

Received: 2 November 2007; Revised: 10 August 2008

PAUKŠČIŲ TAKAS IR JO STRUKTŪRINĖS FUNKCIJOS GRAND ČAKŲ MOKOVI GENTIES PASAULĖŽIŪROJE

Alejandro Martín López,
Sixto Giménez Benítez

Santrauka

Šiame straipsnyje nagrinėjamas Paukščių tako įvaizdis ir jo reikšmė Mokovi genties, gyvenančios pietinėje Čakų (Chaco) provincijoje (Argentina, Pietų Amerika), žmonių pasaulėžiūrai. Buvę medžiotojai ir maisto rinkėjai Mokovi genties nariai kolonijiniais laikais patyrė daug permainų. Tačiau jie sugebėjo atlaikyti europiečių įtaką iki pat XX a., kuomet argentiniečiai pradėjo sistemingą skverbimąsi į jų tradicinę teritoriją. Šiuo metu Mokovi gentį sudaro 1200 žmonių, kurie dirba žemės ūkyje. Nuo 1998 metų buvo vykdomas antropologinio pobūdžio mokslinių tyrimų projektas, kurio pagrindinis tikslas buvo ištirti Mokovi genties etnoastronomiją ir ją palyginti su kitų regionų etnoastronomija. Išanalizavę istorinius šaltinius, ankstyvąją etnografinę literatūrą ir mūsų mokslinių lauko tyrimų duomenis, šiame straipsnyje pateikiame keletą Makovi gentyje žinomų Paukščių tako vaizdinių.

Paukščių takas yra svarbus Mokovi genties kosmologinės sistemos elementas. Jis vaizduojamas kaip kosminis medis, kelias arba upė. Paukščių tako kaip „kelio" įvaizdis išreiškia esminę Makovi astronominės sistemos ir žodinės tradicijos idėją. Paukščių takas čia iškyla kaip prasiveržimo į užžmogišką erdvę kelias, išilgai kurio skleidžiasi santarvę su pasaulį valdančiomis galiomis simbolizuojančių ženklų seka.

Mes taip pat tyrinėjome vertikalios ašies sampratą Makovi kosmologijoje ir simbolikoje ir konkrečiai Paukščių tako kaip Kosminio medžio idėją. Nustatėme, kad naudojimasis Paukščių taku orientavimuisi erdvėje bei laike turėjo įtakos pačios erdvės ir laiko sampratai Mokovi kosmologijoje.

Mūsų atskleisti ryšiai tarp Paukščių tako ir šamanų galios „matyti" kosmoso struktūrą leido suprasti esant svarbius saitus tarp kosmologinių koncepcijų ir galių valdymo bei visuomeninės kontrolės ir jos organizacijos. Galiausiai mes aptarėme Mokovi kosmologinių idėjų sistemos transformaciją įvykusią dėl religinių misijų, švietimo sistemos ir žiniasklaidos poveikio.

Vertė Algirdas Girininkas

VENUS AND THE STAR WOMAN

CECILIA PAULA GÓMEZ

Abstract

Like several other Gran Chaco indigenous groups, the Wichí identify several constellations in the sky; among them, Venus appears as an important celestial object generally identified with the mythical motif of the Star Woman. This character (*kates lhukwetah*) is crucial in an important myth associated with Venus. The mythical motif of the Star Woman will therefore be analysed. The cultural meanings implicit in Wichí representations of women and gender relationships are tracked in several social, symbolic, celestial and material contexts. Meaningful relationships between celestial beings (Venus), cosmological representations (Star Woman) and feminine social life (material culture, string figures, marriage alliance, initiation rites) are verified and analyzed.

Key words: Wichí, Venus, Star Woman, myth, woman, string figures.

Introduction

The Gran Chaco indigenous groups identify several constellations in the sky. Among these, Venus appears as an important celestial object generally identified with the mythical motif of the Star Woman. Among the extensive mythical narratives that have been documented in these groups, one of the most recurrent motifs is the one about the Star Woman. The heavenly reference to this character is "the bright star" Venus. The representation that the Wichí address as *kates lhukwetah* will be at the core of this paper. Our final objective will be to describe how this representation reveals a social, material and stellar representation of women.

Venus, the Star Woman Myth and Social Life among the Wichí

Known until recently as "Matacos", the Wichí of the Gran Chaco form the linguistic group Mataco-Maká together with the Chorote, the Maká and the Nivaclé. The Wichí do not constitute a homogenous unity, but are organized in an "ethnical chain" made up of many peoples who share certain linguistic characteristics while at the same time upholding different linguistic and cultural traditions (Braunstein 1976).

From the Wichí point of view, the Star Woman (*kates lhukwetah*) is a crucial character in an important myth associated with Venus. One version says: "Once there was a man so ugly that no woman would marry him. One night his mother heard him speaking with a woman. The following morning she asked: 'With whom were you talking last night?' She did not know that the woman was the daughter of 'The two brothers' (the name of a constellation). The son remained silent. The mother asked again: 'Who was she?' But he still refused to answer. Every night the Star Woman would leave her home to visit her lover, and then return. She combed his hair and gave him necklaces. Finally the man became good-looking. All the women fell in love with him but he would have nothing to do with them as they had despised him when he was ugly. The Star Woman took him to the sky with her as her husband. He met his wife's family. One day his wife and the women of her family went to pick wild beans. Before leaving, the Star Woman said: 'Do not touch the fire; it is bad; it will burn you.' The man did not obey her; he touched the fire and it exploded. He fell down dead. His wife put his head and bones in a bag and dropped it near the house of his parents. The bag full of bones fell with a thud. The mother, seeing what was in the bag, knew her son was dead so she buried his bones" (A. Métraux, quoted in Wilbert y Simoneau 1982, p.48). In several versions of the myth collected among different Wichí groups, it is said that the Star Woman had a bead necklace on her chest, or either a necklace that was really bright. It is often also said that, as it was winter and therefore a dry season, there was nothing to eat. The Star Woman, however, was able to make food appear on condition that nobody would ever see how she had accomplished the deed. The food was duly distributed to all the community, but when the woman tried once more to make food appear, she was spied on. As her condition was not fulfilled, she was not able to present food again and she returned to the sky utterly offended. Her lover followed her home, where he finally died. In yet other versions, the Star Woman's father burned his daughter's husband and ate him, whereupon his soul turned into an owl called *tyustáx*, which always makes the noise "Wek, wek, wek".

As for any oral narration, the Star Woman myth has many versions since the narrative performance depends

on the specific context in which the myth is being told. Under these circumstances, despite their differences or their inevitably fragmentary nature, we consider the different plot variants as parts of the same story. Starting from the standard premise that the sense of a myth becomes increasingly clarified as more narrative variants are taken into account, we present parts of some of the variants of the Star Woman myth among different groups of the Wichí complex recorded throughout the decades in the ethnological literature.

Working with different versions of the Star Woman myth (Palmer 2005, p.288-296; Braunstein 1993, p.41-46; Dasso 1989, p.32; Barúa and Dasso 1999, p.261-262; Métraux quoted in Wilbert and Simoneau 1982, p.48-49), the most fundamental idea being conveyed seems to be the union between astral and human beings. Nevertheless, it is productive to examine some of the finer details.

First, the star can be identified as an object of desire. Second, we are talking about a powerful being that has an unusual capacity as a provider of food and other goods. But its power is not free of ambivalence: breaking an obligation to the Star Woman brings misfortune, and in fact in most versions mere contact with her entails excesses of heat (burns) or cold (frost) or even, sooner or later, death. Third, the stories repeatedly mention the implicit tensions and problems involved in a marriage alliance. Fourth, the Star Woman appears to be associated, quite explicitly, with an opposition between the terrestrial and the celestial planes – and within the latter, particularly with Venus. The end of the tale is almost always unfortunate, as if the myth is insisting that the sky is not a suitable place for human life.

In addition, danger appears to be a distinctive characteristic of Wichí representations of femininity. We can therefore affirm that there are certain correspondences between this myth and social life. In both planes, for instance, the woman performs a crucial economic role: in everyday life she collects wild fruit and seeds for horticulture, whereas in the myth she magically provides people with a great amount of food, knowledge about the harvest, or the creation of art designs. In fact, the origin of chaguar (Bromeliaceae) fibre and bags is strongly related to the celestial plane, since this is a piece of knowledge women brought when they came down from the sky. It has been stated that, in some Wichí groups, these contributions on the part of women are considered gifts to men. In the same way, shame and bashfulness are feminine characteristics dealt with in the myth. The fact that the Star Woman goes back to the sky – in some versions because she feels embarrassed after she has been spied upon when she makes the algarroba (Prosopis spp.) appear in dry seasons; in other versions because humans have not respected her wishes – represents a typical attitude among Wichí women, who react violently when they feel humiliated (for instance, when their husbands are unfaithful).

It is also necessary to point out that the attractive and ambiguous trait of *kates lhukwetah* is not only related to the narrative plane but can influence daily life. As in the myth, *kates lhukwetah* can damage men's health. The riverside Wichí in Ramón Lista (a district of Formosa) accurately describe the symptoms of those men who sleep in the mountain staring intensely at the stars: they start to suffer from such an intense cold that they have to put half-burnt sticks into their mouths. They also lose weight and do not seem eager to talk. These symptoms show that the "soul" (*husek*) has abandoned the body, since it has been attracted by the bright and sparkling necklace of the Star. At the same time, these symptoms are associated with the light blue cold and can only be cured by the shaman, who must beg the Star Woman to give back a soul to its ailing owner by offering her a necklace full of colorful seeds (Califano 1974, p.50).

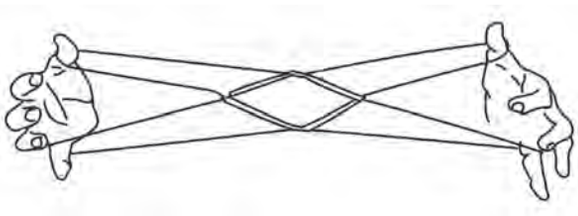
According to the Wichí since the Star Woman is a celestial character, there is a double danger: in addition to being a woman, she belongs to a different plane of existence from everyday reality. Women's beauty, like stars' beauty, provokes both passions and danger. It is worth mentioning that this ambivalence is not alien to Wichí cosmological thought, in which women are primordial, powerful beings (Barúa and Dasso 1999, p.272). In their mythical origin women have a second mouth – a vagina with teeth – an organ that identifies pre-social, celestial women as authentic sexual carnivores. This image easily accords with the idea – current among many contemporary Wichí – that women feed themselves through the coitus (Palmer 2005, p.89). When a myth explains how a trickster breaks the teeth in this mouth, it somehow symbolizes the domestication of the implicit power in feminine sexuality. *Kates lhukwetah*, known as Venus, seduces and even makes ill anyone who observes her for a long period; this makes sense in a cosmology which judges sexual passion as a personal disorder that could cause death or make the victim into an outcast as a consequence (Palmer 2005, p.107).

String Figures and Venus

These beliefs are not the only evidence for the symbolic expression of imagery associated with the Star Woman. Like many others aesthetic patterns, this motif is frequently materialized by means of the string fig-

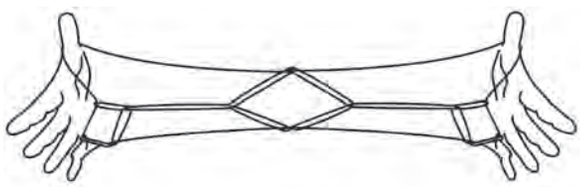
ure, which beyond its recreational function codifies a significant dimension of cultural identity within the Gran Chaco region (Rydén 1934; Braunstein 1991, 1993). Until very recently, these figures seemed to be one of the few means of graphical expression among these peoples and, as is the case with myths, variants of particular figures circulate through considerable geographical areas.

There are two figures that are mainly associated with the Star Woman. The first is called, precisely, *kates lhukwetah,* and is a rhombus which represents the morning star: the "potbellied star".



Kates lhukwetah

From this image, another figure is elaborated in a progressive way – one figure derives from the other – and this is called *kates lhukwetah lehwís,* the "star with arms" or else "the star that embraces".



Kates lhukwetah lehwís

This figure of "the star with arms" is linked to a fundamental dimension of Wichí social life, which could be described as the marital agency of women. The central rhombus of the design represents a vagina. In the myth, the trickster had to break the vaginal teeth in order to tame women and to make it possible for men and women to live together on the Earth. At the same time, *katés lhukwetáh lehwís*, the star which embraces, evokes both attraction and danger. Due to the matrilocal conformation of Wichí kinship groups, women are placed at the centre of society; and men are then attached to this centre by playing the role of in-laws and husbands. It is important to understand that, although some parameters are imposed by the male members of the family such as the husband's exogamy or capacity for productivity, it is the Wichí woman who chooses her mate during social visits within the community or courtship dances. Traditionally, women attract their future husbands by dancing behind them and placing their hand over their shoulder, or seizing them by their belt. They then invite the man to their parents' home, and they are told to hunt or fish some meat, which will later be handed to the in-laws by the woman as mediator (Palmer 2005, p.106-110).

Within the set of meanings conveyed by these string figures, we find connotations such as the charm, sexual power and marital initiative of women which can help us to comprehend the way the Wichí conceive the feminine condition. In a more general sense, if these graphical expressions can be accepted as a cultural representation of society and a standardized depiction of mythical phenomena, we can state that, methodologically speaking, string figures can be used as an ideal complement to oral literature.

Final words

To sum up, the complex meaning of a figure such as *kates lhukwetah* can only be partly understood from a narrative point of view. It is also necessary to analyze its graphical representations in string figures, as well as certain beliefs and representations associated with animism and the nature of the human soul, the existential dilemmas of suffering and ambivalence, the cultural conception of the light blue plane, and the active role of Wichí women in sexual relationships and marriage alliance. As with any other relationship among the Wichí, gender ideology seems to be better understood if we bear in mind its multiple contexts of symbolic representation. In other words, different planes of reality (symbolic, ideological, material) are illuminated by each other, since the cosmological dynamics seem to be ruled by a logic that does not presuppose a clear distinction between the terrestrial and the celestial planes, or even between subjectivity and the properties of the cosmos (Lévi-Strauss 1996, p.238-239).

Acknowledgements

I am grateful to José Braunstein and Diego Villar for sharing invaluable data regarding the Chaco string figures and for their critical insights on several drafts of this paper.

References

BARÚA, G., AND DASSO, M. C., 1999. El papel femenino en la hostilidad Wichí. In: M. CALIFANO, M.C. DASSO, eds. *El chamán Wichí*. Buenos Aires: Ciudad Argentina , 251-297.

BLIXEN, O., 1991. La mujer estrella. Análisis de un mito sudamericano. *MOANA* 4/1, 1-27.

BRAUNSTEIN, J., 1976. Los Wichí. Conceptos y sentimientos de pertenencia grupal de los Mataco. *Scripta Ethnologica* 4/1, p. 130-143.

BRAUNSTEIN, J., 1991. Figuras de Hilo de los mataco orientales y Lenguajes de Hilo. *Hacia una Nueva Carta Étnica del Gran Chaco 4*, 36-66, 109-117.
BRAUNSTEIN, J., 1993. Las figuras de hilo del Gran Chaco II y Las figuras de hilo del Gran Chaco III. *Hacia una Nueva Carta Étnica del Gran Chaco 6*, 131-151
CALIFANO, M., 1974. El concepto de enfermedad y muerte entre los mataco costaneros. *Scripta Ethnologica* 2/2, 33-73.
DASSO, M. C., 1989. Las transformaciones del sol y las estrellas en la cosmovisión de los mataco (grupo *tachóhnai*). *Scripta Ethnologica*, Supplementa 9, 19-42.
LEHMANN-NITSCHE, R., 1924. La Astronomía de los Matacos. *Revista del Museo de La Plata* 27, 253-265.
LÉVI-STRAUSS, C., 1996. *Lo crudo y lo cocido*. México: Fondo de Cultura Económica.
PALMER, J., 2005. *La buena voluntad Wichí. Una espiritualidad indígena*. Formosa y Salta: APCD, CECAZO, EPRAZOL, FUNDAPAZ, Tepeyac, Asociana.
RYDÉN, S., 1934. South American String Figures. *Gothia* 2, 16-43.
WILBERT, J., SIMONEAU, K., eds., 1982. *Folk Literature of the Mataco Indians.* Los Angeles: UCLA Latin American Center Publications.

Received: 1 November 2007; Revised: 9 May 2008

VENERA IR ŽVAGŽDĖ-MOTERIS

Cecilia Paula Gómez

Santrauka

Gran Čakų (Chaco) indėnų kultūroje aptinkame įdomių kosmologinių sampratų apie dangų. Šios etnoastronominės koncepcijos yra labai svarbios indėnų kultūros ir etninio identiteto supratimui. Vienos iš gausiausių Gran Čakų regiono genčių Vičų (Wichí) požiūriu, Žvaigždė-Moteris (*kates lhukwetah*) yra svarbiausias mitų, siejamų su Venera, personažas. Todėl Žvaigždės-Moters mitinį motyvą mes analizavome vičų genties kosmologijos kontekste. Kultūrinės prasmės, susijusios su vičų moters ir santykių tarp lyčių vaizdiniais, yra atsekamos pagal įvairius socialinius, simbolinius, dangiškuosius ir materialinius kontekstus. Pavyzdžiui, Žvaigždė gali būti laikoma troškimo, galios ir dviprasmiškumo objektu ir priešybių tarp skirtingų kosmologinių lygmenų ženklu. Čia esama aiškaus atitikmens tarp mito ir socialinio gyvenimo, kuriame moteris vaidina labai svarbų ekonominį vaidmenį. Mes išanalizavome ir nustatėme reikšmingus ryšius tarp dangiškosios būtybės (Veneros), kosmologinio personažo (Žvaigždės-Moters) ir moters socialinio gyvenimo (materialinės kultūros, virvelinių figūrų, vedybų, iniciacijos apeigų).

Vertė Algirdas Girininkas

ASTRONYMS IN BELARUSSIAN FOLK BELIEFS

TSIMAFEI AVILIN

Abstract

This article presents some known Belarussian "astronyms" and related beliefs based on folkloric-ethnographic sources from the nineteenth and twentieth centuries together with material collected by the author and other researchers in the last decade.

Key words: astronyms stars, folk astronomy, Belarussian folk-beliefs, ethnoastronomy, constellations.

Introduction

The study of "astronyms" – the names of celestial bodies (stars, constellations, planets, etc.) that can be seen with the naked eye – is an almost completely unresearched area of Belarussian onomastics. Some astronyms can be found in nineteenth- and twentieth-century Polish (K. Moszynski, M. Gladyszowa, M.Federowski et al.) and Belarussian (E. Romannov, A. Serzhputovski et al.) folkloric-ethnographic sources, but unfortunately they are few. However, Belarus is exceptional in that people in the villages have preserved their traditional knowledge about the stars, and related beliefs, right through to the present time. Some of the material presented in this article is original, having been collected by the author and various local historians during research expeditions between 2004 and 2007. These researchers used standard principles for collecting the "field" material during their expeditions, on the basis of a questionnaire[1] that was specially developed by the author for these purposes.

Stars are usually called *zorki, zory, zviozdy,* or *gviazdy* (Matskevich 1979, p.439) (from *gwiazda* – a star in Polish). In addition to a widespread belief that stars were lights that were lit and attached to a solid sky by God (NM 2003, p.189) it was also said regarding their origin that

"In old times there was always light and there lived a strong man who could do anything. People asked him if he could make darkness to cover the Sun. And he did cover the Sun. Everyone was frightened and started to light up lights which could be seen in the sky afterwards" (NM 2003, p.204).

It should be mentioned that the 'star' astronym means both a single star and a constellation.

Stars are human souls: there are as many stars as people on Earth (Pietkiewicz 1938, p.11) and every star has its own name. When a child is born God or an angel immediately lights up its star, which brings fortune, love and happiness. When a man dies they put its star out and then it falls. But there is an opposite belief that stars are the souls of deceased people. Stars also are the souls of unbaptised children shining from the sky for their parents.

It is believed that stars are houses of angels. When stars are shining at night then it is said that angels have their windows open (NM 2003, p.197); alternatively, stars are candles lit by the angels every evening.

The brightness of a star indicates the social status of a man (a bright star for a rich man, a dim one for a poor) or else his age and spiritual qualities (a bright star for a young and kind man, a dim one for children and old or evil men and sinners).

Names of constellations and beliefs about them

1. **Aries –** a Ram (Nosovich 1870, p.15).

2. **Auriga** – a she-goat (*Kaza*) (Avilin 2007, p.48) (only α Aur). During the celebration of *Koliad* on December 24th and 25th the appearance of this star marked the time when people started to eat *kut'ia*[2] and (at a peak time in the celebrations) came out in the evening and walked carrying a pole with a star.

3. **Böotes –** a ploughman (*Rataj)* (Federowski 1897, p.150).

4. **Capricorn** – a wild goat *(Kaziarog)* (Katsar 1996, p.195). It was believed that a symbol of Capricorn wo-

[1] It is planned in the near future to publish that the questionnaire that has been developed. The questionnaire is partly based on those of M. Rut and J. Vaiškūnas (J. Vaiškūnas 1998) but is the first to have been specially developed to record star knowledge in the Belarussian context. (In other Belarussian sources there are only one or two questions related to astronyms and folk-astronomy.)

[2] A traditional Slavic ceremonial meal made of cooked grains with honey, sugar and raisins.

ven on a *rushnik*[3] could heal and guard domestic animals from diseases and evil supernatural beings. Such *rushniks* with this and other astronomical symbols were used for divination.

5. **Cassiopeia** – *Visazhar* (Nekrashevich 1928, p.182), *Kastsy* ('mowers') (Avilin 2006, p.321) (α, β, γ, δ, ε Cas) are mowers (reapers) that "were put on guard and can slice and cut anyone" (Saharov 1990, p.114).

6. **Coma Berenices –** *Sito* ('a sieve') (Karlowicz 1906, p.120). It was said that "God used to sift grains of *zhito*[4] through it".

7. **Corona Borealis –** *Karona* ('a crown') (Dobrovol'skii 1914, p.3), *Karuna* ('a crown') (Krasnevich 1926, p. 112). The constellation was a symbol of the thorn wreath that was put on Christ's head. It is also said that "a star's crown impended over the earth" (Avilin 2007, p.100).

8. **Cygnus** – *Petrova Palka* ('a Peter's stick') (Kryvitski 1987, p.10), *Petrou Krest* ('a Peter's cross') (Biryly 1994, p.25), *Tsarou Krest* ('a Czar's cross') (Kryvitski 1987, p.262) (α, γ, η, β – a vertical beam, ε, γ, δ – a cross beam).

- *Petrova Palka* ('a Peter's stick') and *Petrou Krest* ('a Peter's cross')[5]. The first two names refer to a staff (made in a shape of a cross) and a symbol of St. Peter.
- *Tsarou Krest* ('a Czar's cross'). This name is linked to one of the czars. Thus it could not have appeared any earlier than the fourteenth century, since in Russia it was Ivan IV (Ivan the Terrible) who first acquired the title of Czar.

It is also said that "the stars in a shape of a letter T form the name of St. Teresa" (β, γ, δ ε, ɜ Cyg?).

9. **Draco –** *Zmej* ('a serpent') (Pietkiewicz 1938, p.11) (β, γ, ζ, ε, ν, δ Dra, α UMi?). "St. Yuri killed this serpent and hung it near the star that always stands in the same place" (ibid.). It seems that this name is connected with a myth about the slaughter of a serpent, one that is known to many peoples in the world. In this case it is told from a Christian perspective.

10. **Gemini –** *Blizniuki* ('twins') (Karatkevich 1990, p.111), *Litwa* (Karlowicz 1902, p.479) (α Gem), *Korona* ('a crown') (ibid). (β Gem). These two stars (α and β Gem) served as a symbol of two states: the Great Lithuanian Princedom and the Polish Kingdom. Their original names were probably *Lele* and *Polele*, who were two characters in pagan myth. It is also said that "the Blizniuki star usually appears before the rain"[6].

11. **The Hyades** – *Dazhdzhaviki* (Nekrashevich 1928, p.79), *Vuzhy*? ('grass-snakes') (Grynblat 2005, p.161), *Charviaki?* ('worms'). Unfortunately, little is known at present about this cluster; perhaps future expeditions will reveal more about it.

- *Charviaki?* ('worms'). This name can nonetheless be found, together with the names of other constellations, in the work of the Polish-Belarussian poet *Tomasz Iewlewicz* in his "Labirynt, abo Droga zawiklana" (printed in 1625): "…wherefrom Artur, and Voz, and Charviaki, and Kosy…"

12. **Lyra –** *Niavesta* ('a bride') (α Lyra), *Dva braty* ('two brothers') (β, γ Lyr), *Sapernik* (a rival) (δ Lyr) (Karatkevich 1990, p. 111). These names are mentioned in "*Khrystos pryziamliusia u Garodni"* ("Christ landed in a Garodnia city") by a famous Belarussian writer, V.S. Karatkevich.

13. **Orion –** *Kreselca Pana Jezusa* ('Lord Jesus's chair') (Gladyszowa 1960, p.48) (Orion), *Grabli* ('a rake') (Kas'piarovich 1927, p.83), *Kastsy* ('mowers') (Matskevich 1979, p.435) ("a sword" and δ, ε, ζ Ori), *Try Karali* ('three Kings') (Avilin 2007, p.100), *Kasar* ('a mower') (Pietkiewicz 1938, p.11), *Karomyselko* ('a small yoke') (Gladyszowa 1960, p.48), *Tri Siostry* ('three sisters') (ibid.), *Prahi, Papradki* ('yarn spinners') (Krasnevich 1926, p.112), *Traiko, Asilki (asilak, bagatyr* is the name of an epic hero, cf. Belarussian "Kasary – the three stars. It is said these are stars- *bagatyrki*" (Polesskii Arkhiv)). (Avilin 2006, p.324) (δ, ε, ζ Ori) (Matskevich 1979, p.435), *Kigachi* (Lastouski 1924, p.419), *Matawila* ('a reel') (Serzhputouski 1930, p.11), *Kosy* ('scythes') (Gladyszowa 1960, p.37), *Chepiga* (Sanko 2004, p.507), *Kichagi ragachy* ("shaft of a plough") (Lastouski 1924, p.419), *Kryzhe* ('a cross') (Avilin 2007, p.100), *Chesnyj hrest*[7] ('Chesnyj cross') (Polesskii Arkhiv), *Lisa* ('a fox') (ibid.), *Trohkutnaia* (lit. 'with three corners') (ibid.).

- *Kreselca Pana Jezusa* ('Lord Jesus's chair'). The first name derives from a comparison between this constellation and the heavenly throne of Jesus Christ.

[3] A name for a traditional Belarussian woven fabrics decorated with certain patterns.

[4] Usually rye or barley in Belarus.

[5] It should be noted that these constellation names sometimes refer to Orion's sword and belt rather than to Cygnus, but this is because of possibly erroneous researchers' records.

[6] This record was collected by Ganna Sharenda (Local History Department, Lenin Regional Library, Gomel).

[7] This astronym (*Chesnyj hrest*) is also identified with the constellation Cygnus in the Polesskii Arhiv, but this intepretation is most likely incorrect. Compare, e.g., with Ukraine *Česny chrest* (Polish transcription) (Orion).

- *Try Karali* (‘three Kings’). It was said that these three kings were the evangelical Three Wise Men (The Magi) who came to see Christ. In some areas of Belarus this constellation represented a celebration of *Vodokreschenіia* (Baptism ceremony on January 6th), the constellation’s time of appearance at a certain location in the sky marking the beginning of the celebration.
- *Tri Siostry* (‘three sisters’). It is probable that the names *Tri Siostry* (‘three sisters’) and *Prahi, Papradki* (‘yarn spinners’) are connected with a myth about three cursed sisters who, after their death, remained in the sky as three shining stars. The sisters are widely invoked in magic spells and three stars symbolising the three sisters are frequently used in the ornamentation on *rushniks*.
- *Kastsy* (‘mowers’). The name *Kastsy* (‘mowers’) reflects an image of those who mow in the sky: “Three stars stand one after another in the manner of people mowing the fields” (Matskevich 1979, p.435). The Polish maintain a belief that “*Babki* (‘old women’) (the Pleiades) carry meals for people who are mowing (Orion)” (Gladyszowa 1960, p.36). Among the Belarussians there are numerous tales and legends in which *babki* and *kastsy* are the main characters. They are working in a field when God comes to them walking along a road and different miracles take place. The same images can be seen in the sky: the people mowing form part of the constellation of Orion, the old women are the Pleiades, the road is the Milky Way, and the field is the sky. These three stars are also called “*svetovaia, zahodnia, poznia,* but some people say these three stars are called Kosary” (Polesskii Arkhiv). One of these three stars has the name *Paraskeva Piatnitsa* (This record was collected by Ganna Sharenda).
- *Matawila* (‘a reel’). It is possible that researchers mistakenly ascribed the name of *Motowilo* to Orion. It is more likely that it was the constellation of Perseus (Sanko 2004, p.308). Moreover, this name can be found in different folk-riddles, e.g. “Shylamatawila has been in the sky, has lost the keys, and a star with the Moon has stolen them” (answer to the riddle: a swallow).
- *Koromyselko* (‘a little yoke’). Taking into consideration the Ukrainian and Belarussian notion of a “belt” being a “*divka vodu niase”* (Polesskii Arkhiv) (‘a young maiden carrying water’) and the Belarussian name *Koromyselko* (‘a little yoke’) it follows that they saw a young maiden who carried a yoke in “Orion’s belt and sword”.

About these three stars it was said: “They consist of three people. They are seen mostly during winter-time” and “The three stars somehow relate to lords”.

Using this constellation they determined the time of night: “People knew which pair of them would show up, it was time to wake up, it was said that the Mowers had walked far so it was time to get up.” (Matskevich 1979, p.435). It also indicated the weather: “When *Kosy* is in the sky it will rain” (Polesskii Arkhiv).

14. **The Pleiades**. *Olosozar* (Moszynski 1928, p.156), *Wosozhary* (Gladyszowa 1960, p.187), *Velisazar* (Kas’piarovich 1927, p.56), *Valasazhar* (Matskevich 1979, p.272), *Czary-valasazhary* (Kryvitski 1987, p.137), *Polosozar* (ibid. p.147), *Visazhar* (Narodnae 1976, p.51), *Valoski* (Kas’piarovich 1927:52), *Valosny* (lit. ‘hair’) (ibid. p.52), *Baby* (‘women’) (Lastouski 1924, p.476), *Sitsiachko* (Avilin 2006, p.325), *Reshata* (Matskevich 1979, p.334), *Maloe Sita* (‘a little sieve’) *Gniazdo* (lit. ‘nest’, probably a beehive) (Lastouski 1924:476), *Kuchki* (ibid. p.476), *Kurochka* (‘a hen’) (Kuntsevich 2001, p.67), *Kurki* (‘hens’) (Moszynski 1928, p.156), *Kupki* (Gladyszowa 1960, p.158), *Stazherka* (Kas’piarovich 1927, p.291), *Koronka*? (‘a crown’) (Polesskii Arkhiv), *Venochok* (‘garland’) (ibid.), *Buket tsvetov* (‘a bunch of flowers’) (This record was collected by Igor Zhitin).

- *Velisazar*. The name *Velisazar* and other names resembling it were originally connected with a Slavic pagan god, Veles, “the god of cattle” who is also the ruler of the underground kingdom. It is evident that this name itself originates from the archaic Russian word *Vlasezhelische* (Sreznevskii 1893, p.270), which means a place where Veles lived – the underground kingdom or an entrance to it. But with the coming of Christianity the name and its meaning started to change, because the Christian counterpart of Veles was standing close to the Devil.
- *Valosny* (lit. ‘hair’). It is likely that the names *Valoski* and *Valosny* also originate from the early Russian word *Volosyni* (ibid. p.294). Some scientists are of the opinion that it represented the names of Veles’ wives. Interestingly, a surviving legend from the Horvats tells of seven *vil*, souls of deceased brides who live in the Pleiades and take part every night in *khorovod* (walking in a circle holding hands with each other). (Afanas’ev 1994, p.229).
- *Sitechko* (‘a sieve’). It is said of *Sitechko (Rasheto, Sittse)* (‘a sieve’) that in this place “angels sift righteous souls from sinful ones” (Serzhputouski 1930, p.7).

- *Kuchki. Kuchki* means "ten sheaves": *kupki* means "a few piles" and *stazherka (stazhary, stazhar'e)* means a support pole that was put in the middle of a haystack under which branches and straw were laid.
- *Visazhar. Visazhar* is another name for the Pleiades which may come from the archaic Russian word *viss (vissa, visson, vissos)*, the name of a plant whose tincture was used to make colour fabrics: a stained cloth made from flax, and such clothing in general, were considered valuable, being thin and soft. It is likely that in the past the beauty of the rising Pleiades at sunrise was associated with such wonderful cloth, cf., for example, the Belarussian phrase "[The Pleiades] are a *runia* ['a fleece'] of *zarnitsa* ['daybreak']" (Polesskii Arkhiv). In a metaphorical sense this name could relate to Christ's clothes: "There sits on the throne my Lord Jesus Christ in v*isos* shining with crimson and throwing sparks".
- *Gniazdo* (lit. 'nest', probably a beehive). The term 'nest' is used for the inner part of a beehive where frames with honeycombs are placed and where bees spend the winter. Examples of Russian names for star groups or clusters are *Ulej* ('a beehive') and *Os'e Gnezdo* ('a wasp's nest') (Rut 1987, p.15). It is known that the eastern Slavs thought that the souls of the deceased in the form of bees depart to the other world during the winter and return to Earth in the springtime when all of Nature is waking up. The rebirth of Nature is most intense during the spring festivities of St. Yuri on May 5th-6th (April 23rd in the old-style calendar of the nineteenth century). By the seventeenth century this date was already used as a legal term. It defined the start date for the lease of a *folvarks* ('farm') and from which the hiring period for workers was determined. On this date, cattle were released to graze for the first time after the winter. On this date the Pleiades sets (heliacal setting) while on December 8th–9th (November 26th in the old-style calendar) they rises (achronal rising) during autumn festivities for St. Yuri. Thus the beginning and ending of agricultural activities was determined by the setting and rising Pleiades. Cf. the Russian name for the Pleiades – *Kliuchy Petrovy* (lit. 'Peter's keys'). It was believed that using these keys St. Peter or St. Yuri "opens the earth" (i.e. brings about the beginning of spring and of agricultural work).

Besides determining the beginning of annual festivities, this star cluster was used to determine the time. In bygone days when the spinning of yarn continued almost until morning, it was said that "*Velisazhar* is already in the south – it is time to sleep" (Matskevich 1979, p.272) or "*Velisazhar* is already in the south – it is time to go to thresh" (Kas'piarovich 1927, p.56). In some regions it is said: "*Volosozhary* shows the coming rain" (Polesskii Arkhiv) or "If *Volosozhar* goes low, the autumn will be rainy; if it goes high, then autumn will be dry" (ibid.). The Christian Slavonic astronyms of the Pleiades (*Vlasozhelets*) and Orion (*Prakhodnia*) also appear in the Bible printed by the famous Belarussian pioneer printer *Frantsisk Skaryna* in the year 1517 (Book of Job 38:31-32, 9:9).

15. **Polaris –** *Gvozd* ('a nail') (Avilin 2007, p. 100), *Zorny Kol* ('a star pole') (Karatkevich 1990:7), *gwiazda polnochna* (Gladyszowa 1960, p. 62), *polunochna zora* (Moszynski 1928, p.156) (lit. 'a midnight star'), *Stazhar* (Min'ko 1993, p.104).

- *Stazhar*. It was believed that the Milky Way was a pole (in the sense of a post or pillar) with the star *Stazhar* on the top of it.
- *Gvozd* ('a nail'). The name of *Gvozd* can be found in the tale *Neba i Pekla* ('Heaven and Hell'): "He has hammered a nail in the sky, lit a fire, and laid down and is smoking his pipe" (Serzhputouski 1911, p.1).

The knowledge of the star's permanent location in the sky allowed a person to get his bearings on the ground.

16. **Ursa Major** – *Voz* ('a cart') (Avilin 2007, p.100), *Voz faraonski* ('a Pharaoh's cart') (Gladyszowa 1960, p.55), *Illyouo voz* ('Elias's cart') (Kas'piarovich 1927, p.145), *Vialiki voz* ('a large cart') (Avilin 2007, p.100), *Kon's vazom* ('a horse and cart') (Avilin 2006, p.326), *Kon' i Kaliosy* ('a horse and wheels') (Biryly 1994, p.25), *Koni* ('horses') (Avilin 2007, p.100), *Pavozachka Aliashova* ('a small cart of Elias') (Matskevich 1979, p.282), *Kaliasnitsa* ('a chariot') (ibid. p.387), *Kareta* ('a carriage') (ibid. p.429), *Kaliaska* ('a carriage') (ibid. p.386), *Brychka sv. Iakuba* ('a britzka of St. Jacob') (Gladyszowa 1960, p.55), *Brychka* ('britzka is a cart similar to a tilbury') (Avilin 2006, p.2), *Buda* (Sanko 2004, p.233), *Grazhulia Koly* (Matskevich 1979, p.474), *Kaliosy* ('wheels') (Biryly 1994, p.25), *Bal'shyia Kaliosy* ('big wheels') (ibid. p.25), *Kish* (Avilin 2006, p.77), *Randelechak* (Biryly 1994, p.25), *Palojnik* (ibid. p.25), *Apalonichak* (Matskevich 1979, p.84), *Koushyk* ('a ladle) (ibid. p.509), *Karets* (Pietkiewicz 1938, p.8), *Chasha* ('a cup') (Narodnae 1976, p.56), *Sitso* ('a sieve') (Avilin 2007, p.100), *Stazhar'e* (ibid.), *Sahachy* (Lastouski 1924, p.814), *Viadmedzitsa* ('a she-bear') (Matskevich 1979, p.385), *Majsash* (Bir-

yly 1994, p.25), *Piiasash* (Biryly 1994, p.25), *Paprytsa* (Biryly 1994, 25) (all are α, β, γ, δ, ε, ζ, η UMa).

- *Voz* ('a cart'). Most of these names were given to the constellation because of its obvious resemblance to a cart or a ladle. A cart was also called a *koliosa, buda,* or *britzka* and a ladle a *palojnik, apalonichak* or *karets.* This explains the origin of the names. St. Ilia (Aliash) rides in this cart in the sky, the souls of the deceased are carried in this cart along the sky road to *tot svet* ('the other world'). There also exists a belief that before the end of the world the anti-Christ himself will ride in this cart and seduce righteous people so that they forget God. While describing the constellation it is said that the cart is harnessed with a horse or bears, and that it has a broken beam (ε, ζ, η UMa). Biblical Egyptians were sometimes called *Pharaohs* and it was believed that they were half-human and (the lower half) half-fish.
- *Stazhar'e*. The name *Stazhar'e*, which means a support pole in the centre of a haystack, possibly arises from a comparison between the sky full of stars and a field full of ears of corn. Cf. the folk-riddle: "Lay the road, scatter the peas, and lay down a hunk of bread" or "The field is not measured, the sheep are not counted, and the shepherd is horned " (answer to the riddle: the sky, stars and the Moon).
- *Sahachy* ('a moose'). *Sahachy* was the name for a moose. Generally the name *Los'* ('a moose') (Sreznevskii 1893, p.295) and the name *Baby* ('old women') are very old and can be found in the fifteenth-century "*Hozhdenie za tri moria"* ("A journey beyond three seas") by Afanasiy Nikitin.

The position of the constellation in the sky allowed people to determine the time of night: "From the north a cart walks over to the south – morning is near" (Matskevich 1979, p.323).

The name *Kolesnitsa* can also be found in magic spells: "standing under a serene sky, at a clear dawn, facing the fine stars, in front of the hot sun and lucid moon and heavenly *kolesnitsa* ('a chariot')".

17. **Ursa Minor** – *Karomisla* ('a yoke') (Matskevich 1979, p.422), *Vyshezar* (Rut 1987, p.22), *Stozhar'e* (ibid.), *Maly vos* ('a small cart') (Matskevich 1979, p.27), *Kurochka?* ('a small hen') (Avilin 2006, p.328) (all are β, γ, δ, ε, ζ, η UMi). It must be said that some of these names (e.g. *Kurochka*, *Stozhar'e*) may not relate to this constellation. The main reason for this is probably that the people who lived in the villages at the end of the nineteenth and beginning of the twentieth centuries had typically completed a few educational classes but frequently confused the Pleiades and Ursa Minor, leading researchers collecting such material to associate the names with the wrong constellations.

Some constellation and star names do not correspond to known ones: thus *Karomysly* ('yokes', pl.) (Dobrovol'skii 1914, p.346), *Metla* ('a broom') - "stars were scattered" probably referred to a comet (ibid. p.23, *Grob* ('a coffin') (ibid. p.145); *Kaza* ('a she-goat') was most likely Capella (α Aur) (Avilin 2006, p.328); *Shesternia* ('six stars') (Dobrovol'skii 1914, p.999), "there (near "Orion's belt") walks one star which is a sister of *Kosari* ('mowers') to tell them that her stepmother wants to beat her up" (Avilin 2006, p.328); *Liaska Jakuba*[8] ('Jacob's staff') (Avilin 2007, p.100); *Bal'shoe Sita* ('a big sieve') (ibid.); the star *Miadvedzitsa* ('bear') (ibid.); *Vuzh* ('a grass-snake') (Polesskii Arkhiv); and *Vadaliv* ('If the *Vadaliv* star appears, people stay opposite it and throw a boot over a fence'. This record was collected by Ganna Sharenda).

In this article we have made one of the first attempts to present the majority of astronyms known from the literature and collected by local historians. This material may be useful in the comparative analysis of Baltic and Slavonic astronyms and in educational programs as an excellent example of preserved 'oral history'. The author wishes to emphasize that most of the data presented here were collected during the last decade. This shows that it is still possible to record archaic pagan beliefs continuing to exist today in the region of Belarus.

References

AFANASEV, A., 1994 (reprint 1865). *Poeticheskie vozzreniia slavian na prirodu,* 1. Moskva: Indrik.

AVILIN, T.V., 2006. Belarusskaia NM astranomiia. In: *Istoriko-astronomicheskie issledovaniia* (Studies in the History of Astronomy), 31. Moskva: Nauka, 314-322.

AVILIN, T.V., 2007. Belarusskaia NM astranimiia u suchasnych zapisah. In: *Romanovskie chteniia-III: sb. trudov Mezhdunarodnoi nauch. konferentsii*. Mogilev: MGU, 100-102.

BAHANKOVA, A.YA., ed., 1976. *Narodnae slova*. Minsk: Navuka i tehnika.

BIRYLY, M.V., MATSKEVICH, YU.F., ed., 1994. *Leksichny atlas belaruskih narodnykh gavorak.* Minsk: Minskaia kartagrafichnaia fabryka.

DOBROVOLSKIY, V.N., 1914. *Smolenskii oblastnoj slovar*. Smolensk: tip P.A. Silina.

FEDEROWSKI, M., 1897. *Lud bialoruski na Rusi Litewskiej,* 1. Krakow: Wydawnictwo Komisyi Antropologicznej Akademii Umiejętności w Krakowie.

GLADYSZOWA, M., 1960. *Wiedza ludowa o gwiazdach*. Wroclaw: wyd. Polskiej Akademii Nauk.

[8] This astronym is most probably Orion's belt. Cf., for example, the Polish names *Jakubowa policzka*, *laska* or *kosztur Jakuba*.

GRYNBLAT, M.YA., GURSKI, A.I., ed., 2005. *Legendy i padanni*. Minsk.
KARATKEVICH, U., 1990. *Hrystos pryziamliusia u Garodniu. Zbor tvorau u 8t*, 6. Minsk.
KARLOWICZ, J., KRYNSKI, A., NIEDZWIEDZKI, WL., eds., 1902. *Slownik jezyka polskiego*, 3. Warszawa: dr. "Gazeta Handlowaja".
KARLOWICZ, J., KRYNSKI, A., NIEDZWIEDZKI, WL., eds., 1906. *Slownik jezyka polskiego*, 6. Warszawa: dr. "Gazeta Handlowaja".
KATSAR, M. S., 1996. *Belaruski arnament. Tkatstva. Vyshyuka*. Minsk.
KASPYAROVICH, M.I., 1927. *Vitsebski krayovy slounik*. Vitsebsk: Zaria zapada.
KRASNEVICH, A., 1926. Kryvichanskiia nazovy gviozd. *Kryvich. Mesiachnik lit., kul'tury i gramad. zhytstsia*. Studzen-cherven №11(1), 112, Kaunas.
KRYVITSKI, A.A., TSYHUN, G.A., YASHKIN, I.YA., eds., 1987. *Turauski slounik*, 1. Minsk: Navuka i tehnika.
KUNTSEVICH, L.P., YASHKIN, I.YA., ed., 2001. *Zhyvoe nasha slova: Dyialektal. zb* . Minsk: Bel. Navuka.
LASTOUSKI, V., 1924. *Padruchny rasijska-kryuski (belaruski) slounik*. Kouna: Druk. A. Baka.
MATSKEVICH, IU.F., GRYNAVETSKIENE., E., RAMANOVICH, IA. M., eds. 1979. *Slounik belaruskih gavorak Paunochna-Zahodniaj Belarusi i iae pagranichcha,* 1. Minsk: vyd. Navuka i tehnika.
MINKO, L.I., 1993. *Narodnyia vedy. Gramadski byt i kultura selskaga naselnitstva Belarusi*. Minsk: Navuka i tehnika.
MOSZYNSKI, K., 1928. *Polesie wschodnie*. Warszawa: kasa im. Mianowskiego.
NEKRASHEVICH, S.M., BAJKOU, M.YA., 1928. *Rasijska-belaruski slounik*. Minsk: Dziarzhvyd. BSSR.
NM, 2003 - *Narodnaia mifalogiia Gomel'shchyny: fal'klorna-etnagrafichny zbornik*. Minsk: LMF „Ninom".
NOSOVICH, I. I., 1870. *Slovar belorusskogo narechiia*. SPb.
PIETKIEWICZ, CZ., 1938. *Kultura duchowa Polesia Rzeczyckiego*. Warszawa: Towarzystwo Naukowe warszawskie.
POLESSKII ARKHIV – digital archive of the Institut Slavianovedenia RAN. Moscow.
RUT, M. E., 1987. *Russkaia narodnaia astronimiia*. Sverdlovsk: UrGU.
SAHAROV, I.P., 1990. *Skazaniia russkago naroda: Narodnyi kalendar'*. Moskva: Sov. Rossiia.
SANKO, S., VALODZINA, T., VASILEVICH, U., ed., 2004. *Belaruskaia mifalogiia: Entsyklaped. Slounik*. Minsk: Belarus.
SERZHPUTOUSKI, A.K., 1930. *Prymhi i zababony belarusau-paleshukou*. Minsk.
SERZHPUTOUSKI, A. K., 1911. *Skazki i razskazy belorussov*. Minsk.
SREZNEVSKII, I.I., 1893 (reprint 1989). *Materyaly dlia slovaria drevne-russkogo iazyka,* 1. SPb.
VAIŠKŪNAS, J., 1989. *Liaudies astronominių žinių klausimynas*. Vilnius: Lietuvos kraštotyros draugija.

Received: 1 November 2007; Revised: 30 May 2008

ASTRONOMIJA GUDŲ LAUDIES TIKĖJIMUOSE

Tsimafei Avilin

Santrauka

Gausioje gudų žodinėje liaudies kūryboje (dainose, mįslėse, liaudies pasakose ir kt.) iš dangaus šviesulių dažniausiai minimi: Saulė, Mėnulis, Venera ir žvaigždės (kartais Sietynas). Dangaus šviesuliai dažnai yra personifikuojami: Mėnulis ir Saulė yra brolis ir sesuo, Venera yra Mėnulio žmona, o žvaigždės – Mėnulio vaikai.

Liaudies tikėjimams apie žvaigždes dažniausiai būdingi du archajiniai motyvai – žvaigždė yra žmogaus siela ar gyva dvasia; vėlesniuose krikščioniškuose tikėjimuose žvaigždės yra: angelai, angelų buveinės arba tiesiog – žvakutės. Tikėta, kad susispietusios žvaigždės yra šeimos, žvaigždžių šviesis atitinka žmogaus socialinį statusą, mentalinį lygmenį, amžių.

Straipsnyje bene pirmą kartą apžvelgiama gudų liaudiškų dangaus šviesulių vardų visuma ir su jais susiję tikėjimai. Remiamasi tautosakiniais-etnografiniais XIX–XX a. duomenimis bei medžiaga, surinkta paties autoriaus per paskutinį dešimtmetį.

Vertė Jonas Vaiškūnas, Algirdas Girininkas

TRADITIONAL ASTRONOMICAL KNOWLEDGE IN THE WORLD-VIEW OF BELARUSSIANS IN 1994–2005

DZMITRY KANAPLIANIKAU

Abstract

I use methods of systems analysis to build a model of the traditional world-view among present-day Belarusians. Ethnographic observations and interviews served mostly as sources for my research on Belarusian traditional astronomical knowledge. I corroborate the assertion that today's informants' knowledge is traditional by a comparison with records from earlier periods.

Traditional astronomical conceptions are common among present-day Belarusians. They influence not only people's orientation in space and management of nature, but also social relations, including the way in which calendrical, family, medical and other rituals are conducted. Traditional astronomical conceptions form part of a hierarchically arranged traditional world-view. Since these archaic myths and rituals are on the brink of extinction, it is urgent that we record them as soon as possible and take special steps to protect them.

Key words: traditional world-view, traditional knowledge, Belarusians, the sky, stars, the sun, the moon.

Introduction

I define ethnocosmology, or in other words a traditional world-view, as a system of well-ordered ethnic knowledge about the world. I have used systems analysis to build a model of the traditional world-view of Belarussians (Novikava and Zhybul 1998; Kanaplianikaŭ). For the most part, the research model is built upon my own ethnographic observations, interviews I have conducted since 1994, and on investigations of archival records. I have based my research largely on the opinions of informants. Traditional representations of the world arose during the historical development of ethnos so they are the most stable mental representations. The processing of information by humans has specific characteristics, according to which I distinguish linguistic and pictorial representations (pictorial representations can be dynamic). I paid particular attention to phenomena that reside explicitly within the Belarussian cultural tradition: folklore, sacred sites and objects, and ritual activities. I used various techniques (direct explanations of words by informants, indirect explorations of semantics, the discovery of classifications and mental maps) to reveal representations. I asked the informants to describe the contents and scope of the meaning of the words I presented to them and to correlate different objects with conceptions or to draw pictures of them. I asked the informants to explain how they imagine certain objects and rituals. Simultaneously I focused upon the linguistic categories the informants used for descriptions of space, objects, their own actions, and the interconnections between objects; and what myths, legends, and tokens refer to the representations, including why people refer to them as they do, how they appear, and how they are used for household, economic and ritual activities. These methods are very efficient for revealing the structure and dynamics of the traditional world-view system (the number of main levels in the system, the types of connection between the levels, and the presence of knowledge about the system in the system itself). I paid particular attention to orientation in space and time with respect to the Earth and to astronomical bodies referred to in everyday life and during rituals. Also I recorded mythological conceptions about the sun, moon and stars.

I corroborate the assertion that today's informants' knowledge is traditional by a comparison with records from earlier periods. A problem is that these records were published under strict censorship, at first by the Orthodox church in the Russian Empire and then during atheism in the USSR, and so they do not show all the clearly recognizable pagan conceptions: contemporary ethnographic records show us undoubtedly archaic conceptions in which natural phenomena are explicitly identified as god-like (though not related to the Christian God), and in this way many common rituals can be explained. For example, I have recorded a conception that the sun is a god and that because of this the deceased are buried facing the sun.

It is important to bear in mind that: literacy in Belarus stands at 99 % and that in Belarus the private ownership of land was banned, so that the traditional way of farming was completely destroyed: as a result, there

are no classical peasants in Belarus. Urban residents of all ages proved to possess the traditional world-view (i.e. the principles of organization of that world-view), although they have less extant traditional knowledge (i.e. they know less of folklore and rituals) than that of the rural residents. Religious education is not well developed in Belarus. The majority of Belarusians suppose themselves to be Christians, but they do not ever read the Bible, go to church, know the Catechism, or believe in resurrection (they cannot imagine it). All the informants cited below (AIMEF, AGGKA, PEAK), on the other hand, are church-goers; they were educated in school, watch TV and listen to radio, and are or were agricultural workers on big state-owned farms.

Analysis of Belarusian Traditional Astronomical Knowledge

The SKY. In everyday life, Belarusians use only the traditional concept of the sky. The common understanding of the concept of "the sky" is that this is the blue space above the ground. Belarusians suggest that the sky is situated above the clouds. Some Belarusians suppose that the sun, moon, stars, god, and souls of the dead are in or above the sky (*Informants*: "In the sky there are souls of the dead, the moon, and stars. Birds fly near the sky and cannot reach it"; "The soul came to the sky – to God"; "The sky is in outer space [note: the informant simultaneously uses a scientific term and a traditional word]"; There is the sun and God in the sky"; "During Ascension we see God go up to the sky"; "The sun goes above the clouds, above the sky"; "The sun is in the sky, the sky is blue, clouds are under the sky" (AIMEF 116, p.90; AIMEF 125, p.16; PEAK 1). Some people suppose that the sky we can see is not real, and the real sky – where God is – is above, next to the sky we see (*Informant:* "The sky is so high that nobody sees it. It is so many miles to the sky that nobody can walk there**.** The sky is very bright, golden. The black, blue, white – all of this is clouds. On the holiday of the Exaltation of the Cross in the winter, the spot around the sun opens and you can see the sky" (PEAK 1). Similar conceptions about the invisible real sky were held at the end of the nineteenth and the beginning of the twentieth centuries: "God opens the curtain and shows the real sky" (Serzhputoŭski 1998, p.28); "How many hairs are there on the cow – that is how many miles there are to the sky where God is" (Vasilevich 1998, p.33).

STARS. Informants speak about the constellations of "the Haymakers", "the Bear", "the Sieve", "the Hen", "the Cup" and "the Cart". Some of these exist only in folk astronomy and are not found in scientific astronomy. The Milky Way also is called "the Way of the Birds" and "the Way of the Geese", though today these names are quite rare (Arashonkava *et al.* 1996: maps 8, 12, p.86–87, 398, 467; Czurak *et al.* 2002, p. 314, 316, 318, 320; AIMEF 129, p.26–27).

I have noticed that Belarusians refer to constellations as "a star" (Fig. 1).

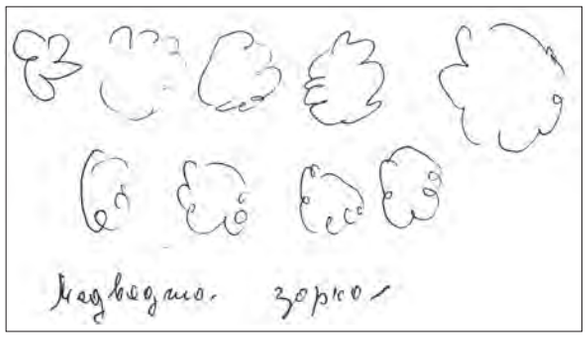


Fig. 1. "Bear star" according to the informant (PEAK 1: file Czurlova 15.01.05).

In most cases stars are not personified. I have recorded suggestions that stars and meteors are souls of the dead: "The star in the sky is out – somebody died", "However many stars there are, there are that many souls" (PEAK 1; AIMEF 116, p.114); that meteors are dragons bringing money (PEAK 1, file Garad, Vietka). One informant spoke of "Snake stars" – groups of stars that look like coiling snakes with eyes, which are more plentiful around midnight. If many groups of those stars are seen at Christmas then in summer there will be many grass-snakes (AIMEF 118, p.108 –109) (Fig. 2).

There is knowledge about the defining time according to the stars: for example, when to get up in winter ("When the weather is frosty and 'the Haymakers' are seen, it is time to get up" (AIMEF 129, p.19, 390) and when to begin supper on Christmas Eve ("when a star rises" AIMEF 121, p.67). The same beliefs about stars were recorded in the end of the nineteenth century (Vasilevich 1996, p. 53–55; Piatkevich 2004, p. 282).

The SUN. In the traditional world-view the sun of great importance. Knowledge about the sun serves to orient people in space and time. The basic direction for Belarusians is an east-west line, which is drawn using the movement of the sun. East and west are not usually

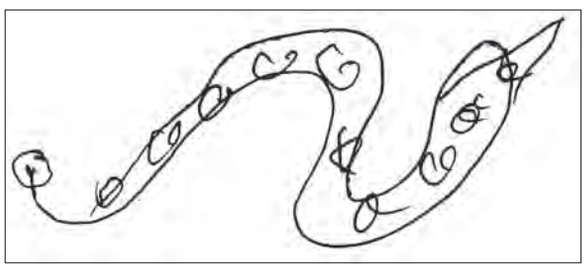


Fig. 2. "Snake star" (PEAK 1: file Rudakova 14.01.05).

used for orientation in the landscape and on the farm, but are generally used in rituals and for situating sacred images. For example, in the Petrykaw district sacred images are situated in the eastern part of the house: the bride's place is near to this sacred image, and informants say that the bride and bridegroom must walk around the table during the wedding according to the movement of the sun or to sunrise, which means with the sun, clockwise (PEAK 1).

Everywhere in Belarus the dead are traditionally buried according to the sun, with their heads to the west and feet to the east; the cross or tombstone is put either at the foot or at the head of the grave (see, for example, the text of the song (Gaiduk 1997, p. 158–159, p. 340–341)).

I have recorded suggestions that the easterly direction contains the god and that the sun is the god. Another informant speaks of a legend where the god, whom the informant supposes to be the sun, gave children to a childless couple with the help of almsmen (beggars). She says: "The sun is the god, it feeds us and warms, and lights and gives rain and everything". The dead are buried facing the sun because god raises them and they pray (PEAK 1).

The other informants from different regions say that: "Svietavit [a name derived from the word 'light'"] is the god of the sun and he is the main god" (Matskevich *et al.* 1984, p.388–389).

Belarusians suppose that the sun has a sacred quality: they say that at Eastertime the sun shining on Easter eggs sanctifies them (AIMEF 128, p.142). Informants suppose that the sun looks unusual at sunrise on St. John's day (Midsummer Day), Easter (AIMEF 128, p.98).

Traditionally, Belarusians define the daily cycle according to the movement of the sun. The day is supposed to begin when the sun rises, and it is universally presumed that the day comes first, followed by the night. Dividing the day in this way is different from defining time with the help of a clock (where the day is presumed to begin at midnight–a method that is used in parallel with the traditional method) and also different from the Christian division of the day (where the day is supposed to begin at 6 p.m. – a method that is used by the Church).

There are many beliefs connected to sunrise and sunset: for example, it is supposed that some rituals and magic spells are most effective when performed before, during or after sunrise. It is sometimes believed that a person should not go to sleep at sunset. The timing of the beginning of some celebrations depends on sunset (PEAK 1; AIMEF 129, p.19; AGGKA 1998, p.20).

Similar suggestions about astronomical bodies, orientation in time and space, the year and the daily cycle, determined by the movement of the sun, were recorded in Belarus centuries ago (Bartashevich 1992, p.181, 399, 402, 408, 412, 415, 425, 436, 452, 473, 478; Vasilevich 1996, p.51–53; Serzhputouski 1998, p.28–29; Piatkevich 2004, p.273, 279–281, 284–285).

The MOON. Belarusians not only use a solar calendar but also a lunar one. Agricultural activities are especially dependent upon the shape of the illuminated part of the moon: what plants to grow and when, when to bring in the harvest, when to butcher cattle, and when to collect medical herbs. Informants often say that when they did not follow these beliefs connected to the moon, their crops failed or the harvest rotted. Such beliefs are drawn from analogies holding between the shape and state of the moon (or words defining them) and the shape of plants, cattle etc. Metaphors connected to the moon are commonly used in spells against toothache (examples: AIMEF 128, p. 98; AIMEF 121, p.67; Valentsova 2001, p.369).

Conceptions about the attributes of the moon and the sun are used in a figurative sense to describe people ("He is as clear, light as the moon, the sun".) (PEAK 1).

Similar conceptions were recorded centuries ago in Belarus (Vasilevich 1996, p.48–50; Tsvirka 1978, p.420; Serzhputouski 1998, p.30; Piatkevich 2004, p.280, 283–284; Gurski 2003, p.181–189, 342, 383, 399, 577, 578, 583).

Traditional astronomical conceptions are common among present-day Belarusians. They influence not only their orientation in space and time and the way they manage nature, but also social relations, including the conduct of rituals – calendrical, family, medical and other rituals. The knowledge informants acquire at school and from the mass media is processed according to the traditional world-view and is either compared to and mixed with traditional knowledge or else has a separate existence from it.

Archaic myths and rituals are faced with extinction; this fact makes it urgent that they be recorded as soon as possible and that the necessary steps are taken to protect them.

Abbreviations

AIMEF – Arkhiŭ Instytuta mastactvaznaŭstva, etnagrafii i fal'kloru Nacyianal'nai akademii navuk Belarusi.

AGGKA – Arkhiŭ Gomel'skai garadskoi kraviaznaŭchai arganizacyi „Talaka".

PEAK – Dz. Kanaplianikau's personal ethnological archive.

References

AGGKA. Sshytak № 2/1998 "Stolinski raen – 1998".
AIMEF 116. Fond № 6. – sprava № 14. – Adzinka zakhavannia № 116.
AIMEF 118. Fond № 6. – sprava № 14. – Adzinka zakhavannia № 118.
AIMEF 121. Fond № 6. – sprava № 14. – Adzinka zakhavannia № 121.
AIMEF 125. Fond № 6. – sprava № 14. – Adzinka zakhavannia № 125.
AIMEF 128. Fond № 6. – sprava № 14. – Adzinka zakhavannia № 128.
AIMEF 129. Fond № 6. – sprava № 14. – Adzinka zakhavannia № 129.
ARASHONKAVA, G.,U., BIRYLA, M.,V., IASHKIN, I.,IA., 1996. *Leksichny atlas belaruskikh narodnykh gavorak: u 5 t. Tom. 3: Chalavek.* Minsk: Fond fundamental'nykh dasledavanniaŭ Respubliki Belarus', Kamitet geadezii pry Savetse Ministraŭ Respubliki Belarus'.
BARTASHEVICH, G., A., 1992. *Zamovy.* Minsk: Navuka i tekhnika.
CZURAK, M., GOLACHOWSKA, E., PASTUSIAK, F., 2002. *Atlas gwar wschodniosłowiańskich Białostocczyzny. Tom. VIII. Leksyka 4.* Warszawa: Slawistyczny Ośrodek Wydawniczy pry Instytucie Slawistyki Polskiej Akademii Nauk.
GAIDUK, M. 1997. *Pesni Belastochchyny.* Minsk: Belaruskaia navuka.
GURSKI, A., I., 2003. *Zemliarobchy kaliandar: Abrady i zvychai.* Minsk: Belaruskaia navuka.
KANAPLIANIKAU, DZ.,G., 2005. Madel' sistemy tradytsyinaga svetagliadu belarusaŭ kantsa XX – pachatku XXI st. In: Nemateryial'naia kul'turnaia spadchyna slavianskikh narodaŭ: prablemy zbirannia, zakhavannia, perspektyvy kompleksnaga vyvuchennia. 3–4 liutaga 2005 Minsk. *Traditional worldview*: *Blog*. Available from: http://traditionalworldview.blogspot.com [Accessed 04 December 2008].
MATSKEVICH, IU., F., GRYNAVETSKENE, A., I., GLUSHKOWSKA, IA., 1984. *Slownik belaruskikh gavorak pawnochna-zakhodniai Belarusi i iae pagranichcha: u 5 tamakh. Tom. 4. P–S.* Minsk: Navuka i tekhnika.
NOVIKAVA, S., ZHYBUL, A., 1998. Acts of Mathematics with Hierarchical Haze. In: I. DUMITRACHE, F. KILE, P. KOPACEK, eds. *Supplemental Ways for Improving International Stability, 1998 (Swiis'98) : A Proceedings Volume from the Ifac Conference, 14-16 May 1998, Sinaia, Romania.* United States: Elsevier Science & Technology Books, 57–62.
PEAK 1. Fond K. – Adzinka zakhavannia № 1.
PEAK 3. Fond K. – Adzinka zakhavannia № 3.
PIATKEVICH, CH. 2004. *Rechytskae Palesse.* Minsk: Belarusi knigazbor.
SERZHPUTOWSKI, A. K. 1998. *Prymkhi i zababony belarusaŭ-paleshukoŭ.* 2nd ed. Minsk: Universitetskae.
TSVIRKA, K., A., 1978. *Viaselle: Abrad.* Minsk: Navuka i tekhnika.
VALENTSOVA, M., M., 2001. Astronomiia. Meteorologiia. Vremia. In: O.V. BELOVA, E. E. LEVKIEVSKAIA, A.A. PLOTNIKOVA, S.M. TOLSTAIA, eds. *Vostochnoslavianskii etnolingvisticheskii sbornik: Issledovaniia i materialy.* Moskva: INDRIK, 355-378.
VASILEVICH, U., 1996. *Belaruskiia narodnyia prykmety i paver"i. – Kniga. 1 : Ziamlia staits' pasiarod svetu.* Minsk: Mastatskaia litaratura.
VASILEVICH, U., 1998. *Belaruskiia narodnyia prykmety i paver"i. – Kniga. 2 : Zhytstsia advechny lad.* Minsk: Mastatskaia litaratura.

Received: 16 October 2007; Revised: 25 November 2008

TRADICINĖS ASTRONOMIJOS ŽINIOS BALTARUSIŲ PASAULĖŽIŪROJE 1994–2005 METAIS

Dzmitry Kanaplianikau

Santrauka

Taikydamas sisteminės analizės metodą autorius bando sukurti tradicinės baltarusių pasaulėžiūros modelį. Pasitelkiant įvairias technologijas (tiesioginį informatoriaus žodžių aiškinimą, netiesioginį semantinį tyrimą, klasifikacijos, mentalinių žemėlapių metodą) bandoma atskleisti pateikėjų supratimą apie pasaulį. Pateikėjų žinių tradiciškumas nustatomas lyginant pastaruoju metu surinktas žinias su užrašytomis ankstesniais laikotarpiais.

Konstatuojama, kad tradicinės astronominės žinios iki šiol daro įtaką ne tik žmonių orientacijai erdvėje ir naudojimusi gamtiniais ištekliais, bet ir socialiniams santykiams, įskaitant kalendorinių, šeimos, medicininių ir kitų ritualų organizavimą. Tačiau šios žinios jau yra ant išnykimo ribos, todėl būtina jas kuo skubiau fiksuoti ir pagal galimybes stengtis apsaugoti nuo išnykimo ir užmaršties.

Vertė Algirdas Girininkas, JonasVaiškūnas

A SOLAR CALENDAR FROM LATVIAN DAINAS[1]

IRENA PUNDURE

Abstract

As ancient Latvians were engaged mainly in growing crops, they used the Solar Year as the basis for their time-reckoning system. Latvian *Dainas* (LDs) contain clear evidence that the four main seasonal festivals, recognized as the Annual Festivals *(Gadskārtas svinības)*, correspond to the astronomical solstices and equinoxes:

Winter Solstice – *Ziemassvētki* (Winter Festival),
Vernal Equinox – *Lieldienas* (Big Day),
Summer Solstice – *Jāņi*,
Autumnal Equinox – *Miķeļi, Apjumības* (Harvesting festival).

The four ecliptic points provided recognizable clues that could be observed in nature, thus laying the foundation for the division of the year into smaller units – *laiks* (time), the proper names of which were formed by adding a seasonal characteristic to the term *laiks (see figure)*, e.g. *Ziemas laiks* (Winter-time), *Siena laiks* (Hay-time), etc. and *savaite* – a nine-day long period. By dividing the year in this manner, the ancient Latvian time-reckoning system established a Perpetual Calendar where a particular day of the *savaite* and the date it represented remained constant and unchanged.

In the reconstruction of the ancient Latvian Calendar, the Summer Solstice is most useful because it coincides with the Summer Festival personified by *Jānis* (pl. *Jāņi*) – *Dievadēls* (Son of God) that is celebrated for one day only when the night is the shortest in the year. The Latvian festivals, which formed an integral part of the ancient time-reckoning system, are still known by their original names (Grīns, Grīna 1992).

Key words: Latvian *Dainas*, annual (seasonal) festivals, Perpetual Calendar.

Introduction

The collection of Latvian folklore that began mainly in the second half of the 19th century, the period of national awakening in Europe, reveals a multi-faceted cultural heritage. It represents a rich source of information about ancient customs and religion as well as way of life, including the time-reckoning system. Through the ages until the 19th century, folk-songs were passed from generation to generation by oral transmission, and as a result some of the information contained in them has remained unchanged and can be traced back to the Stone Age. Latvian folk poetry and songs can be compared to the Vedas of India (Grīns, Grīna 1992).

Thanks to the lifelong efforts of Krišjānis Barons (1835–1923), some 300 000 folk-song texts were assembled and classified, and thus rescued from oblivion as they faded from people's memory. Because of his work as a folklorist, and especially his systematization of the folk-songs and his work in preparing the folk-song texts for publication in eight thick volumes *"Latvju Dainas"* (1894-1915), Barons is known as the "Father of *Dainas*" (*Dainu tēvs*). For the purpose of organizing thousands of hand-written paper slips containing folk-song texts, he used the so-called *Dainu skapis* (Cabinet of Folksongs), which was built in 1880 from his own drawing in Moscow, where Barons and his family lived at that time. This "treasure chest" served him as a working tool. In 1893, the *Dainu skapis* with approximately 150 000 items in it at that moment was brought to Latvia, and now it is a widely acknowledged cultural symbol.

From 1856 to 1860, Barons studied mathematics and astronomy at the Imperial University of Dorpat (Kaiserliche Universität zu Dorpat) (Arājs 1985), now Tartu. At the time it was one of the largest centres of higher education and science in Russia, promoting the successful development of the LD classification system. Barons' life is even commemorated in celestial objects, e.g. asteroid No 3233 (discovered in 1977 by N.Chernykh at the Crimean Astrophysical Observatory): this is named after the father of dainas – *Krisbarons* (Laucenieks 1997).

On 4 September 2001, the Cabinet of Folksongs, a part of the Archives of Latvian Folklore, was included as documentary heritage in the UNESCO Memory of the

[1] Dainas (sing. *daina* in Latvian and *daina* in Lithuanian) are folk-songs. S.K.Chatterji (1890-1977) considers that this word is related to *dhēnā* in the Vedas meaning *speech, voice, words, song of praise, song* and to *daēnā* in the ancient Iran's Avesta meaning *human's inner substance, teaching, revelation* (Arājs 1985).

World Register[1] and since 2002, information from the Cabinet of Folksongs has been available on the World Wide Web (www.dainuskapis.lv).

Being well acquainted with folkloric materials, Barons considered some of the folk-songs to be very old mythological songs that had undeniably existed before the German entry into the Baltic Region, i.e. long before the 13th century (by which time singing by Latvian tribal soldiers is already mentioned in the Chronicles of Livonia) (Arājs 1985).

LD 33664-3

Es atradu uz celiņa	I found on the cart-road
Dieva jātu kumeliņu:	A **God**-ridden steed:
Caur segliem **Saule** lēca,	Through the saddle the **Sun** was rising,
Caur iemauktu **Mēnestiņš**,	Through the bridle the **Moon** was seen,
Pavadiņas galiņâ	On the tip of bridle-rein
Auseklitis ritinaja.	***Auseklitis***[*)] was rolling.

[*)] *Auseklitis* – an *evening* and *morning* star

LD 33684

Lēni lēni **Dieviņš** jāja	Very slowly **God** was riding
No kalniņa lejiņâ;	From the hill down to the dale;
Saules meita vārtus vēra,	The **Sun's Daughter** was opening the gate,
Zvaigžņu cimdus rociņâ.	With her **starry** gloved hands.

We can only surmise about the subject of these picturesque *Dainas* for they are mainly mythological in character.

In this article, only a few folk-songs have been selected from more than 15 000 entries in the Chapter *Gada svētki un svinamas dienas* (Annual festivals and commemorative days) in *Latvju Dainas*. Their subject matter indicates the length of commemorative seasonal festivals and their place within the year.

Very Short Is *Jānis* Night

The Solar Legend (folk-songs about the Sun, the Moon, the stars and celestial phenomena) presents the oak-tree as the symbol of the year, and the Sun itself as various round objects – a pea, a disc, an apple, etc. In ancient times, the Summer Solstice or *Jāņi* (pl. of *Jānis*, diminutive *Jānits*) explicitly marked the beginning of the year (Grīns, Grīna 1992).

LD 33142

Es pārsviedu zelta **zirni**	I flung a golden **pea**
Par sudraba **ozoliņu**,	Over the silver **oak-tree,**
Lai tas krita skanedams	So that it fell jingling
Uz **Jāniša** cepuriti.	On ***Jānits'*** hat.

Jāņi is a festival lasting one day (night) marking the shortest night of the year. The celebration of this summer festival starts on the eve of *Jāņi*.

LD 33200

Īsa īsa Jāņu nakts	**Very short is *Jānis* night,**
Par visàm naksniņàm:	**Shorter than all other nights:**
Te satumsa, te izausa,	Now it's twilight, now it's dawn,
Te Saulite gabalâ.	Now the Sun is high above.

LD 33223

Gauši nāca, drīz aizgāja	That great ***Jānis* night**
Ta lielaja **Jāņa nakts**:	Tardily came, soon went away:
Ne bij dienu, ne nedeļu,	It was neither a day, nor a week,
Vienu pašu vakariņu.	**One evening only.**

LD 33223-1

Ilgi gaidu **Jāņa dienas**	I waited long for ***Jānis* day,**
Gaidu visu pavasaru.	I waited all the spring.
Es domaju, ilgi būs,	I hoped it would stay long,
Būs jel kādu nedeliņu;	To last for a week at least;
Ne dieniņas nepalika,	It did not stay a single day,
Vienu pašu vakariņu.	**It lasted one evening only.**

Jānits Came Annually

A year is the period of the Earth's revolution around the Sun. It is divided into four seasons, during which seasonal festivals are celebrated. Latvian annual festivals are held at astronomically significant points of the Tropical Year, which is the interval between two successive returns of the Sun to the Vernal Equinox. These circumstances were perceived by ancient people watching nature as changes in the length of daytime

[1] http://portal.unesco.org/ci/en/ev.php-URL_ID=22970&URL_DO=DO_TOPIC&URL_SECTION=201.html

and night-time, and these were often sung about by our ancestors.

Jāņi, celebrated at the Summer Solstice, is the seasonal festival to which the most splendid and magnificent folk-songs of praise are dedicated. Only a small sample of the several thousand grand *Jāņi* songs that evidently speak about the place and duration of this summer festival are presented in this article.

LD 32938

Jānits nāca par gadskārtu	*Jānits* came every year
Savu bērnu apraudzìt,	To visit his children:
Vaj tie ēda, vaj tie dzēra,	Were they eating, were they drinking,
Vaj Jāniti daudzinaja.	Were they praising *Jānits?*

LD 32919

Jāņu diena svēta diena,	*Jānis* Day is a holy day,
Aiz visàm dieniņàm:	More sacred than other days:
Jāņu dienu Dieva dēls	On *Jānis* Day the Son of God
Saules meitu sveicinaja.	Betrothed the Sun's Daughter.

LD 33201

Īsa īsa Jāņa (Jāņu) nakts	**Very short was *Jānis* night,**
Par visām naksniņām:	**Shorter than all other nights:**
Vienâ malâ Saule gāja,	On the one side the Sun set,
Otrâ Saule uzlīgoja.	On the other it rose again.

The Autumn Festival is personified by *Miķeļi* (sing. *Miķelis* – a stout, prosperous man) or the Harvest Festival. In the Sun's apparent motion *Miķeļi* (the Autumnal Equinox) is confronted by *Lieldienas* (the Vernal Equinox) in such a way that those events are involved in the ancient Latvian time-reckoning system with strict accuracy:

LD 32278

Lieldieniņa liela sieva,	*Lieldieniņa**), a big woman,
Ta atnāca tukšu roku;	She came with an empty hand;
Miķelits mazs vīriņš,	*Miķelits**), a small man,
Tas atnāca pilnu roku.	He came with a full hand.

*) *Lieldieniņa* – a diminutive for *Liela diena*; *Miķelits* – a diminutive for *Miķelis* (pl. *Miķeļi*).

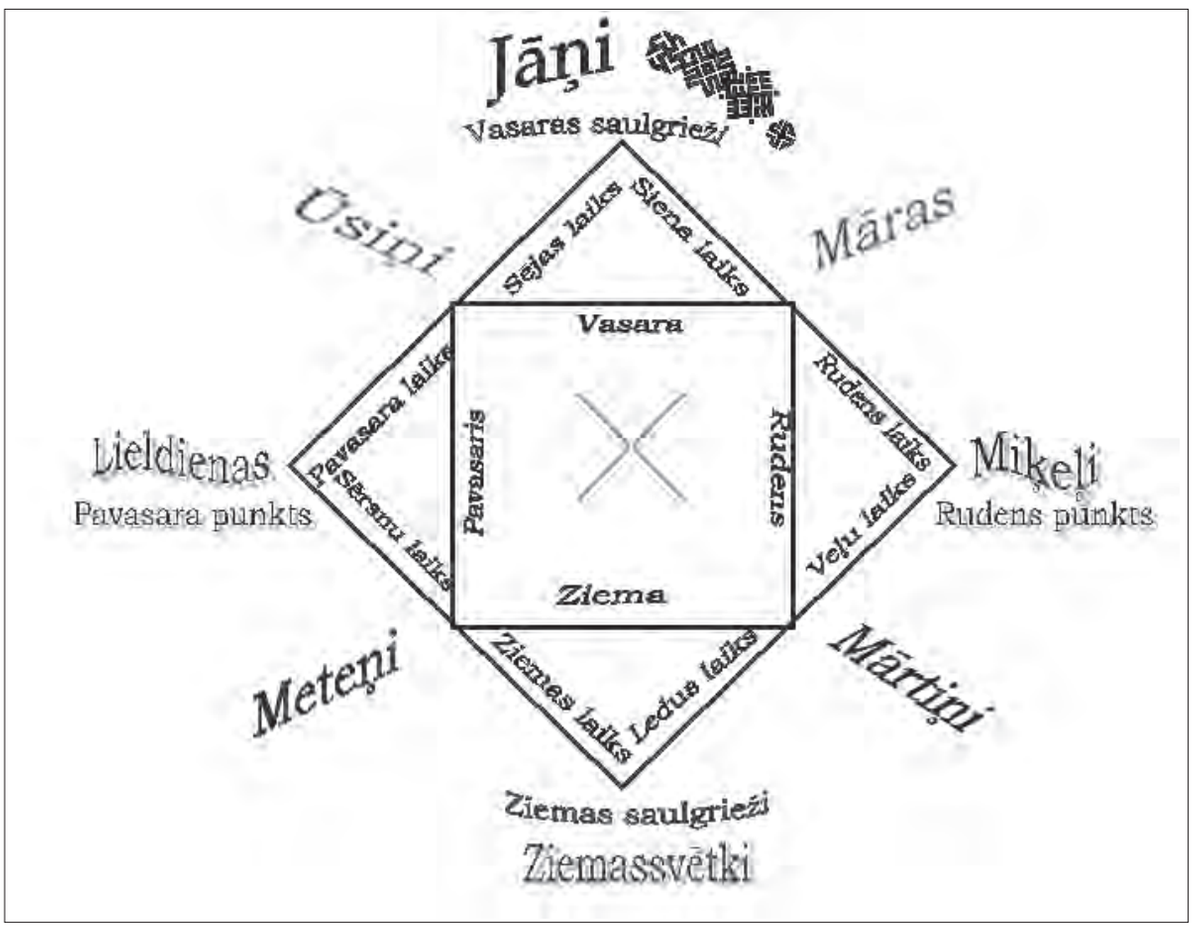


Fig. 1. The main Latvian Annual Festivals correspond to the astronomical solstices and equinoxes. The division of the year into smaller units – *laiks* (time). Illustrated by Gunta Jakobsone (Grīns, Grīna 1992; Pundure 2003).

LD 32240

Brāļi, brāļi, **Liela diena**,	Oh, brothers, it's a **Big Day,**
Kur kārsim šūpuliti?	Where shall we hang a swing?
- Aiz upites kalniņâi	- Across the river on the hill
Div' sudraba ozoliņi.	Between two silver oaks.

For ancient Latvians the length of the daytime also determined the place of other seasonal festivals within the year. The Big Day (*Vernal Equinox* or *Liela diena*, pl. *Lieldienas*) is the day on which the Sun rises and sets exactly at the east and west points (it was punctually observed by our ancestors too), and the day and night are of exactly equal length. The Sun (as it appears to travel against the background stars due to the revolution of the Earth) crosses the celestial equator from the southern hemisphere to the northern hemisphere, and the length of the daytime increases. When the light of the day begins to gain over the darkness of the night, the ancient Latvians celebrated *Lieldienas* (the Big Day).

LD 33295

Ziemas svētki, Liela diena,	Winter Festival and the Big Day,
Tie Dievam lieli svētki:	Those are God's great festivities:
Ziemsvētkôs Dievs piedzima,	In Winter Festival God was born,
Lieldienâ šūpli kāra.	On the Big Day the cradle was hung.

The predominant activity during *Lieldienas* is swinging. The mythical source of this custom, as suggested by *Dainas*, points to God's cradle which is said to have been hung on *Lieldienas* (the Big Day), while *Ziemassvētki* (the Winter Festival) is referred to as the time of God's birth.

Brahmans Came Together on the High Hill

The Tropical Year, which depends on the Sun's apparent motion through the celestial sphere on the Ecliptic and which determines the cyclical recurrence of the seasons (spring, summer, autumn, and winter), is about 365¼ days long *(365.2422 mean solar days)*.

The civil year (in practice, counted only in full days), or simply the **year** in Latvian folklore, is quite frequently represented by *sacred numbers* located on branches, leaves, blossoms, and berries of the *cosmic tree*, in other words, the *sacred tree* is a symbol of the year in the LDs.

The number *nine* most often captures both time and space (Kursīte 1999); "9" often indicates the minimal period of time – a week *(savaite)*, which is a unit of time in the ancient time-reckoning system consisting of nine days. (Grīns, Grīna 1992).

LD 34075

Sajāja bramaņi	Brahmans came together
Augstajâ kalnâ,	On the high hill,
Sakāra zobenus	They hung up their sabres
Svētajâ kokâ.	In the **sacred tree**.
Svētajam kokam	The sacred tree has
Deviņi zari,	**Nine branches**,
Ik zara galâ	Each branch at its tip
Deviņi ziedi,	Has **nine blossoms**,
Ik zieda galâ	Each blossom at its tip
Deviņas ogas.	Has **nine berries**.

Sacred (cosmic) tree + 9 branches **x 9** blossoms **x 9** berries = 1 + 729 = **730**

A high hill is an equivalent of the Universe's centre; the brahmans (particularly priests who, among other things, engaged in renewing the time cycle at the cosmic tree) separate the old year from the new one with their sabres.

The Latvians belong to the Baltic group of peoples within the Indo-European family and ancient Indo-Europeans counted days and nights separately (Kursīte 1999). Thus:

730 is made up of **365 days** and **365 nights** of **one year.**

After Every Three Years in the Fourth Year...

The difference between a common year and a leap year (the latter falling in each fourth year) is clearly seen in the folk-songs. The course of events in the three-year period and the distinction in the fourth year are showed in the Solar Tale (Legend) folk-songs where the wedding of the Sun's Daughter is reflected (LD 34047 etc.).

LD 34047-4

Mēness savas zvaigznes skaita,	The Moon is counting its stars,
Vaj ir visas vakarâ.	If there are all of them in the evening.
Ira visas vakarâ,	Yes, they all are there,
Ausekliša vien nebija.	Except *Auseklitis* who is a-way.

Auseklitis aizteceja	*Auseklitis*[*)] is on its way
Pār jūriņu Vāczemê,	Across the sea to Germany,
Pār jūriņu Vāczemê	Across the sea to Germany
Saules meitas lūkoties.-	To propose to Sun's Daughter. -
Saule, meitu izdevuse,	The Sun who married off her Daughter
Lūdz pērkoni vedejôs.	Asks the Thunder to be the best man.
Pērkoniņš aiziedams,	The Thunder upon leaving,
Sasper zelta **ozoliņu**.	Strikes the golden **oak-tree**[**)].
Trīs gadiņus Saule raud,	For **three years** the Sun is weeping,
Zelta zarus lasidama.	Picking up the golden branches.
Visus zarus salasija,	Having picked all of them,
Galotnites vien nevaid.	She finds the top missing.
Ceturtâ gadiņâ	In **the fourth year**
Atrod pašu galotniti,	She finds the top,
Atrod pašu galotniti	She finds the very top
Aiz kalniņa lejiņâ.	Beyond the hill in the dale.

[*)] *Auseklitis* – an *evening* and *morning* star – masc. gender in latv.

[**)] The oak-tree – a symbol of the year.

In the course of four years or summers (*summer* – here means a *year*) the difference in observations by ancient people accumulates and is likewise reflected in another folk-song:

LTdz 10015

Trīs vasaras Saulīt' lēca	For **three summers** the Sun rose
Purvā lejas rāvienāi,	Down in the marsh-land,
Ceturtāji vasarāji	When **the fourth summer** came
Lec ozola pazarē.	It rose through the lower oak branches.

The fourth year, when the Sun "rose through the lower oak branches", may symbolize the so-called leap year *(every fourth year has an extra day, i.e. it consists of 366 days)* and concludes the common cycle of three years (Kursīte 1996).

Conclusion

The main annual (seasonal) festivals *(Jāņi, Miķeļi (Apjumības), Ziemassvētki,* and *Lieldienas)* — celebrated at the two *Equinoxes* and two *Solstices*, four equidistant points on the Ecliptic, the apparent annual path of the Sun against the background stars on the celestial sphere — shaped the ancient Latvian time-reckoning system. This laid the foundations for a Perpetual Calendar where a particular day of the *savaite* (nine-day period) and the date it represented remained constant and unchanging (Grīns, Grīna 1992).

Acknowledgments

The author extends her gratitude to folklorist Habil. Dr Beatrise Reidzāne for useful comments on the translation of Dainas, to Dr Gunta Jakobsone for suggestions and assistance in the making of the poster, and to language specialist Maija Gulēna for editing the author's English, especially the translation of folk songs. The author also thanks the anonymous referee for his/her constructive comments.

References

DAINU SKAPIS – Cabinet of Folksongs, 2001, Latvia. http://portal.unesco.org/ci/en/ev.php-URL_ID=22970&URL_DO=DO_TOPIC&URL_SECTION=201.html

DAINU SKAPIS KB – Krišjāņa Barona Dainu skapis (Krišjāņa Barona Cabinet of Folksongs). http://www.dainuskapis.lv/

ARĀJS, K., 1985. *Krišjānis Barons un "Latvju dainas"* [Krišjānis Barons and „Latvian dainas"]. Rīga: Zinātne.

GRĪNS, M., GRĪNA, M., 1992. *Latviešu gads, gadskārta un godi* [The Ancient Latvian Time-Reckoning System, Festivals and Celebrations]. Rīga: Everest.

KURSĪTE, J., 1996. *Latviešu folklora mītu spogulī* [Latvian Folklore and Myths]. Rīga: Zinātne.

KURSĪTE, J., 1999. *Mītiskais folklorā, literatūrā, mākslā* [The Mythical in Folklore, Literature, Art]. Rīga: Zinātne.

LAUCENIEKS, L., 1997. Ar Latviju saistīto mazo planētu kopā salikums [Total of Minor Planets Connected with Latvia]. *Zvaigžņotā Debess*, Rudens, Nr.157, 16-19, Rīga: Mācību grāmata.

LTdz – *Latviešu tautasdziesmas* [Latvian folksongs] III, 1981. Rīga: Zinātne.

PUNDURE, I., 2003. *Parādies tu, Saulīte... (par senlatviešu dienas un gada sadalījumu)* [Appear thee, Sun... (on the ancient Latvians division of a day and a year)], *http://www.liis.lv/astron/IE_version/Paradies/Saule.htm*.

Received: 26 October 2007; Revised: 1 December 2008

SAULĖS KALENDORIUS PAGAL LATVIŲ DAINAS

Irena Pundure

Santrauka

Senovės latviai, būdami žemdirbiai, laiką skaičiavo pagal saulės kalendorių. Latvių kalendoriniai metai dalijami į 8 smulkesnius laiko vienetus – laiks (laikas): Ziemas laiks (žiemos laikas), Sērsnu laiks (šerkšnų laikas), Pavasara laiks (pavasario laikas), Sējas laiks (sėjos laikas), Siena laiks (šienapjūtės laikas), Rudens laiks (rudens laikas), Veļu laiks (vėlių laikas), Ledus laiks (ledo laikas) (žr. 1 pav.). Kiekvieno sezono pabaigą ir kito sezono pradžią žymi svarbios metų šventės.

„Latvju dainas" (LD) mini keturias pagrindines metų šventes (Gadskārtas svinības), susijusias su astronominėmis saulėgrįžomis ir lygiadieniais:

Žiemos saulėgrįža – Ziemassvētki (Žiemos šventė),

Pavasario lygiadienis – Lieldienas (Didžioji diena),

Vasaros saulėgrįža – Jāņi (Joninės),

Rudens lygiadienis – Miķeļi, Apjumības (Pjūties šventė).

Latvių šventės buvo integrali laiko skaičiavimo sistemos dalis. Straipsnyje aptariamos tik kelios iš daugiau kaip 15 000 „Latvju dainas" rinkinyje pateikiamų ir kalendorinių švenčių ir atmintinų dienų temai priskiriamų dainų.

Vertė Jonas Vaiškūnas

II. ASTRONOMICAL AND COSMOLOGICAL KNOWLEDGE IN MYTHOLOGY AND RELIGION

MESOPOTAMIAN INFLUENCES ON PERSIAN SKY–WATCHING AND CALENDARS. PART II. ISHTAR AND ANAHITA

KRZYSZTOF JAKUBIAK, ARKADIUSZ SOŁTYSIAK

Abstract

There are a small number of similarities between Ishtar and Anahit, the Persian and Babylonian Venus-goddesses. These similarities may result from cultural diffusion between Persia and Mesopotamia, which was mainly eastwards. We present a comparison of the attributes belonging to both Ishtar and Anahita. This is mainly based on the Mesopotamian sources, since the Persian ones are very meagre. The relationships and influences between the two goddesses are visible in the symbolism of the planet Venus and the constellation Leo, and are associated with autumnal equinox festivals.

Keywords: Mesopotamia, Persia, Ishtar, Anahita, the planet Venus.

This paper is the second report on our research concerning Mesopotamian influences on the Persian calendar and sky-watching. In the first paper, our attention was focused on the Sun-gods Shamash and Mithra. It was presented at the conference "Time and Astronomy in Past Cultures", which took place in the spring of 2005 at Toruń (Jakubiak and Sołtysiak 2006). We intend to split the whole project into three parts, each devoted to one of the pairs of deities belonging to the triads attested both in Mesopotamian and Persian religions, namely Shamash and Mithra, Ishtar and Anahita, and Ahuramazda and Sin. Thus in this report we turn our attention to the second pair of deities: the goddesses of the planet Venus, Ishtar and Anahita.

Inanna/ Ishtar and Anahita. Symbolism, iconography and attributes

Inanna/Ishtar was the most important female deity in ancient Mesopotamia. Her name is documented first in the archaic tablets found in Uruk/Warka, which date back to ca. 3200 BCE. At that time she was already connected with the planet Venus and therefore called ^{d}INANA-UD/húd (Inanna of the evening) and ^{d}INANA-sig (Inanna of the morning). The name ^{d}INANA-KUR (Inanna of the Netherworld) is also attested, though less frequently (Szarzyńska 1997, p.116, 177). The three names seem to reflect the three phases of Venus visibility. During the third millennium BCE Inanna was frequently mentioned as the chief goddess in local pantheon of Uruk and as an important deity in other local traditions of southern Mesopotamia. The Semitic inhabitants of Mesopotamia – first Akkadians, then Amorites and others – identified her with Ishtar, their most worshipped female deity.

An important innovation in the history of Inanna/Ishtar occurred during the reign of Sargon the Great, the founder of the Akkadian empire, who promoted the goddess as the protective deity of his kingdom. She was equally important to the Sumerians and Semites and thus was conceived to be a symbol of unity. Sargon's daughter Enheduanna composed two hymns to Inanna, which were expressions of her veneration for the goddess (Sjöberg 1975). Inanna from Uruk remained a very important goddess figure during the third dynasty of Ur and the first dynasty of Isin (ca. 2100–1800 BCE). The kings of these dynasties legitimized their rule by taking part in the ritual performance of a sacred marriage with the goddess. Afterwards, they were recognized as protective gods of the land, and were therefore identified with Dumuzi/Amaushumgalanna, the god of plant vegetation and Inanna's consort in the Urukite tradition (Kramer 1970).

In the late second and first millennia BCE, Ishtar remained the most important female deity and her dual character as the goddess of love and of war was accentuated. In fact, many local female deities were identified as Ishtar and shared her general attributes. However, even when this occurred, these female deities were sometimes distinguished from each other and always kept a local flavor. The most important among them were Ishtar from Niniveh and Ishtar from Arbil, both worshiped by Assyrian kings. At that time Ishtar was strongly connected with the god of the Sun (Shamash) and of the Moon (Sin), and this triad was frequently represented both in religious texts and in representative art, using the symbols of a star, a Sun-disc and a crescent.

After the Late Uruk period, when the first readable documents were produced, Inanna/Ishtar continued to be associated with the planet Venus. This association remained constant throughout the three-thousand-year history of the cult of this goddess. In Sumerian texts she was sometimes called Ninsianna ("heaven's radiant queen") and her name appeared both in the purely astronomical tablets of Ammisaduqa and in a description of the sacred marriage ritual (Jacobsen 1987, p.124; Heimpel 1982, p.10–11). In post-Sumerian texts even her name was etymologized, as Ninana(k) "the queen of heaven" (Jacobsen 1970, p.27); and many other epithets also pointed to her astral character, e.g. the prayer LKA 70 i 28–29 where she was called "the celestial light that penetrates the heavens and the earth" (Seux 1976, p.435). As the goddess of Venus, Ishtar was symbolized by a six- or eight-pointed star.

In this respect, it is likely that the famous myth about Inanna/Ishtar descending to the Netherworld (Sladek 1974) was based on an observation of Venus' internal conjunction (Sołtysiak 2002). The goddess entered the land of the dead in the west, but declared that her aim was to travel to the east. The seven elements of her divine aura – which she was forced to leave behind, one after the other, in each of the seven gates of the Netherworld – may have been associated with the gradual disappearance of the planet into the glow of the Sun. The story itself was probably composed at the turn of the third millennium, but even then it expressed some older motifs and was re-written as late as the Neo-Assyrian period.

The dualism of Inanna/Ishtar, obviously related to the two easily observed phases of Venus' visibility, was strongly emphasized both in early and late Mesopotamian texts. There are many explicit mentions of Inanna as the goddess of dusk and dawn, e.g. in her *ershemma*-hymn (Cohen 1981, p.134). In later periods Ishtar was frequently recognized to be an androgynous deity. In an astronomical text from Ashurbanipal's library (K 5990) the morning star was called (the male) Ishtar of Akkad while the evening star was called (the female) Ishtar of Uruk (Heimpel 1982, p.14); the opposite attribution can also be found (Reiner 1995, p.6; Koch–Westenholz 1995, p.125). This gender dualism was sometimes related to the duality of Ishtar's ascription as the goddess of both love and war (Reiner 1985a, p.30). There is mention of a bearded Ishtar from Babylon in a Neo-Assyrian hymn dedicated to Nanaya, and a passage about Ishtar from Niniveh, also with a beard, in a prayer of Ashurbanipal (Heimpel 1982, p.15). Ishtar's androgynous character is also expressed in a Babylonian hymn to the queen of Nippur (Lambert 1982, p.200).

In some local traditions the duality of Inanna/Ishtar is expressed by a twin female deity. For example, in early Uruk Inanna and Ninsun were a couple (Cohen 1993, p.215); later, Ishtar was connected with Nanaya. During the third dynasty of Ur, there is a description of a feast of the twin goddesses Annunitum and Ulmashitum celebrated in the capital city; the twin goddesses were very likely the two aspects of Inanna. An interesting document explaining Ishtar's dualism is the Akkadian hymn to Agushaya, in which Ishtar as the goddess of war makes trouble for the people and Ea decides to create Saltu – the mirror reflection of Ishtar. Unfortunately the tablet containing the text is broken. Nevertheless, the last passage suggests that the goddess was not happy with this creation and promised to stay calm for whole year except on the day of the feast of Agushaya. On this day, people would dance and celebrate in the streets (Foster 1977, p.84).

All these particulars clearly show the important role Ishtar played in the Mesopotamian pantheon as well as in popular beliefs. Unfortunately, we do not have at our disposal equally good sources concerning the role of Anahita in Persian religion.

As is well known, Anahita had long been present in the Iranian pantheon, probably since its origin sometime in the Bronze Age. Persians paid homage to the goddess Anahita whose cult continued to be practiced without interruption up until the time of the Muslim conquest. The Arab conquest of the Sasanian Empire put an end to the ancient period of the Zoroastrian religion and there are indications that references to Anahita also disappeared almost completely from Persian belief at this point. Our study is focused mainly on the Achaemenid period, but later time periods should not be forgotten since they serve to reveal further developments in Zoroastrian religion. During the Achaemenid dynasty, Mesopotamian influences on Persian religion seem generally to have been strongest, particularly when the

broader relationships between the two lands are taken into consideration.

The name of Anahita can be associated with the Avestian adjective *anahita* which is usually connected with *Harahwati Aredwi Sura yazata*. It is clear that *yazata* had a strong relationship to flowing water and fertility. The adjective *anahita* can be translated from the Avestian language as "immaculate". This indicates that Anahita, as a goddess who was immaculate and pure, had been a very powerful symbol in Persian religion. Moreover, she was identified with the planet Venus, which provides a strong argument that she was linked to the Mesopotamian goddess Ishtar.

Anahita is probably one of the most mysterious deities in the Persian pantheon. She was present in the oldest forms of Iranian religion. Moreover, it is also interesting that no *Yasht* was dedicated to her, particularly because this suggests that since the oldest periods she had been worshiped among the ordinary people, and that her symbolism and position in Iranian religion was so strong that no further elaboration was needed.[1] This argument is even more persuasive if one takes into account the fact that in the absence of textual sources the dominant position of Anahita remained unchanged throughout nearly the whole of antiquity and flourished most intensely during the Sasanian period. In *Yasht* 5 of the Avesta, one does find some sentences that were dedicated to Anahita. Here the goddess is described as a person driven on a chariot, a wild river, a wind, a cloud, and snow. The dualistic symbolism of the goddess is clearly highlighted in these poetic elements, for she is portrayed as warlike while at the same time being associated with concepts of fertility. On the other hand, these pluvial aspects were rather marginal since the main attributes of Anahita were rivers, ecologically crucial elements in Iranian religious belief among rural communities (Boyce 1967; Boyce 1988, p. 89).

Anahita's position probably changed during the late Achaemenid period (late fifth and fourth centuries B.C.). It appears that this process occurred during the reign of Artaxerxes II (404-358 B.C.), who introduced two deities, Mithra and Anahita, into the official religion in addition to the main god Ahuramazda. This reform was probably carried out on Persian territory and under strong Mesopotamian influence (Jakubiak, Sołtysiak 2006). In this respect, it is important to note that the construction of the temples in Iran had been going on since the time of Artaxerxes II. As was discussed briefly in during the Toruń conference, the same situation can be identified concerning the two other Iranian deities from the main triad, Shamash and Mithra (Jakubiak and Sołtysiak 2006). According to the testimony of Beressos the Babylonian, who lived in the third century B.C., similar temples dedicated to the Persian triad were erected in nearly every city.

Nevertheless, in Persian art from the Achaemenid period certain motifs can be found that could be associated with the attributes typical of Anahita. Such motifs can be recognized most readily in the glyptic material. According to Shepherd, who analyzed the iconography of Anahita, several seals depicting females are likely to be representations of this goddess (Shepherd 1980). Of course, there are very few such representations compared to the Sasanian period, a situation that could be explained by the fact that Anahita was venerated particularly by members of the Sasanian dynasty.

In the Achaemenid period, iconography that can be associated with depictions of Anahita can be found on cylinder seals. The attributes depicted – a lotus flower, a bird and a diadem – are typical for Anahita (Shepherd 1980, p.56). The tiara which also could be recognized as a *corona muralis* is one of the other elements often linked to the attributes of Ishtar. Together with a *corona muralis*, birds were also typical elements associated with Ishtar (Shepperd 1980). It seems highly likely that the introduction of Anahita into the official state religion by Artaxerxes II was strongly tied to propaganda campaigns and to the prevailing royal ideology. Generally speaking, everything that was Persian in origin was viewed as the quintessence of Persian pride. Such a preeminent role could be assigned to Anahita, who, according to the ideology of the time, was just as important as one of the most popular goddesses from Mesopotamia: Ishtar.

The similarity of Anahita to Ishtar may well have been the starting point for her association with the planet Venus. According to Herodotus (I. 131), the cult of Anahita was widespread in the Persian Empire and her cult was referred to by the name of the celestial goddess Aphrodite/Anahitis. The Avestan word *anahitish* means "immaculate" which was a concept connected with Venus. Nor was it accidental that both deities had similar attributes, since the convergence provided an opportunity to establish the position of Anahita firmly on both Mesopotamian and Persian territory.

Moreover, the iconography of Anahita is very closely related to the constellation Leo. This is confirmed by the representations found on cylinder seals as well as the symbol of the lion (Boardmann 2003, p.195). It is commonly accepted in Mesopotamian research that such representations of lions have astral aspects connected with the constellation Leo. Consequently, if depictions almost identical to the Mesopotamian repre-

[1] "Yashts" is the Persian name for the hymns that formed important parts of the Avesta, the holy book of the Zoroastrians.

sentation of Anahita can be found on the cylinder seals, is would support the above thesis.

Apart from this, we have no data that clearly demonstrate diffusion or changes in the nature of Anahita's cult during Parthian rule. We do not even have evidence concerning her celestial association or position in the pantheon. We can only speculate that the religious doctrine did not change. What is significant, according to the sources, is that the cult of Anahita was very popular not only in the Parthian Empire, but also among many peoples and nations in other parts of the Middle East. Anahita was particularly worshiped in Armenia, where her cult survived until the population's conversion to Christianity (Boyce 1983, p.1007). One similarity is significant: all the statues of Anahita were located in temples, no matter in which part of the Middle East the temples themselves were constructed.

A particularly interesting fact, true not only in the region of Mesopotamia, is that the association between Anahita and Ishtar survived. Some aspects of Nanai also can be observed in Anahita's character (Boyce 1988, p.123; Chaumont 1983, p.1008-1009). In other words, we can assume that the cult of Nanai was absorbed by that of Anahita. This supposition is fundamental because the main characteristic of Nanai was her violent and warlike character (Boyce 1988, p.123). If this is right, it means that during the period in question warlike elements in the cult were much more important for the Arsacid dynasty. It is possible that during their conflict with Rome the Parthians needed such warlike deities to give divine support during difficult times. In such conditions, paradoxically, Anahita's cult could have developed and been consolidated in Persia. If so, then Anahita's increased importance, which started during the Achaemenid period, continued during Parthian times and reached its peak in the Sasanian period.

Some astronomical aspects of Ishtar and Anahita

Many minor feasts dedicated to Inanna and Ishtar are attested in various local traditions, but the most important and persistent of them was the feast that took place during the sixth month of the standard Mesopotamian calendar, called Ululu ("the cry") in Akkadian and Kin-Inanna ("the oracle of Inanna") in Sumerian (Sallaberger 1993, p.128–129). This feast was organized at one of most important junctures in the solar year, close to the autumnal equinox. Despite the fact that in the Mesopotamian lunar calendar the relation between fixed calendar feasts and the position of the Sun was always fluid, the proximity to the autumnal equinox may have been important. The relationship between Inanna and the sixth month is attested back in ca. 2100 BCE, and it is possible that even earlier, in Gudea's calendar (ca. 2150 BCE), the name of the sixth month Ur ("the lion/dog") was already connected with the goddess, whose animal attribute was the lion. Unfortunately, no information about any feast during this month has been preserved (Cohen 1993, p.74).

During the second millennium, the sixth month was continuously linked with Ishtar and the so-called "Nippur Compendium" simply associates Ululu with the goddess (Cohen 1993, p.324). In one of the mythological texts composed early in the second millennium, Dumuzi, Inanna's husband sentenced by her to death, was called Ululu (Jacobsen 1978, p.51), which suggests that the Akkadian name of the month was related to the story about Ishtar's journey to the Netherworld and her return. The name of the sixth month in the local calendar from Sippar may also reflect this story, since Tirum is probably associated with Akkadian *taru*, "to come back" (Cohen 1993, p.278). In the more-or-less contemporary calendar used in Mari, the sixth month was called DINGIR.IGI.KUR, which may be interpreted as the name of the deified Netherworld and again associated with Inanna's journey.

According to the menology of Astrolabe B, the month Ululu is the "work of Ishtar of Elam, the goddesses are purified in the sacred river" (Cohen 1993, p.322). It is possible that this ritual took place in the middle of the month, between the 11th and the 14th days (Cohen 1993, p.104–105). Also in the Neo-Assyrian calendar of feasts K 3753, during the month of Ululu "the lady of gods purifies her body in the divine river". In the decadent tradition of Uruk the purifying rites of Anu and Ishtar, as well as the ceremony of their sacred marriage, took place in the month of Ululu (McEwan 1981, p.177).

In the later Assyrian calendar, the minor feast of Ishtar took also place in the fourth month and was related to the *taklimtu* ritual when Dumuzi/Tammuz was called back from the Netherworld together with the dead who received their offerings. Such a feast may also be attested in the calendar from Mari (Cohen 1993, p.289), where the major feast of Ishtar took place during the ninth month (Cohen 1993, p.293). In third-millennium Uruk the feast *elunum* of Inanna was organized during the second month (Cohen 1993, p.211). More mysterious is the passage in Astrolabe B which relates that the tenth month Tebetu was "the month of Ishtar's brilliance". Perhaps an explanation can be found in one of Ashurbanipal's inscriptions, where we read that "Tebetu [is] the month of visibility of the Bow Star, the feast of the worshipped Queen, the daughter of Enlil"

(Cohen 1993, p.336). The Bow Star (identified as Canis Major) and the bow in general were widely recognized attributes of Ishtar, so it is possible that in later traditions the calendrical feast of Ishtar was also associated with her constellation.

Another astral attribute of Ishtar was the constellation of Annunitum (part of modern Pisces). During at least the second and first millennia BCE the lion was the chief symbolic animal of Ishtar, and this provides another reason why the constellation of Leo sometimes appears, especially in late astrological tradition, as the attribute of Ishtar, who was also connected with the planet Venus.

Ishtar was represented most frequently as an armed woman standing on a lion, sometimes with wings or surrounded by stars. In addition, it is possible that representations of naked women standing facing forwards ought to be identified as Inanna/Ishtar. In a few cases the goddess was associated with mountains, as in the Sumerian epic "Enmerkar and the Lord of Aratta" where Inanna is presented as "heaven's great queen riding on high in a ruddy robe, enthroned on the mountain summits" (Jacobsen 1987, p.295).

At this point we will take a closer look at Anahita and her status as well as the significant role and astronomical manifestations of her cult. Since our knowledge about Persian religious belief and its astronomical connotations is very scanty, it is impossible to determine for certain how many religious aspects came to be deeply rooted in Persian astronomical lore. Among the data at our disposal we do not have clear evidence that could be helpful in our investigations of those aspects directly linked to Persian religious beliefs, since the textual sources have not survived. However, there can be no doubt that Persian religion, like any religious system, could not have existed without a calendar and calendrical festivals, and consequently without using astronomical lore.

Although we have no information regarding the astronomical aspects of the cult of Anahita within Persian territory, sources from the area strongly influenced by Persia can be very helpful and serve to clarify this interesting topic.

Some celestial aspects of the Anahita cult can supposedly be found outside Persian territory. In Commagene, for instance, there was a cult of Ormuzd, Mithra and Anahita (Boyce 1986, p. 843, 7 vol., Dio Chrysostom XXXVI 38-60; Strabo XV. 3. 13-17). As is well known, the religion of the Commagenian dynasty contained many aspects of Hellenistic, Persian, and local traditions mixed together, which brought a new syncretism to the local religion of the region. In this respect, the religion dating from the reign of Antioch I of Commagene is quite well documented by his gigantic "mausoleum" at Nemrud Dag (Wagner 2000; Waldmann 1991). The worship of Anahita in Commagene could have been borrowed from Persian tradition, but Mesopotamian tradition very probably played an important role too, and in all likelihood Anahita was strictly associated with the astral aspects of the planet Venus.

As we have already mentioned, other details of Anahita's cult are found in Armenia. In this country strongly influenced by Persia, not only were statues of the goddess worshiped; we can also recognize some celestial contexts of the cult. It is peculiar that only in Armenia did people organize special ceremonies and festivals dedicated to Anahita. These festivals developed over time. During the early Christian period, the Assumption of the Virgin Mary was celebrated on a day formerly called Great Mithraghan. This fell on the 21st day of the month Mihr (Boyce 1986, p.802-805). The month Mihr can be identified back to the Achaemenid period as the seventh month in the Mesopotamian calendar – what became August/September. Hence, the 21st day of Mithraghan was celebrated on September 19/20th. In other words, the feast was organized near the autumnal equinox. That day was probably important in the Persian religious calendar because Anahita was worshiped as a goddess of victory, an assumption that derives from the character of the early Christian ceremony organized in Armenia. Moreover, the day and the character of the ceremonies dedicated to Anahita in her capacity as a celestial and victorious deity were not chosen accidentally. According to Persian tradition, on that day the Persian hero Feridun had defeated Hahak, a terrible evil monster, in what can be understood as a mythological reflection of combat between good and evil spirits, a tradition that is very well known in Persian religion.

Another feast that can also be associated with the cult of some of Anahita's aspects is the ceremony dedicated to Tishtria, the *yazata* of rivers. The feast was called Tirigam and took place during the springtime. However, the only other information we have at our disposal is that the feast was associated with Sirius. Nothing in the ancient sourceshelps us to determine the day on which the ceremonies took place. There is no doubt, however, that the *yazata* of water was viewed as emanating from Anahita (Boyce 1969, p.31; Boyce 1979, p.100-101). This does at least allow us to conclude that ceremonies dedicated to this important goddess and her cult were not only carried out in the early autumn but also, in special circumstances, during the springtime.

Conclusions

The existence of these links between the main deities of Persia and Mesopotamia is not surprising. Mesopotamian religion, with its very old traditions, must surely have had very strong influences on Persian religion and associated beliefs. The confluence of ideas is particularly clear during Artaxerxes II's reign, when a fascination with Mesopotamian customs was observed as bringing about a very profound process of change in Persian religion. Under Mesopotamian influences, Mitha and Anahita appeared alongside Ahura Mazda to form the main triad of deities in the Persian pantheon. It seems reasonable to draw a parallel with Shamash, Ishtar and Sin. Certain astral aspects associated with the planet Venus – which is linked to with Ishtar and Anahita – are also very interesting. Furthermore, two other aspects are typical for those two goddesses. The first is an association with the constellation of Leo and other aspects commonly intertwined with Leo symbolism. The second involves the autumnal equinox. A strong argument that the autumnal equinox was very important in the liturgy of both deities can be constructed from that fact that the most important festivals dedicated to Ishtar and Anahita took place at the same time. Also worthy of attention are the warlike aspects of both deities as well as their mutual associations with fertility and their common representation as virgins and attractive women. However, only Anahita was worshiped as the abstract personification of pure water or everlasting fire.

In conclusion, in the case of Anahita and Ishthar, unlike comparative studies focused on Mithra and Shamash, it is simply impossible to find many parallels and similarities holding between the two goddesses. Only two convergent elements can be associated with Anahita and Ishthar. One is the festival dedicated to these two goddesses, which took place in September, near to the autumnal equinox. The other comprises some iconographical elements associated with the representation of lions, understood as attributes of the goddesses. Consequently the conclusion must be rather pessimistic. We have relatively good Mesopotamian sources at our disposal but relatively limited ones from the Persian side. As a result, comparative studies on Ishtar and Anahita continue to be very difficult. Yet the two similarities that are presented above seem to be relatively important and show how carefully such comparative studies must be conducted. The difficulty of reconstructing reciprocal influences between these two ancient religious systems must also be emphasized. Even if the relationships and associations documented here did exist in ancient Mesopotamia and Persia, the nature of our sources still requires us to derive our conclusions primarily through inference by constructing patterns of converging evidence. Hence, we have little direct evidence which could support the hypothesis on more scientific grounds.

References

BOARDMAN, J., 2003. *Die Perser und der Westen.* Mainz am Rhein: Ph. von Zabern.

BOYCE, M., 1967. Bibi Shahrbanu and the Lady of Pars. *Bulletin of School of Oriental and African Studies, University of London, 30, 1, Fiftieth Anniversary Volume*, 10-34.

BOYCE, M., 1969. On Mithra's Part in Zoroastrianism. *Bulletin of School of Oriental and African Studies, University of London, 32, 1*, 10-34.

BOYCE, M., 1979. *Zoroastrians. Their Religious Beliefs and Practices.* London: London University Press.

BOYCE, M., 1983. Anahid. *Encyclopaedia Iranica*, 1003-1007.

BOYCE, M., 1986. Iranian Festivals. *The Cambridge History of Iran* vol. 3, 2, 792-815.

BOYCE, M., 1988. *Zoroastrians. Their Religious Beliefs and Practices.* (Polish edition), Łódź: Wydawnictwo Łódzkie.

CHAUMOT, M., L., 1983. Anahid, The Cult and Its Diffusion. In: *Encyclopaedia Iranica:* Encyclopaedia Iranica Foundation, Bibliotheca Persica Press. 1007-1009.

COHEN, M., 1981. Sumerian Hymnology: the er emma. *"Hebrew Union College Annual" Supplements 2, Cincinnati.*

COHEN, M., 1993. *The Cultic Calendars of the Ancient Near East*, Bethesda: Capital Decisions Ltd.

FOSTER, B., 1977. Ea and Şaltu. In: M. DE- JONG ELLIS, ed. Essays on the Ancient Near East in Memory of Jacob Joel Finkelstein, *Memoirs of the Connecticut Academy of Arts and Sciences*, 19. Hamden, 79-84.

HEIMPEL, W., 1982. A Catalog of Near Eastern Venus Deities. *Syro–Mesopotamian Studies 4/3*. 9-22.

JACOBSEN, T., 1970. *Toward the Image of Tammuz and Other Essays on Mesopotamian History and Culture*. W.L. MORAN, ed. Cambridge MA: Wipf & Stock Publishers.

JACOBSEN, T., 1987. *The Harps that once... Sumerian Poetry in Translation*. New Haven–London: Yale University Press.

JAKUBIAK, K., SOŁTYSIAK, A., 2006. Mesopotamian Influence on Persian Sky-Watching and Calendar, Part I. Mithra, Shamash and Solar Festivals. In: A. SOŁTYSIAK, ed. *Proceedings of the Conference Time and Astronomy in Past Cultures, Toruń, March 30- April 1, 2005*. Warszawa-Toruń. 51-62.

KOCH-WESTENHOLZ, U., 1995. *Mesopotamian Astrology. An Introduction to Babylonian and Assyrian Celestial Divination*. The Carsten Niebuhr Institute of Near Eastern Studies Publications 19. Copenhagen: Museum Tusculanum Press.

KRAMER, S., N., 1970. The Dumuzi – Inanna Sacred Marriage Rite: Origin, Development, Character. In: A. FINET, ed. *Actes de la XVII^e Rencontre Assyriologique Internationale. Université Libre des Bruxelles, 30 juin – 4 juillet 1969.* Ham–sur–Heure: Comité belge de recherches en Mésopotamie, 135-141.

LAMBERT, W., G., 1982. The Hymn to the Queen of Nippur. In: G. van DRIEL, TH.J.H. KRISPIJN, M. STOL, K.R. VEENHOF, ed. *Zikir Šumim. Assyriological Studies*

Presented to F.R. Kraus on the Occasion of his Seventieth Birthday, Leiden: Brill, 173-218.
MC EWAN, G. J. P., 1981. Priest and Temple in Hellenistic Babylonia. *Freiburger Altorientalische Studien 4*. Wiesbaden: Steiner.
REINER, E., 1985. *Your Thwarts in Pieces, Your Mooring Rope Cut. Poetry from Babylonia and Assyria*. Michigan: University of Michigan Press.
REINER, E., 1995. Astral Magic in Babylonia. *Transactions of the American Philosophical Society,* 85, part 4. Philadelphia: The American Philosophical Society.
SALLABERGER, W., 1993. *Der kultische Kalender der Ur III–Zeit*, vol. I. Berlin–New York: Gruyter, 37–314.
SEUX, P., J., 1976. *Hymnes et prieres aux dieux de Babylone et d'Assyrie*. Paris: Le Cerf.
SHEPHERD, D., G., 1980. The Iconography of Anahita. *Berytus 28*, 47-87.
SJÖBERG, Å., W., 1975. In-nin š-gur4-ra. A Hymn to the Goddess Inanna by the En–Priestess Enheduanna. *Zeitschrift für Assyriologie,* 65(2), 161-253.
SLADEK, W., R., 1974. *Inanna's Descent to the Netherworld*. PhD dissertation, Baltimore.
SOŁTYSIAK, A., 2003. Betrayed Lovers of Ištar. A Possible Trace of the 8-Year Venus Cycle in Gilgameš VI:i-iii. In: M. BLOMBERG, P.E. BLOMBERG, G. HENRIKSSON, eds. *Calendars, Symbols, and Orientations: Legacies of Astronomy in Culture. Proceedings of the 9th Annual Meeting of the European Society for Astronomy in Culture (SEAC). Stockholm, 27–30 August 2001*. Uppsala, 101-106.
SZARZYŃSKA, K., 1997. *Sumerica. Prace sumeroznawcze*. Series: Philologia Orientalia, 3. Warszawa: Dialog.
WAGNER, J., 2000. *Gottkönige am Euphrat, Neue Ausgrabungen und Forschungen in Kommagene.* Mainz am Rhein: Ph. von Zabern.
WALDMANN, H., 1991. *Der kommagenische Mazdaismus.* Series: Istanbuler Mitteilungen, Beiheft, 37. Tübingen: Wasmuth.

Received: 1 November 2007; Revised: 15 September 2008

MESOPOTAMIJOS ĮTAKOS PERSŲ DANGAUS STEBĖJIMAMS IR KALENDORIAMS. II DALIS. IŠTAR IR ANAHITA

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Santrauka

Straipsnis nagrinėja panašumus tarp Babilonijos ir Persijos religinių sistemų. Šie panašumai aptariami nagrinėjant dvi abiem religinėms sistemoms svarbias deives. Deivės Anahita ir Ištara pasirodo čia ne tik religiniame lygmenyje, bet taip pat yra siejamos su dangumi ir astrologija. Jos abi čia atstovauja Veneros planetą. Šie panašumai gali būti rezultatas tų įtakų, kurios sklido iš Vakarų į Rytus – iš Mesopotamijos į Persiją. Lyginamuosius tyrimus apie jų atributiką, simbolius ir jų padėtį panteone paremia abiejų labai turtingų Mesopotamijos (Asirijos ir Babilonijos) šaltinių analizė ir negausūs šaltiniai iš Persijos, kurie išliko iki mūsų dienų. Negalima nepaminėti keleto naujų Anahitos kulto aspektų, atsiradusių dėl Mesopotamijos įtakos, valdant Artakserksui II. Savo valdymo laikotarpiu šis karalius iš pagrindų reformavo Irane buvusį tikėjimą, į oficialią religinę sistemą įtraukdamas dvi naujas deives. Viena iš jų buvo Anahita, kuri pasirodė kartu su Mitra ir tapo aukščiausiojo dievo Ahuramazdo partnere iraniečių panteone.

Šis straipsnis yra tęsinys anksčiau atliktų Mesopotamijos ir Persijos dievų triados (Sinas, Šamašas, Ištar /Ahuramazdas, Mitra ir Anahita) tyrimų. Pirmoji dievybių pora – Mitra ir Šamašas – buvo nagrinėjama 2005 m. Torūnėje vykusioje konferencijoje „Laikas ir astronomija praeities kultūrose" (Jakubiak and Sołtysiak 2006).

Vertė Algirdas Girininkas

THE BIRTHDAY OF ASAKKU

ARKADIUSZ SOŁTYSIAK

Abstract

In a letter to Aššur, the Assyrian king Esarhaddon informed his god about a campaign against the small state of Šubria located in the hills north of Assyria. When Assyrian troops besieged Uppume, the capital city of Šubria, in the dead of night "on the 21st day of Kislimu, the birthday of Asakku", the defenders tried to burn the rampart constructed by the Assyrians; this was the only military success of the Šubrians who not long after were defeated by their enemies. The most interesting element of this story is the date of this event, which according to the letter's author was not accidental and explicitly called *uhulgalû* (Akkad. "unfavourable day"). The term "birthday of Asakku" is not known from other sources, but its significance may be explained in terms of Assyrian hemerology, astromancy and astral symbolism. First, it was the 21st day of the month, the day of lunar third quarter and one of five most dangerous days in the month when appropriate rituals must have been performed in order to prevent the increased activity of demons. Second, the month of Kislimu was close to the winter solstice and attributed to Nergal, the god of the Underworld and great warrior. The link between this date and Asakku, a stony monster in Sumerian lore and a demon of the eastern mountains in Assyrian tradition, was well-grounded in contemporary speculative theology in which the combat of a warrior-god against Asakku had been connected with winter storms. The whole passage discussed seems to be a deliberate attempt to set the campaign against Šubria in a broader cosmological context which contemporary learned Assyrians would find easy to recognise, using the network of astronomical and calendrical symbols developed during the Neo-Assyrian period by priest-astromancers.

Keywords: Assyria, history of constellations, winter solstice, Mars, astromancy.

The corpus of Neo-Assyrian historical texts contains, among other things, a letter from the king Esarhaddon to the god Ašur, informing him about the military campaign in the hills north of Assyria. In 673 BCE Esarhaddon sieged Uppume, the capital city of a small Hurrian state called Šubria (Dezső 2006). Assyrian troops constructed a rampart but "on the 21st day of Kislimu, unfavourable day (*uhulgalû*), on the birthday of Asakku, when the night is deepest", the defenders tried to take the initiative and burn the rampart. Fortunately for the Assyrians, a northerly wind extinguished the fire or turned it against the city walls. In the end, Esarhaddon conquered Uppume and destroyed the city (Borger 1956, p.104).

At first sight, the text contains no reference to the celestial bodies and gives only basic calendrical information, as would be expected in a military report of this kind. In reality, however, this letter is a very clear case of the use of astromancy in Assyrian policy, maybe not as direct as in the hundred pieces of correspondence between Esarhaddon and his priest-astromancers, but also very important. The astronomical background can be clarified after more detailed discussion of four elements underlined in the royal report: (1) the month Kislimu, the 9th month in the standard Mesopotamian calendar; (2) the 21st day of the month; (3) Asakku, which was thought to oppose Esarhaddon; and (4) the northerly wind that helped the Assyrians.

The first element: Kislimu

Kislimu is the common name of the 9th month in the standard Mesopotamian calendar, used in Akkadian texts from the first half of the 2nd millennium BCE. It usually occurred at the beginning of winter (December/January), although in the lunar calendar this depended upon the regularity of intercalations. In an Old Babylonian document (BM 17175+17284) the date of winter solstice is fixed as the 15th day of Kislimu (Hunger and Pingree 1989, p.163), and this association is also attested in the 1st millennium, although in some Neo-Assyrian documents Kislimu is replaced as the date of winter solstice by the 10th month Tebetu (Horowitz 1996, p.42).

Standard Neo-Assyrian menologies (such as AO 6775, K 7164 and ND 4389) connected the month Kislimu with the god Nergal, "the great warrior" (Wiseman 1969, p.176–182); this association is also attested in earlier sources. In Old Babylonian Larsa the ritual bath of Nergal was organised during the 9th month (Cohen 1993, p.234) and in contemporary Mari the 5th and 7th day of the 9th month were the feast of Nergal's chariot (Cohen 1993, p.292). In a Neo-Assyrian letter from the priest Nabû- šum-iškun to the king, the 15th day of Kislimu is called the day of prayer to Nergal (ARAK 371; Weidner 1932, p.116; Hunger 1992, p.211).

The menology of the Middle Assyrian catalogue of months and constellations called "Astrolab B" de-

scribes Kislimu as the month of Nergal, the mighty hero who had ascended from the Netherworld (Weidner 1915, p.88). More informative is the tablet KAV 218 found in Aššur which gives precise dates for the descent (18th day of Du'uzu) and ascension (28th day of Kislimu) of Nergal (Gurney 1962, p.158). It is very likely that these dates were related to the period of invisibility of Mars, the planet strongly associated with Nergal in Neo-Assyrian astronomical sources. Perhaps we are seeing here the same kind of lore as is found in the famous story about the descent of Ištar, which reflected the inferior conjunction of the planet Venus (Sołtysiak 2003).

Another god associated with the month Kislimu was Ninurta, the main character of the festival that commemorated the victory of this god over the bird Anzû. An important event during the festival was a race along the city walls mentioned in ritual tablet KAR 143+219, which moreover associates Ninurta with Nergal (Jacobsen 1975, p.72–73; Frymer-Kensky 1983, p.136; Cohen 1993, p.292). It is likely that the fight between Ninurta and Anzû is represented in a famous sculpture found in Ninurta's temple in Nimrud built by Ašurnasirpal II (Gadd 1936, p.138). Another version of the same tradition, preserved in some tablets from Ashurbanipal's library (K 6359, 6330+9338), informs us that Ninurta defeated Anzû, Kingu (Marduk's antagonist in Babylonian texts) and *asakku*-demon (Cohen 1993, p.333–334). The association of Anzu with the month Kislimu was still alive in the Seleucid period and a medical text (TCL 6, 12) from Uruk explains that an unguent for the 9th month should be prepared with the head, feathers and blood of Anzu (Reiner 1995, p.116–117).

A link between Nergal and the planet Mars is noted in the so-called "Astrolabs", tablets containing lists of months each of which was connected with constellations or stars from three sectors of the sky. The star from the "path of Ea" (southern sky) for the month Kislimu was Salbatanu, which is the planet Mars (Waerden 1949, p.9; Horowitz 1998, p.162). During the same month the star of the "path of Anu" (the area of the celestial equator) was a "Demon with gaping mouth" (sumer. UD.KA.DUH.A) called Panther (*nimru*) in Akkadian. According to the series *mulApin* I iv 27, the heliacal rising of this constellation, identified as *Cygnus+Lacerta+Cassiopeia*, took place on the 15th day of the month Kislimu (Hunger and Pingree 1989, p.59). In astronomical tablet BM 82923, 25–26 the planet Mars (Salbatanu) is directly associated with death (i.e. Nergal) and the "Demon with gaping mouth" (Walker and Hunger 1977, p.30–31).

In menologies the month Kislimu was connected with rain, storms and high water or flood. The standard menological series *Iqqur ipuš* gives, among other things, the following exemplary apodoses for Kislimu (Labat 1965): "Adad (the god of storm) will make heavy rain and shrink the land" (§ 69); "there will be rain" (§70); "there will be rain caused by Adad" (§74); "there will come flood" (§92); "thunders of Adad" (§104); and "Adad and Nergal will devour the land" (§103). The association between Kislimu and precipitation was obvious for people living in Mesopotamia, where most rains falls during the winter (Oates and Oates 1976, p.111).

The second element: the 21st day of the month

In Mesopotamian hemerologies contemporary with Esarhaddon's letter, the most dangerous days were those related to the following lunar phases: the 7th, 14th, 19th, 21st, and 28th day of each month (Reiner 1995, p.113; Rochberg-Halton 1988, p.38). The 21st day of the month was recognised as the day of the third quarter, as in the tablet K 2164 obv. II 2–10 (Livingstone 1986, p.39), and some late texts from Uruk mention the *hitpu*-sacrifices on days 6/7, 13/14, 20/21, and 27/28 of the month, obviously related to phases of the Moon (Beaulieu 1993, p.80; Robbins 1996, p.79).

More particulars concerning the symbolism of the 21st day of the month are provided by the ritual tablets. In a late supplication litany the 21st day is called the day of "realisation of Sin's and Šamaš's accounts" (Wiseman 1969, p.181), meaning that on this day the gods of the Moon and of the Sun executed the fate of the land, this having been fixed by the great gods during the new moon days (it is interesting that in the same hemerology the 27th day was called "dance of Nergal", which perhaps reflects the tablet KAV 218). According to KAR 69, 21 exorcisms should be performed on the 21st day of the month (Bottéro 1985, p.111) and according to a magical tablet (STT 89, 31) spells are most effective on the 21st or 22nd day (Reiner 1995, p.106).

The third element: Asakku

During the Neo-Assyrian period Asakku was conceived both as a mythological monster and as a class of demons (both these meanings being suggested in Esarhaddon's letter). The first definition of Asakku is much older and is rooted in the Sumerian tradition from Girsu, where the stony monster Asag (this being the Sumerian prototype of the Akkadian name Asakku) inhabited mountains in the east. Asag is presented as an enemy of the god Ningirsu, called Ninurta in other Sumerian traditions. Their battle is vividly depicted

in the long and famous hymn *Lugal-e*, and the whole story is most likely a reflection of the winter storms and spring floods connected with the annual re-generation of plant vegetation (Jacobsen 1987, p.236–248). As a powerful monster living in the Zagros mountains, Asag/Asakku was sometimes identified with the giant bird Anzu, a much more important character in Sumerian and Akkadian mythology, and also presented as Ningirsu's antagonist (Cohen 1993, p.8; Wiggermann 1992, p.161). In the Neo-Assyrian period Ninurta was sometimes identified with Nergal for his symbolism as a warrior, an association already indicated in the discussion of the month Kislimu.

After the middle of the 2nd millennium BCE Asakku started to be presented as a conventional enemy of the great gods. He is mentioned as such a character in the lists of monsters defeated by Marduk (Livingstone 1986, p.153–154) and in the mysterious list AO 17626 of "seven defeated gods whose eyes were placed on a bronze kettle", where Asakku was associated with Antu, the wife of Anu, the god of the heavens (Livingstone 1986, p.199).

At that time Asakku was also presented as a demon living outside a town, according to the enigmatic text called "The Nippur Compendium" (George 1992, p.157), and some medical texts mentioned *asakku*-disease (Wiggermann 1992, p.162), also known from the short list of omens in the series ^{mul}*Apin* (Hunger and Pingree 1989, p.118). A very mysterious passage in an astronomical commentary BM 55466 to *Enuma eliš* provides information about the visibility of the stars of *asakku*-demons on the 16th day of the 10th month Tebetu. A direct link between the monster Asakku and *asakku*-demons is provided by the medical tablet BM 34035 in which one of the exorcisms mentioned reflects the race of Ninurta trying to chase Asakku; the god is symbolised by white gypsum, while the monster/demon is symbolised by black bitumen (Livingstone 1986, p.173).

The fourth element: the northerly wind

There are many Assyrian and Babylonian lists of world directions, winds, and their associations. They differ in detail, but some symbolic elements are quite consistent. In the context of Esarhaddon's letter, the most interesting of these is the frequent association between Jupiter and the north and between Mars and the east (Rochberg-Halton 1988, p.57): Jupiter was usually treated as the planet of the king and the association between Mars and Nergal, the warrior and the god of death, was also strong.

In a late round diagram W 26030/121 found in Uruk we find a list of the four winds linked to the four parts of the year: the month Kislimu is mentioned as the turning point between the northerly and easterly wind (Horowitz 1998, p.194). An earlier Neo-Assyrian explanatory text *šumma Sîn ina tamartišu* 4 associates Kislimu with the northerly wind and the path of Enlil, the area of the sky north of the celestial equator (Koch-Westenholz 1995, p.108). The northerly wind was usually called ^{im}si.sá (Sumer. "the proper wind") and the easterly wind ^{im}kur.ra (Sumer. "the wind from the mountains"), which reflects the simple observation that the northerly wind was most common in Mesopotamia and there are mountains east of this region (Horowitz 1998, p.197). Almost every known source associates the northerly wind with the constellation ^{mul}mar.gíd.da (*Ursa Minor*), which was also quite obvious (Horowitz 1998, p.199; Koch-Westenholz 1995, p.155). The easterly wind was connected in ^{mul}*Apin* II i 71 with two constellations: ^{mul}Šu.gi (Sumer. "Old Man", *Perseus*), and mul.mul (*Pleiades*).

Conclusion

If Esarhaddon stated that he had troubles during the siege of Uppume on 21st day of Kislimu, it would be nothing but a basic account of military activities. However, the whole passage relating the events on the "birthday of Asakku" seems to be a deliberate attempt to set the campaign against Šubria in a broader cosmological context, easy to recognise for contemporary learned Assyrians. It uses a network of astronomical and calendrical symbols developed during the Neo-Assyrian period by priest-astromancers and used frequently in royal propaganda. The actual date of an event that was not important from a military point of view has been used as a trigger for an association which presented Esarhaddon's victory as a reflection of the victory of Nergal/Ninurta over the monster Asakku, Asakku symbolising the mountains and thus also the mountainous state of Šubria.

The powers of evil attacked during an unfavourable day in the month of winter storms connected with the god of war and of death. However, the king of Assyria supported by a favourable northerly wind sent by Aššur (not mentioned, but indicated by the association of the northerly wind with Jupiter, the royal planet) defeated the Šubrians who were supported by evil demons connected with the mountains. This act made him a follower of warrior gods who killed the dangerous monsters and enabled the regeneration of the land after the winter.

In this whole story there is only one point that cannot be directly explained using the known sources: the meaning of the term "birthday of Asakku". There are no analogies for this name, but it is very likely that it was used to underline the whole significance of Esarhaddon's relationship and to associate Asakku with the constellation called "Demon with gaping mouth", which heliacally rose around the date of the Uppume siege and obviously fitted well into the whole network of associations suggested by the passage we have discussed.

Acknowledgements

Thanks are due to Dr Franciszek M. Stępniowski who carefully read the manuscript and commented upon the location of Šubria.

Abbreviations

AO – Antiquités Orientales au Musée du Louvre, Paris.

ARAK – H.C. Hunger, Astrological Reports to Assyrian Kings.

BM – British Museum, London.

K – Kouyunjik (inventory number).

KAR – Keilschrifttexte aus Assur religiösen Inhalts, ed. E. Ebeling.

KAV – Keilschrifttexte aus Assur verschiedenen Inhalts, ed. O. Schroeder.

ND – Nimrud (inventory number).

TCL – Textes cunéiformes, Musée du Louvre, Paris.

STT – The Sultantepe Tablets.

W – Uruk/Warka (inventory number).

References

BEAULIEU, P.A., 1993. The Impact of Month-lengths on the Neo-Babylonian Cultic Calendar. *Zeitschrift für Assyriologie*, 83, 66-87.

BORGER, B., 1956. *Die Inschriften Asarhaddons, Königs von Assyrien.* Series: Archiv für Orientforschung, Bft 9. Graz.

BOTTÉRO, J., 1985. *Mythes et rites de Babylone*. Paris: H. Champion.

COHEN, M., 1993. *The Cultic Calendars of the Ancient Near East.* Bethesda: CDL Press.

DEZSŐ, T., 2006. Šubria and the Assyrian Empire. *Acta Antiqua*, 46, 33 – 38

FRYMER-KENSKY, T., 1983. The Tribulations of Marduk. *Journal of the American Oriental Society*, 103, 131-141.

GADD, C.J., 1936. The Stones of Assyria. London: Chatto and Windus.

GEORGE, A.R., 1992. *Babylonian Topographical Texts*. Series: Orientalia Lovaniensia Analecta, 40. Leuven: Peeters.

GURNEY, O.R., 1962. Tammuz Reconsidered: Some Recent Developments. *Journal of Semitic Studies*, 7, 147-160.

HOROWITZ, W., 1996. The 360 and 364 Day Year in Ancient Mesopotamia. *Journal of Ancient Near East Society* 24, pp. 35-44

HOROWITZ, W., 1998. *Mesopotamian Cosmic Geography*. Series: Mesopotamian Civilizations, 8. Winona Lake: Eisenbrauns.

HUNGER, H.C., 1992. *Astrological Reports to Assyrian Kings.* "States Archives of Assyria" 8. Helsinki: Helsinki University Press.

HUNGER, H.C., PINGREE D., 1989. *MUL.APIN. An Astronomical Compendium in Cuneiform*. Series: Archiv für Orientforschung, Bft 24. Horn: F.Berger.

JACOBSEN, T., 1975. Religious Drama in Ancient Mesopotamia. In: H. GOEDICKE, J.J.M. ROBERTS, eds. *Unity and Diversity. Essays in the History, Literature, and Religion of the Ancient Near East*. 65-97.

JACOBSEN, T., 1987. *The Harps that once... Sumerian Poetry in Translation*. New Haven and London: Yale University Press.

KOCH-WESTENHOLZ, U., 1995. *Mesopotamian Astrology. An Introduction to Babylonian and Assyrian Celestial Divination*. The Carsten Niebuhr Institute of Near Eastern Studies Publications 19. Copenhagen: Museum Tusculanum Press.

LABAT, R., 1965. *Un calendrier babylonien, des travaux, des signes et des mois.* Paris: Champion.

LIVINGSTONE, A., 1986. *Mystical and Mythological Explanatory Works of Assyrian and Babylonian Scholars*. Oxford: Oxford University Press.

OATES, D., OATES, J., 1976. Early Irrigation in Mesopotamia. In: G.SIEVEKING et al., eds. *Problems in Economic and Social Archaeology*. Boulder: Westview Press, 109-135.

REINER, E., 1995. Astral Magic in Babylonia. *Transactions of the American Philosophical Society,* 85, part 4. Philadelphia: The American Philosophical Society.

ROBBINS, E., 1996. Tabular Sacrifice Records and the Cultic Calendar of Neo-Babylonian Uruk. *Journal of Cuneiform Studies,* 48, 61-88.

ROCHBERG-HALTON, F., 1988. *Aspects of Babylonian Celestial Divination: The Lunar Eclipse Tablets of Enuma Anu Enlil. Archiv für Orientforschung* Bft 22. Horn: Berger.

SOŁTYSIAK, A., 2003. Betrayed Lovers of Ištar. A Possible Trace of the 8-Year Venus Cycle in Gilgameš VI:i-iii. In: M. BLOMBERG, P.E. BLOMBERG, G. HENRIKSSON, eds. *Calendars, Symbols, and Orientations: Legacies of Astronomy in Culture. Proceedings of the 9th Annual Meeting of the European Society for Astronomy in Culture (SEAC). Stockholm, 27–30 August 2001*. Uppsala, 101-106.

WAERDEN, B.L., van der, 1949. Babylonian Astronomy II. The Thirty-Six Stars. *Journal of Near Eastern Studies*, 8, 6-26.

WALKER, C.B.F., HUNGER, H., 1977. Zwölfmaldrei. *Mitteilungen der Deutschen Orient-Gesellschaft zu Berlin*, 109, 27-34.

WEIDNER, E.F., 1915. *Handbuch der Babylonischen Astronomie*. Leipzig: J. C. Hinrich'sche Buch-handlung.

WEIDNER, E.F., 1932. Das Himmelskleid. *Archiv für Orientforschung*, 7, 115-116.

WIGGERMANN, F.A.M., 1992. *Mesopotamian Protective Spirits. The Ritual Texts.* Series: Cuneiform Monographs, 1. Groeningen: Styx Publications.
WISEMAN, D.J., 1969. A Lipšur Litany from Nimrud. *Iraq* 31, 175-183.

Received: 1 November 2007; Revised: 29 July 2008

ASAKKU GIMTADIENIS

Arkadiusz Sołtysiak

Santrauka

Dievui Ašurui skirtame laiške Asirijos karalius Asarhadonas (Esarhaddon) informuoja savo dievą apie žygį prieš nedidelę Šubrijos (Šubria) valstybę, buvusią kalnuose, šiauriau Asirijos. Kai Asirijos kariuomenė apgulė Šubrijos valstybės sostinę Upumę (Uppume), nakties gūdumoje „21 Kislimo ir Asakku gimtadienio dieną“ gynėjai bandė sudeginti asirų pylimo konstrukciją; tai buvo vienintelė Šubrijos gyventojų sėkmė, kadangi neilgai trukus jie buvo nugalėti savo priešų. Labiausiai dominantis motyvas šiame pasakojime yra paties įvykio data, kuri, pasak laiško autoriaus, nebuvo atsitiktinė. Ji aiškiai įvardijama kaip uhulgalû (akadų kalba tai reiškia „nepalanki diena“). Posakis „Asakku gimtadienis“ kituose šaltiniuose neminimas, bet jo svarba tikriausiai gali būti paaiškinta Asirijos hemerologijos, astromantijos ir astralinio simbolizmo kontekste. Pirma, tai buvo 21-oji mėnesio diena, trečio Mėnulio ketvirčio diena ir viena iš penkių pačių pavojingiausių mėnesio dienų, kai atitinkami ritualai galėjo būti atliekami tam, kad užkirstų kelią padidėjusiam demonų aktyvumui. Antra, žiemos solsticijai artimas Kislimu mėnuo buvo priskiriamas Nergalui (Nergal), požemių karalystės dievui ir didžiajam kariui. Ryšys tarp šios datos ir Asakku – akmeninės pabaisos tradiciniame šumerų tikėjime bei rytinių kalnų demono asirų tradicijoje – buvo gerai pagrįstas šiuolaikinėje spekuliatyvioje teologijoje, kurioje dievo-kario kova prieš Asakku yra siejama su žiemos audromis. Visa svarstyta įvykių eiga, atrodo, buvo sąmoningas bandymas pagrįsti žygį prieš Šubriją platesniame kosmologiniame kontekste, kuris tuometinių išsilavinusių asirų būtų lengvai atpažįstamas, remiantis visuma astronominių ir kalendorinių simbolių, paplitusių Naujojo – Asirijos – laikotarpio metu tarp dvasininkų-astronomų.

Vertė Algirdas Girininkas, Jonas Vaiškūnas

UNCOVERING SESHAT: NEW INSIGHTS INTO THE STRETCHING OF THE CORD CEREMONY

NOEMI MIRANDA, JUAN A. BELMONTE, MIGUEL ANGEL MOLINERO

Abstract

The antiquity of the Egyptian ritual of the "stretching of the cord" can be traced back to the 1st Dynasty, although the possibility that it was even older can not be absolutely discarded. Right up until the latest representations of the ceremony, which date to the Roman period, one goddess always appeared in it: Seshat. The iconography of the ritual retained throughout several features that are present in the earliest scene known, dating to king Khasekhemuy. We know that the "stretching of the cord" was used for the orientation of Egyptian constructions and that the scenes represented in several temples were accompanied by texts with astronomical references. During the Ptolemaic period, these texts referred to the constellation *Meskhetyu*. However, it is the question of the iconography of the goddess, and especially of her hieroglyphic sign, that has moved us to propose a new hypothesis for the technique developed and used during the foundation ceremony. Despite many theories, there is no definitive explanation of the sign held by Seshat over her head. The hypothesis we consider here takes into account the apparent similarities that exist between the depiction of Roman *gromae* and the hieroglyph of the goddess. The fact that they are both associated with building orientation leads us to suggest that the sign was not only used as an identification of the goddess, i.e. her emblem, but also represented an actual topographic instrument, similar to a *groma*, that would have served to orientate the buildings according to certain rules that are referred in the hieroglyphic texts.

Key words: Egyptian astronomy, Seshat hieroglyphic sign, Roman *groma*, Egyptian aspective, stars of *Meskhetyu*.

Introduction

We do not have any information from the oldest periods of Egyptian history about how sacred structures (i.e. temples, pyramids, tombs, etc.) were orientated. However, we do have some important texts from the Greco-Roman period that mention how the foundations of a temple were established. In particular, the temple axis was laid out by stretching a rope between two stakes or poles in a ceremony known as the "stretching of the cord". As shown in Fig. 1, this is frequently depicted on temple walls as early as the 2nd Dynasty (Miranda, Belmonte and Molinero 2007), where the pharaoh and the goddess Seshat, with her hieroglyphic sign over her head, are represented holding up the two poles. But let the king speak to us (Zaba 1953):

I have grasped the stake along with the handle of the mallet. I take the measuring cord in the company of Seshat. I observe the progressive movement of the stars. My eye is now fixed upon Meskhet(yu). The god of timekeeping stands by me, in front of his merkhet. Then, I have established the four corners of the temple.

This text is written on the walls of Horus' temple in Edfu, whose foundations were laid in 237 BCE. The astronomical target observed in order to lay down the temple axis is the constellation of the Bull's Foreleg, *Meskhetyu*, in the present day the Plough. Some additional information can be obtained from another text (Zaba 1953) associated with the stretching of the cord, in this case at the temple of Dendera, a further 150 km to the north of Edfu:

The king stretches the rope in joy. With his glance toward the Akh of Meskhet(yu), he establishes the temple of the Lady of Dendera, as took place there before.

Here the text mentions the *Akh* of the Plough. This term, plural *akhu*, is mentioned in the Pyramid Texts and has been translated as "spirit", "brilliant" or "blessed". Hence, we might translate it as "the brilliant (star) of the Plough". However, bearing in mind that the seven stars of the Plough are almost of the same brightness, we could consider, as Krupp (1983) has already suggested, that *Akh* "most likely refers to a particular position and orientation of the Plough in its circular course around the Pole". This idea will be relevant for our proposal.

The earliest representation of a stretching of the cord ceremony is found in the Palermo Stone: it refers to the reign of an unknown king of the 1st Dynasty (*ca.* 3000 BCE), presumably Den (Wilkinson 2000). Here, the sign of Seshat is written in a way more similar to the Old and early New Kingdom depictions (see for example, Fig. 2) than to those of the Greco-Roman period,

i.e.  (ancient form) instead of  (modern form).

Fig. 1. Image of the ritual of the stretching of the cord: Queen Hatshepsut (18th Dynasty, *ca.* 1465 BCE.) in front of Seshat, performing the ceremony for the Red Chapel of the temple of Karnak. The four corners of the building were presumably established during the ritual. Unfortunately, however, no celestial target is mentioned in the short inscriptions associated with the ceremony in this particular case. Photograph by J. A. Belmonte.

Fig. 2. Image of the goddess Seshat with her sign upon her head. This is formed by seven radial elements that form a rosette (reconstructed here, since the rosette is broken by the stone fracture). In addition, there is a semicircular arc above these radial elements surmounted by two parallel vertical "strokes". This image shows the sign in its ancient form, which is known from the earliest dynasties. The importance of this particular representation is that we can see how the sign is introduced within a frieze of stars. The part of the sign included in the starry freeze exactly corresponds to the two vertical strokes. Abusir, 5th Dynasty (ca. 2450 BCE). Adapted from Borchard (1913).

Consequently, the stretching of the cord ceremony can be traced back to the earliest stages of Egyptian history (if not earlier – Belmonte, Shaltout and Fekri 2008) and we can guess that it was very probably used to establish the axis of sacred buildings prior to starting the actual construction of the monument. Unfortunately, neither the Palermo Stone nor the earlier representations (see, e.g., Fig. 1) mention the name of the star or asterism observed at the ceremony so we have to make an informed guess from the information provided by archaeology, the Pyramid Texts and the later tradition, which, as we have seen, mentions only the constellation of *Meskhetyu*.

Discussion

In the early winter of 2005, our colleague Ali Guerbabi, former director of the site Museum of Timgad (Algeria), called our attention to the similarities between the two-dimensional representations of the Roman *groma* on stone stelae and the sign of Seshat, especially in its ancient form (see Fig. 3). The *groma* was the instrument used by Roman topographers (properly termed *gromatics*) to organize space through the orientation and planning of new cities and territories. Once set up at a precise place, the instrument was able to determine the two main axes of any layout as shown in Fig. 3.

On the basis of this similarity, we propose that the sign of Seshat was actually a schematic representation of a very old transit instrument used by the ancient Egyptians, in a similar way to the *groma*, to orientate sacred buildings during one of the phases of the stretching of the cord ceremony. According to the texts mentioned in the previous paragraphs, this orientation was most probably astronomical, although we ought also to consider the possibility that topographic references were eventually used. The fundamentals of our idea are supported by Fig. 2 and Plate VII: Fig. 4 and 5.

Plate VII: Fig. 4(a) shows one of the scenes carved on the walls of the temple of King Sahure at Abu Ghurob, where the hieroglyphic sign of Seshat, borne upon a standard, is depicted as a movable object. We propose that this object is in fact the "instrument" itself. Plate VII: Fig. 5 shows the way in which aspective operated

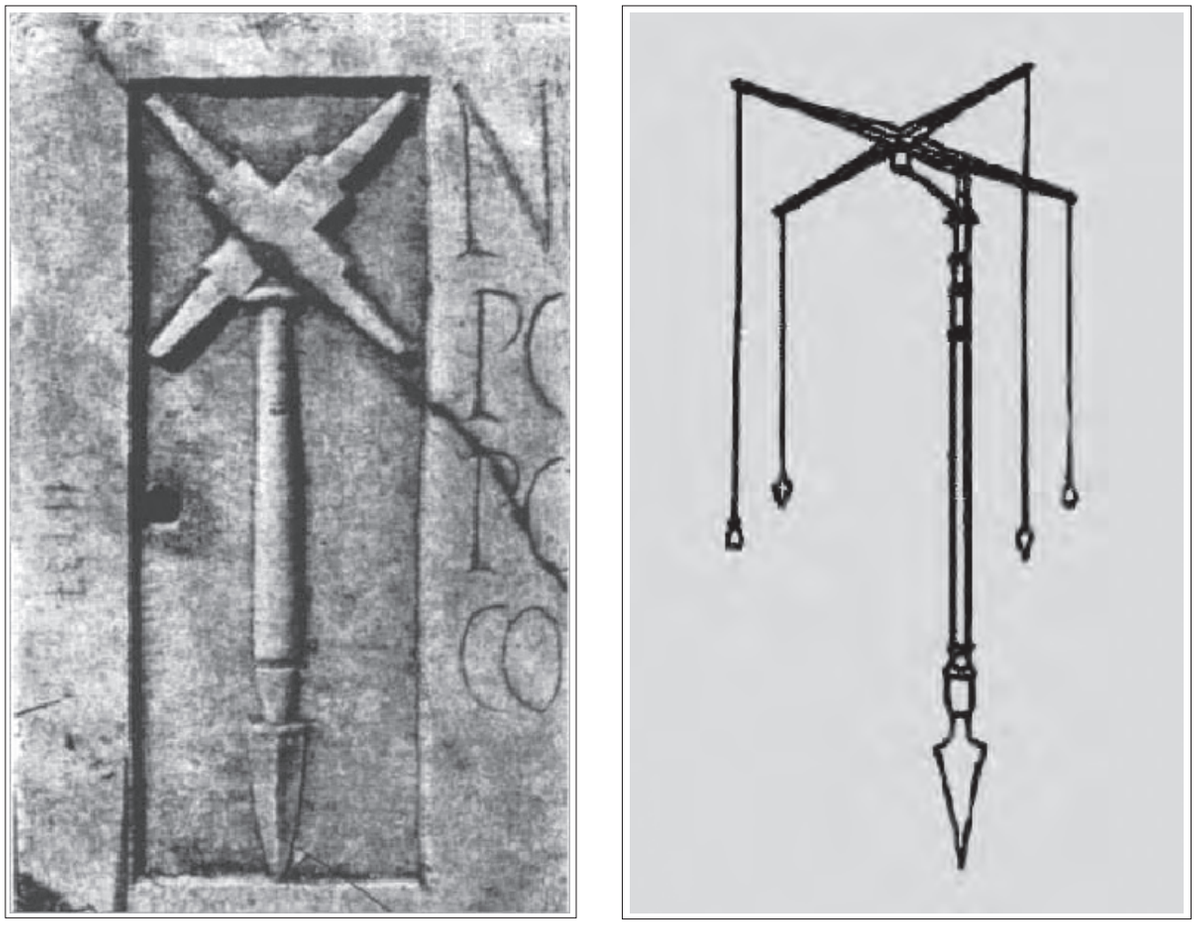

Fig. 3. (left) Funerary stele of a *gromatic* discovered in excavations at Pompeii, showing a schematic representation of his *groma*. (right) Idealized reconstruction of the instrument from different elements unearthed during excavations at the same site. (Adapted from Adam 2002).

in Egyptian art during the Old Kingdom, demonstrating how the four radii of the *seba* parasol (a name actually meaning "star") looked in a flat, two-dimensional representation (a), and would have looked in an actual three-dimensional representation (b) (Schäfer 2002). Applying the same principles of perspective to our "instrument", we arrive at the three-dimensional representation shown in Plate VII: Fig. 4(b). Here, the seven radii of the Seshat rosette have been extrapolated to a horizontal wheel with eight radii, making the assumption that the eighth radius is hidden in the flat representations by the vertical pole. This wheel then becomes an essential element of our proposed mechanism, since at any moment it offers four possible directions (one for each diameter) for the orientation of the main axis of a given building.

The semicircular arc that sits upon this radial element, surmounted by a couple of parallel strokes, then becomes an independent but most important element of the instrument. According to Plate VII: Fig. 4(c), it would define a sighting device, or eyepiece, in the style of traditional hieroglyphic depictions of the *merkhet*. Actually, we wonder if the *merkhet* referred to in the texts associated with the scenes of the stretching of the cord ceremony of the Ptolemaic period (see above) does not really refer to this element of our "instrument". Later on, once the "observation" of the stars had been made, the instrument would have indicated the "four corners" of a temple directly, as shown in Plate VII: Fig. 4(d). In some cases, the astronomical alignment could even have indicated the diagonals of a building, thus permitting its orientation in the intercardinal directions (Shaltout, Belmonte and Fekri 2007). Some circumstantial evidence supporting the idea of a relationship between this special element of the Seshat sign and the starry sky comes from Fig. 2, where we can see that the two vertical strokes, and only this element of the sign-instrument, are introduced within a freeze of stars.

Finally, in Plate VII: Figs. 4(c) and 4(d), we have illustrated the astronomical orientation of a temple to the simultaneous vertical transit of two stars of *Meskhetyu* (Phecda and Megrez). This phenomenon corresponded exactly to a simultaneous meridian transit during the 4th Dynasty and the second author has argued that this was the stellar configuration used for the precise align-

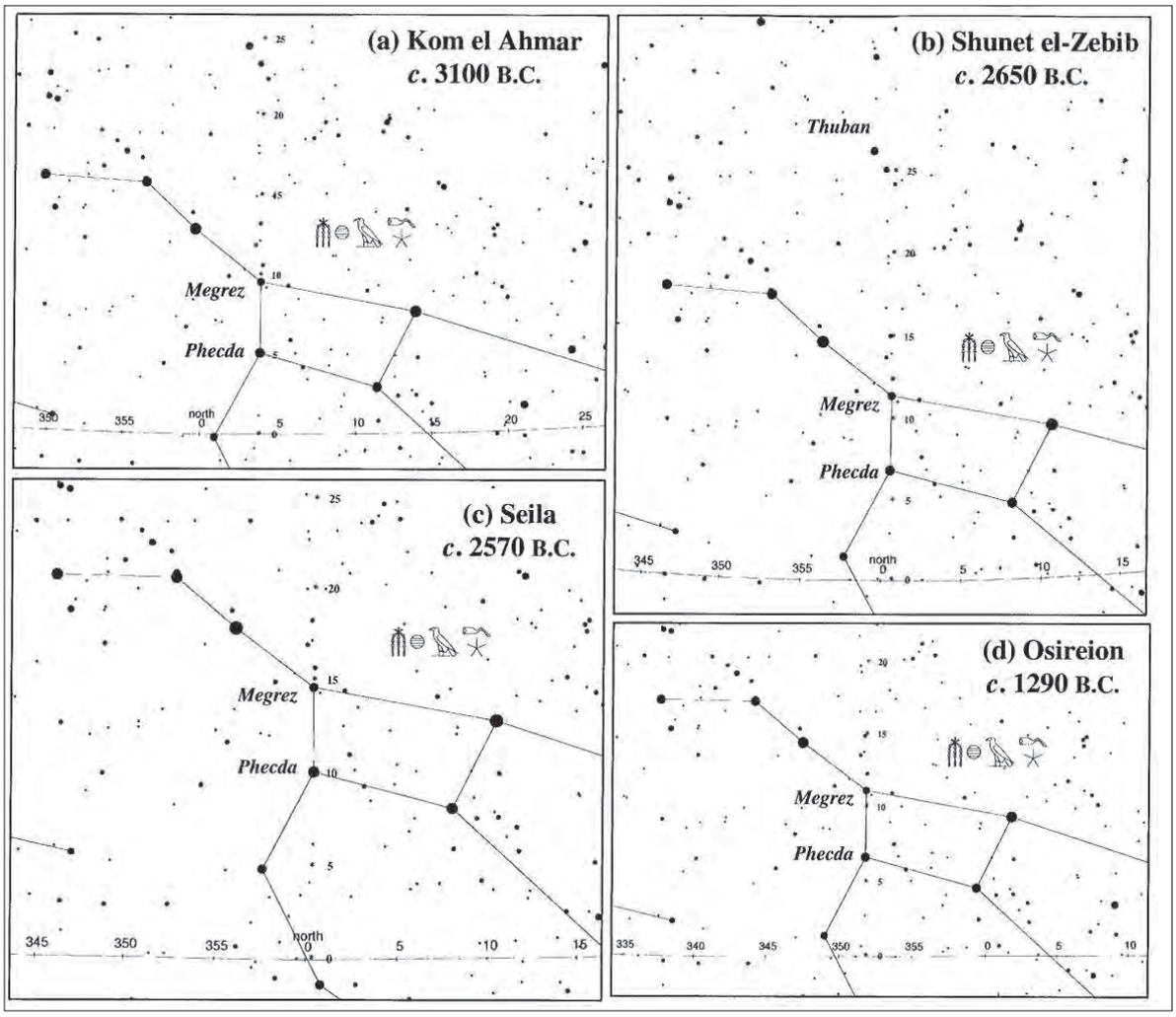

Fig. 6. These diagrams show a particular configuration of the constellation *Meskhetyu* (the Plough), identical to that used as an example in Plate VII: Fig. 4(c), in different historical periods of ancient Egyptian civilization. They show that this asterism could have been used as the target for cardinal and intercardinal orientations long before the Ptolemaic Period. The lower meridian transit of Phecda and Megrez could have been used to establish due north, with an accuracy limited only by human error, in the year 2562 BCE and might have served to orientate the Old Kingdom pyramids (Belmonte 2001). Other important structures such as HK29A in Hierakonpolis (Kom el Ahmar) and Shunet el-Zebib or the Osireion in Abydos could have been oriented in the same manner with lower precision (Belmonte, Shaltout and Fekri 2008). The stars of this constellation were prominent members of the select group of Egyptian "imperishable" stars, probably due to their circumpolar character, with the celestial pole located near Thuban (α Draconis) during the Pyramid Age (see panel b).

ments of the pyramids in that epoch (Belmonte 2001). However, as shown in Fig. 6, this particular configuration of *Meskhetyu* would have offered a marvellous method for the astronomical orientation of sacred buildings in ancient Egypt from the late Pre-Dynastic period onwards, even through to the New Kingdom, either on a north-south axis (cases b and c) or in the intercardinal directions (cases a and d, see Belmonte, Shaltout and Fekri 2008; see also Belmonte at al. 2008).

We want to make it clear that this particular configuration of *Meskhetyu*, used here as a suggestive example, was not the only astronomical target that the Egyptians could have used to orientate their monuments during the stretching of the cord ceremonies (we must even consider the possible use of topographic features such as the Nile or a prominent mountain – Shaltout and Belmonte 2005). In Dendera, for example (see above), it is most likely that the rising of the complete constellation (the *Akh* of *Meskhetyu*) was the observation used to align the temple of Hathor. Other temples were most probably orientated to the sun and to the brightest stars in the Egyptian skies (Belmonte, Shaltout and Fekri 2008). However, *Meskhetyu*, as the northern asterism *par excellence*, was presumably the most important astronomical reference for temple orientation in any of the eight cardinal and intercardinal directions of the compass. These directions would have been indicated directly by a remarkable survey device that, as we have argued in this paper, may have been developed by the

ancient Egyptians: the Seshat sign-instrument or "*seshatium*". We hope that future tests will help either to further support or else to refute this evocative, but nonetheless controversial, hypothesis.

Acknowledgements

We wish to express our thanks to the Multimedia Service of the IAC for providing us with some of the diagrams presented in this paper. Comments and suggestions from César González, José Lull, David Pankenier or Bradley Schaefer greatly enriched the quality of the paper. This work is partially financed within the framework of the projects P310793 "Arqueoastronomía" of the Instituto de Astrofísica de Canarias, and AYA2004-01010 "Orientatio ad Sidera" of the Spanish Ministry of Education and Science.

References

ADAM, J-P., 2002. *La construcción romana: materiales y técnicas.* León: Los Oficios.

BELMONTE, J. A., 2001. On the orientation of the Old Kingdom Egyptian pyramids.
Archaeoastronomy, 26, 1-20.

BELMONTE, J. A., SHALTOUT M., FEKRI M., 2008. On the orientation of ancient Egyptian temples (4): epilogue at Serabit el Khadem and overview. *JHA* 39, 181-211.

BELMONTE, J. A., GONZÁLEZ GARCÍA, A. C., SHALTOUT, M., FEKRI, M. and MIRANDA, N., 2008. From Umm al Qab to Biban al Muluk: the orientation of royal tombs in ancient Egypt. *This volume*.

BORCHARD, L., 1913. *Das Grabdenkmal des Königs Sahu-re II.* Leipzig.

KRUPP, E.C., 1983. *Echoes of the Ancient Skies.* New York: Harper and Row.

MIRANDA, N., BELMONTE, J. A. and MOLINERO, M. A., 2007. Seshat en las escenas de fundación de templos y del cómputo de años. *TdE* 5-6, in press.

SCHÄFER, H., 2002. *Principles of Egyptian Art.* Oxford: Griffith Institute.

SHALTOUT, M. and BELMONTE, J. A., 2005. On the orientation of ancient Egyptian temples (1): Upper Egypt and Lower Nubia. *JHA* 36, 273-98.

SHALTOUT, M., BELMONTE, J. A. and FEKRI, M., 2007. On the orientation of ancient Egyptian temples (3): key points in Lower Egypt and Siwa Oasis, Part I. *JHA* 38, 141-160.

WILKINSON, T. A. H., 2000. *Royal Annals of ancient Egypt. The Palermo Stone and its associated Fragments.* London / New York: Kegan Paul.

ZABA, Z., 1953. *L'orientation astronomique dans l'ancienne Egypte et la précession de l'axe du onde.* Prague: Editions de l'académie Tchécoslovaque des Sciences.

Received: 1 November 2007; Revised: 1 August 2008

DEIVĖ SEŠATA: NAUJOS ĮŽVALGOS APIE VIRVĖS ĮTEMPIMO CEREMONIJĄ

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Santrauka

Senovės Egipto „virvės įtempimo ceremonijos" ritualas siekia I-os dinastijos laikus, tačiau galimybė, kad šis ritualas gali būti ir senesnis, taip pat nėra visiškai atmestina. Iki šių dienų seniausia žinoma „virvės įtempimo ceremonija" datuojama romėniškuoju laikotarpiu, ir deivė Sešata visada minima šio ritualo kontekste. Ikonografija išsaugojo kelias minėto ritualo detales, kurios yra užfiksuotos ankstyviausiose žinomose scenose, datuojamose faraono Chasechemvio valdymo laikais. Mes žinome, kad ši ceremonija Egipte buvo naudota statybose pastatams orientuoti pagal pasaulio šalis ir kad keliose šventyklose prie šias ceremonijas vaizduojančių scenų yra pateikti įrašai su astronomine informacija. Ptolemajų dinastijos valdymo metu šiuose tekstuose minimas *Meskhetyu* žvaigždynas (Ursa Major). Mus domina deivės ikonografijos klausimas ir ypač jos hieroglifas, kuris mums suteikė impulsą pateikti naują hipotezę apie specialiai šventyklos pamatų dėjimo ceremonijai skirtos technikos naudojimą.

Nepaisant daugybės teorijų, nėra galutinio paaiškinimo, ką Sešata laiko virš galvos (virš jos galvos vaizduojamas septyniakampės žvaigždės pavidalo ženklas – vert. past.). Mūsų hipotezė remiasi pastebimu panašumu tarp romėniško *gromae* (*groma* – romėniškas topografinis instrumentas) – vaizdavimo ir deivės hieroglifo. Faktas, kad abu ženklai yra susiję su pastatų orientavimu, leidžia mums kelti prielaidą, kad ženklas buvo naudojamas ne tik deivei identifikuoti, t. y. buvo jos emblema, bet vaizdavo ir topografinį instrumentą, panašų į gromą ir tarnavusį pastatams orientuoti, vadovaujantis tam tikromis taisyklėmis, kurios yra perteikiamos hieroglifais rašytuose tekstuose.

Vertė Audronė Bliujienė

III. ASTRONOMICAL AND ETHNOCOSMOLOGICAL INTERPRETATION OF ARCHAEOLOGICAL AND ETHNOLOGICAL ARTEFACTS

TRACING THE CELESTIAL DEER – AN ANCIENT MOTIF AND ITS ASTRONOMICAL INTERPRETATION ACROSS CULTURES

MICHAEL A. RAPPENGLÜCK

Abstract

Ancient cultures of the northern hemisphere created symbols, myths, and rituals that related deer to certain astronomical phenomena, to cosmological and cosmogonical ideas, and to hunting calendars. From their knowledge of the animal's appearance, behaviour, and phenology they derived conceptions of power, fertility, creation and renewal, life and death, and psychosomatic transformation during a shamanistic seance.

Key words: celestial deer, cosmology, cosmogony, calendar, shamanism.

Introduction

Ethnological and archaeological records show that special rituals such as the impaling of a deer (or its skin) or certain uses of the animal's antlers, skull, or shoulder blade in burials or making sacrifices, involved cosmic symbolism both among archaic and recent cultures of the northern hemisphere (Aldhouse Green 2004, p. 127-130, 173-177, 185-187; Mikhailova 2006). Symbols and myths handed down by people illustrate the features of the celestial deer[1] motif and its astronomical interpretation across cultures.

Deer and solar symbolism

Within both ancient and recent cultural traditions in both Eurasia and the Americas, people likened the halo of flickering beams during the rising and setting of the sun to widely branching deer antlers. Though there are also traces of lunar symbolism, the animal in general was regarded as the "herald" of the rising sun, announcing dawn and the renewal of life: It signified the cardinal direction East, the red sky, rebirth, fire, light, and cosmic power (Andritzky 1988, p. 49; Chevalier and Gheerbrant 1996, p. 920-921; Hentze 1961, p. 80-81, 92-93, 100-101; Müller 1982, p. 101). With or between his antlers or in his body, the male animal was thought to carry the sun (shown as a spiral or labyrinth pattern) across the heavens at daytime and through the nocturnal Underworld (Jacobson 1993, p. 32-33, 37). The annual course of the sun along the ecliptic, through the cardinal points, was visualised by a cross, sometimes inscribed in a circle and set between the animal's antlers, e.g. in the St. Hubertus legend, or by his four legs, signifying the solstices and equinoxes (Eliade 1990, p. 161-162; Evers 1988, p. 16-18; Müller 1956, p. 289-291, 1970, p. 214-215, 1982, p. 100; Sicard 1971, p. 254-264, 268, 279, 281). That idea led to the widespread conception of a flying, fiery, celestial and especially solar deer, moving between the cosmic strata, frequently wearing golden antlers, sometimes showing bird-shaped tips, and often equipped with bird wings, e.g. in Scythian culture (Eliade 1990, p. 58-161; Lushnikova 2002, p. 254; Martynov 1991, p. 66-69, 196-232, 268-275).

[1] The term "deer" is used to summarise the different species of cervidae.

The chronobiology of deer, seasonality, and the calendar

The regularity of the deer's life cycle was vital for the calendars of ancient deer-hunters. Chronobiological research on deer shows that their movement and migration, the rut, the growth of the antlers, and calving are all triggered by the rhythm of light, and hence determined by the solar and lunar cycles (Tylor 2004, p. 68-81, 146): Thus the seasonal migration of deer takes place in the days around a Full Moon, because the higher illumination gives the animals a better chance of passing difficult areas quickly. The shedding of the antlers happens at Full Moon during the weeks around winter solstice, but they start to re-grow on average every February / March, around the Vernal Equinox. The rut, lasting about 5-6 weeks, normally happens at the time of Full Moon during the weeks around the autumn equinox. Male deer prefer to combat with each other at this time because their antlers look more prominent in the moonlight. At the same time the highly inattentive animals are much easier to hunt. After a pregnancy of about 8 ½ lunar months, including an embryonic state of rest during the winter, does preferably give birth around summer solstice in May / June at around the time of New Moon, because darkness protects the juveniles from nocturnal predators.

People in North America and Eurasia correlated the seasons of the deer with the cardinal points of the year (Müller 1956, p. 289-291; Hentze 1961, p. 98-99, 109; Lushnikova 2002) and linked the number of points on the antlers of a royal or imperial stag to a year with 12 or 14 lunar months (Ranke-Graves 1985, p. 242-243; Müller 1956, p. 275, 280-281, 288). At the time of the rut around the autumnal equinox people organised big games, which ended up with ritual sacrifices of the deer, and often started off the new half-year from the autumnal to the vernal equinox (Lushnikova 2002). Apart from the ethnoastronomical examples there also exists archaeological evidence, for example at Ak-Baur, Russia (Marsadolov and Dmitrieva 2007, p. 74-91). In the Lascaux cave (France), dated c. 17.000 BP, rock art shows deer as they appear and behave at the start of autumn (Aujoulat 2005, p. 193-195). A bellowing old stag (in the "Axial Diverticle"), having antlers with 18 ends, indicates the rutting season. On its left an ancient wild horse in its winter fur, evidently before foaling, signals the transition from winter to spring. Below the animals, a series of 39 points divided into 2 sets (of 13 [= 6 + 1 +6] and 26 [= 7 + 5+ 1]), makes evident a counting system based on the value 13. Further analysis (Rappenglück 2008) shows that the row of points, each spot counting 7 days, illustrates a time sequence of 13 weeks (91 days) from the summer solstice (June 21) to the autumn equinox (September 23) plus 26 more weeks (182 days) to the time of the spring equinox (March 21). Thus it denotes the time interval between the rutting season of the deer around the autumn equinox and the foaling of the ancient wild horse from March to June. In all, 39 weeks (273 days: c. 10 sidereal / 9 synodic months) are depicted. This is similar to the Komi calendar, in which the Elk signifies the autumnal equinox and the year was divided into the hunting season of the elk and the bear, separated by nine months, and the pregnancy time of the elk cow (Konakov 1994; Lushnikova 2002).

For people in Eurasia and North America, the shedding of the antlers and their renewal in February / March signalled the change from autumn-winter to spring-summer (Eliade 1990, p. 162). The bloody antlers' velvet symbolized the red sky during dawn, solar fire, and recreation (Hentze 1961, p. 92-93). Having lost his antlers the animal was regarded as a supreme fertility goddess responsible for the start of a time cycle, e.g. the new day or the new (solar) year, the birth and the renewal, the change from the annual dry to the humid season, and the origin of creation.

The cosmic tree of life and the theft of fire

People in Eurasia and North America often located the celestial deer close to the world axis, which signified the primordial origin of the cosmos. They considered the animal's widely branching antlers to be a "Cosmic Tree of Life", a symbol of the world axis and/or the Milky Way, because of their seasonal growth, shedding, and renewal, which illustrated cyclical creation. The deer fed themselves from the live-giving cosmic fluid (water, fire, light), which was thought to be stored in the world tree's crown (Chevalier and Gheerbrant 1994, p. 920-921; Jacobson 1993, p. 26, 61-63, 68, 77, 81-85; 210-211; Sicard 1971, p. 240-250, 253). During special rituals when deer were sacrificed in the spring and autumn, ancient people of Eurasia and North America erected poles, crowned by a deer's head or skin with his antlers, which were thought to represent the polar world axis (Müller 1982, p. 95-101; Eliade 1990, p. 158, 162). Additional information is given by Northern Germanic myths in the Poetic and Prose Edda, 13th c. AD (Diederichs 1984, p. 136, 153, 214-217, 237, 246, 284): In the crown of the world tree four stags were eating the buds, the blooms, and the branches, which signify the hours, the days, and the seasons in a year. In another story, a stag together with a goat browse the branches from the world tree. From the raindrops running down his giant antlers 11 or 12 big icy streams

were formed, which were collected in a well at the bottom of the world axis, in the Underworld.

The deer, who stole the primeval fire from the centre of the world and brought it to the people, is well known in North American and Eurasian myths (Jacobson 1993, p. 242; Seiffert 1990, p. 11-14, 55, 57-58, 89-93, 98). In some stories the solar deer "danced" helically around the primordial fire, drilled by the world-axis at the celestial north pole, and ignited parts of his body, often the antlers (Rappenglück 2005, p. 159-161).

Deer asterisms

In some traditions from North America, Middle America, and Eurasia the deer, e.g. the Fallow Deer by his white spotted summer coat, symbolized the starry sky itself (Milbrath 1999, p. 251; Müller 1956, p. 163; Sicard 1961, p. 232). People in North America and Eurasia detected a giant elk or a reindeer in northern circumpolar star-patterns, like Cassiopeia including stars in Perseus and Auriga (Koch 2001, p. 77-78) or the Big Dipper asterism (Jacobson 1993, p. 194-195; Miller 1997, p. 100-101, 108; Berezkin 2005, p. 81, 83, 87; Lushnikova 2002). Apart from these, deer asterisms have been recognized in the field of Orion or Taurus, focusing on the Hyades and Pleiades (Berezkin 2005, p. 83-85, 87-88; Miller 1997, p. 222, 225; Lushnikova 2002). In Middle America and South America, there exist traces of a deer asterism related to the Hyades and Pleiades (Milbrath 1991, p. 269, 277, 281-282; Reichel-Dolmatoff 1985).

The cosmic hunt and the celestial deer

Ancient people of Eurasia and the Americas created myths, artwork, and rituals dealing with the chasing of a deer across the sky by one or more hunters, mostly along the Milky Way, which illustrated the deer's and hunter's tracks (Baldick 2000, p. 141, 153-158; Santillana and Von Dechend 1993, p. 226; Eliade 1990, p. 143-154; Miller 1997, p. 100-101, 149-150, 199; Lushnikova 2002; Berezkin 2005, p. 83-88; Jacobson 1993, p. 26, 194-197; Miller and Taube 1993, p. 75; Roe 2005, p. 218, 222; Johnson 1990, p. 234-235): The deer is thought to have stolen the sun either at the autumnal equinox or the winter solstice. To restore fire and light, a carnivore such as a lion or a bear killed the herbivore deer. The sun is returned at the vernal equinox or summer solstice. After the cosmic hunt, the body parts of the celestial deer (and sometimes the hunter, too) were scattered off over the starry sky as constellations (De Santillana and Von Dechend 1993, p. 226; Eliade 1990, p. 163; Lushnikova 2002). The cosmic hunt seems to be partially a reflection of an antagonism between the cyclical change of day and night, of the spring-summer and autumn-winter seasons, of constellations dominating the upper and lower cosmic strata, of death and life, and of gender polarity and social dichotomy (Jacobson 1993, p. 195, 212-213, 244-245; Konakov 1994; Lushnikova 2002).

The cosmic deer and the shaman's trance

Deer like to eat hallucinogenic plants, e.g. Peyote in Middle America or the fly agaric (amanita muscaria) in Eurasia (Andritzky 1988, p. 60-61, 159-164; Evers 1988, p. 157-159; Hentze 1961, p. 83; Mikhailova 2006; Torres 1995): Looking at an intoxicated "dreaming" deer, early man considered the animal to know curative, poisonous, aphrodisiac, and hallucinogenic plants. From this he derived the idea of the sacred celestial deer, which acts as a spirit helper and safely guides a shaman (or also a dead person) on his way through alternative states of consciousness, imagined as different spatio-temporal, transcendent worlds. Shamans considered hallucinogenic plants to have a "fiery", "hot" and "solar" nature, which they related to the cosmic deer, and in particular to his antlers (Viesca Treviño et al. 1996, p. 194-195). For them, the spirit animal near or at top of the world axis symbolized the highest states of trance. People of the Northern Hemisphere believed that the cosmic deer at the centre of the world was responsible for the fertilising power of water (rain, rainbow), light, fire and the growth of important plants (crops, hallucinogens): Thus they associated the deer spirit, as a primeval ancestor, with the origin of creation (Sachse and Allen 2005, p.15) and shamans, dressed as half man, half deer, tried to get in contact with the cosmic power offered by him (Andritzky 1988, p. 60-61; Jacobson 1993, p. 174-175, 211; Mikhailova 2006).

Symbolism, myths, and rituals associated with the celestial deer are an important part of the cosmovisions of hunter-gatherer cultures. Further analysis could help to decode principles of those archaic world-views.

References

ALDHOUSE GREEN, M., 2004. *An Archaeology of Images. Iconology and cosmology in Iron Age and Roman Europe.* London and New York: Routledge.

ANDRITZKY, W., 1988. *Schamanismus und rituelles Heilen im alten Peru*. Bd. 1. Berlin: Zerling.

BEREZKIN, Y. 2005. The Cosmic Hunt: Variants of a Siberian-North-American Myth. *Folklore,* 31, 79-100.

CHEVALIER, J. and GHEERBRANT, A.,1996. *Dictionary of Symbols.* London: The Penguin.

DE SANTILLANA, G. AND VON DECHEND, H., 1993. *Die Mühle des Hamlet.* Berlin: Kammerer & Unverzagt.
ELIADE, M., 1990. *Von Zalmoxis zu Dschingis Khan. Religion und Volkskultur in Südosteuropa.* Frankfurt a. M.: Insel.
EVERS, D., 1988. *Felsbilder arktischer Jägerkulturen des steinzeitlichen Skandinaviens.* Stuttgart: Steiner.
HENTZE, C., 1961. *Das Haus als Weltort der Seele. Ein Beitrag zur Seelensymbolik in China, Grossasien, Altamerika.* Stuttgart: Klett.
JACOBSON, E. 1993. *The Deer Goddess of Ancient Siberia: A Study in the Ecology of Belief.* Leiden, New York: Brill, 182-184.
JOHNSON, B., 1990. *Die Große Mutter in ihren Tieren. Göttinnen alter Kulturen.* Olten: Walter.
KOCH, J., 2001, Neue Überlegungen zu einigen astrologischen und astronomischen Keilschrifttexten. *Journal of Cuneiform Studies*, 53, 69-81.
KONAKOV, N. D., 1994. Calendar Symbolism of Uralic Peoples of the Pre-Christian Era. *Arctic Anthropology,* 31, 1, 47-61.
LUSHNIKOVA, A., 2002. Early notions of Ursa Major in Eurasia. In: T. M. POTYOMKINA and V. N. OBRIDKO, eds. *Astronomy of Ancient Societies.* Moskow: Nauka, 254-261.
MARSADOLOV, L. S., and Dmitrieva, N. V., 2007. Drevnee svjatilišče Ak-Baur na Zapadnom Altae. *Moskovskij gorodskoj dvore detskogo (junošeskogo) tvorčestva*, Volume 1. Moskva.
MARTYNOV, A. I., 1991. *The Ancient Art of Northern Asia.* Urbana and Chicago: University of Illinois Press.
MIKHAILOVA, N., 2006. The Cult of the Deer and "Shamans" in Deer Hunting Society. *Archeologia Baltica*, 7, 187-198.
MILBRATH, S., 1999. *Star, Gods of the Maya. Astronomy in Art, Folklore, and Calendars.* Austin: University of Texas Press.
MILLER, M. E. and TAUBE, K. A., 1993. *The Gods and Symbols of Ancient Mexico and the Maya: An Illustrated Dictionary of Mesoamerican Religion.* London: Thames & Hudson.
MÜLLER, W., 1956. *Die Religionen der Waldlandindianer Nordamerikas.* Berlin: Dietrich Reimer.
MÜLLER, W., 1970. *Glauben und Denken der Sioux. Zur Gestalt archaischer Weltbilder.* Berlin: Dietrich Reimer.
MÜLLER, W., 1982. *Amerika – Die Neue oder die Alte Welt?* Berlin: Dietrich Reimer.
RANKE-GRAVES, R., 1985. *Die Weiße Göttin. Sprache des Mythos.* Reinbek: Rowohlt.
RAPPENGLÜCK, M.A., 2005. The Pivot of the Cosmos: The Concepts of the World Axis across Cultures. In: M. KÕIVA, I. PUSTYLNIK, and L. VESIK, eds. *Cosmic Catastrophes: A Collection of Articles,* Tartu: SEAC publication, 157-165.
RAPPENGLÜCK, M.A., 2008. Astronomische Ikonografie im Paläolithikum (35.000-9.000 BP). *Acta Praehistorica et Archaeologica*, 40, 179-203.
REICHEL-DOLMATOFF, G., 1985. Tapir Avoidance in the Columbian Northwest Amazon. In: G. URTON, ed. *Animal Myths and Metaphors in South America,* Salt Lake City: University of Utah Press, 107-143.
ROE, P. G., 2005. Mythic Substitution and the Stars: Aspects of Shipibo and Quechua Ethnoastronomy Compared. In: VON DEL CHAMBERLAIN, J.B.CARLSON, M.J.YOUNG, eds. *Songs from the Sky. Indigenous Astronomical and Cosmological Traditions of the World,* Bognor Regis: Ocarina, 193-228.
SACHSE, F. and CHRISTENSON, A. J., 2005. Tulan and the Other Side of the Sea: Unraveling a Metaphorical Concept from Colonial Guatemalan Highland Sources, Retrieved April 10, 2007, from Mesoweb database, 1-33.
SEIFFERT, B., 1990. *Die Herkunft des Feuers in den Mythen der nordamerikanischen Indianer.* Bonn: Holos.
SICARD, H., 1971. Der Wunderbare Hirsch. *Acta Ethnographica Academiae Scientiarum Hungaricae*, 20, 3-4, 231-286.
TAYLOR, B., 2004. *Biological Time.* Oregon: Ea Press.
VIESCA TREVIÑO, C., RAMÓN DE LA FUENTE, J., RAMOS, M., 1996. Ethnotaxonomy and ethnopharmacology of psychoactive drug of ancient Mexico. In: Actes du 2^{e} Colloque Européen d'Ethnopharmacologie et de la 11^{e} Conférence internationale d'Ethnomédecine, Heidelberg, 24-27 mars 1993, Paris: ORSTOM Editions /Société Française d'Ethnopharmacologie, 192-200.

Received: 26 October 2007; Revised: 25 May 2008

DANGIŠKOJO ELNIO PĖDSAKAIS – ARCHAJIŠKAS MOTYVAS IR JO ASTRONOMINĖ INTERPRETACIJA ĮVAIRIOSE KULTŪROSE

Michael A. Rappenglück

Santrauka

Prieš tūkstantmetį Šiaurės pusrutulio kultūros išplėtojo simbolių, mitų ir ritualų sistemą, siejančią elnią su konkrečiais astronominiais reiškiniais, kosmologinėmis, kosmogoninėmis ir šamanizmo idėjomis bei senovės medžiotojų kalendoriais. Straipsnyje išryškinami dangiškojo elnio motyvai (soliarinė simbolika, gyvybės medis, ugnies vagystė, kosminė medžioklė) ir jo astronominė interpretacija (asterizmas, kalendorius) įvairiose kultūrose, remiantis biologine elnio elgsena ir išvaizda.

Vertė Algirdas Girininkas

CALENDRICAL DEER, TIME-RECKONING AND LANDSCAPE IN IRON-AGE NORTH-WEST SPAIN

ANTONIO CÉSAR GONZÁLEZ GARCÍA, MARCO V. GARCÍA QUINTELA, JUAN ANTONIO BELMONTE, MANUEL SANTOS ESTÉVEZ

Abstract

The relationship between petroglyphs and archaeoastronomy has been treated in several ways in the past. In the present study we examine a particular motif found among the rock carvings in the north-west of the Iberian Peninsula: a large deer with over-sized horns and an unnatural number of tips on each horn. A multidisciplinary approach combining landscape archaeology, comparative history of religions, and archaeoastronomy suggests a coherent interpretation of the motif. It reveals a unique amalgamation of calendrical motives, landscape relationships and lunisolar events. It may also be significant in relation to the Celtic world-view and its artistic manifestation, and to the relationship between time and landscape.

Key words: landscape archaeology, petroglyphs, calendrical systems, Iron Age, Celts.

Introduction

Campo Lameiro is the area with the highest density of petroglyphs in south-western Galicia (Spain). Although the petroglyphs have been studied since the 1920s, there is little published material offering an interpretation in a wider context (exceptions being de la Peña Santos and Vázquez 1999 and de la Peña Santos and Rey García 2001). It is always controversial to link rock art with cosmic cycles owing to severe arbitrariness and the difficulty of comparing it with evidence from ethnographic, textual, historic, cultural or religious sources (Belmonte 2006).

Deer carvings are very common in south-western Galician rock art. They are usually represented in herds and sometimes in hunting scenes (Peña Santos and Vázquez Várela 1999).

The deer are now dated to the Iron Age. This results from their attribution to the Schematic Atlantic Style defined by Santos Estévez (2003, 2008), which has been associated archaeologically with that period. In addition, the excavation of the Laxe dos Carballos carving provided a radiocarbon date for strata associated with the carved rock, the lowest of which yielded a date around 800 BC (First Iron Age). This may place this carved panel in an Indo-European or Celtic cultural context.

Four of these deer are much larger than the rest. These are represented in Fig. 1. In the first three cases the great deer dominates an unusually complex carved panel and has an unnatural number of tips per horn (see Fig. 1). Only the one at Campo de Cuñas appears alone. We shall also consider a unique deer at Os Mouchos (Rianxo, A Coruña), which has an average size but overgrown antlers with a large number of tips on them.

We propose that these motifs relate to a pattern that may have been dictated by a combination of celestial and terrestrial concerns.

The Data

The pattern

In what follows we will briefly discuss each of the four large deer together with the fifth anomalous one. (A complete report on the topic can be found in Belmonte et al. 2008.) We would like to highlight a number of characteristics we found when investigating the first of the large deer—the one at Laxe dos Carballos (Campo Lameiro).

- The deer is large .
- The horns have an excessive number of tips (i.e. ~ 11, as opposed to the standard 7).
- The deer faces right.
- The deer is in front of a large circular motif and surrounded by other lesser motifs of similar kind.
- The number of tips evokes an ‘astronomical’ number (12, 13, 15, 30).
- There are three isolated ‘strokes’ beside the horns.
- The horizon has peculiar astronomical events (solstices and/or lunistices).
- The horizon is open towards the south-east.
- A carving is located within the horns.
- This is what we shall call “the pattern”. We will now examine each of the large deer and see to what extent it complies with these characteristics.

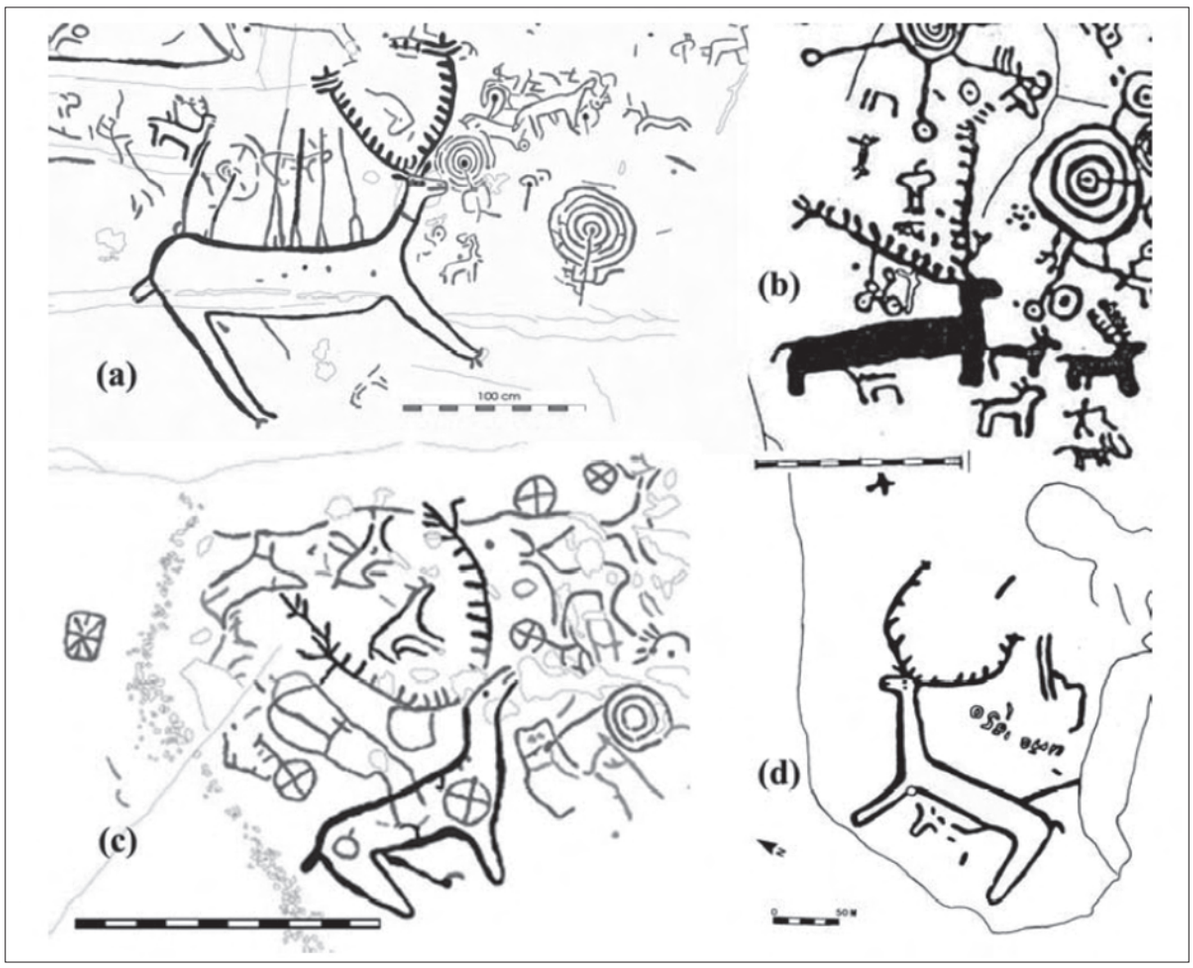

Fig. 1. The four great deer found in the carvings of south-western Galicia: (a) Laxe dos Carballos, Campo Lameiro, Pontevedra; (b) Laxe das Cruces, Tourón, Pontevedra; (c) Rotea de Mendo, Campo Lameiro, Pontevedra; and (d) Campo de Cuñas, Ponte Caldelas, Pontevedra.

Laxe dos Carballos

Obviously, Laxe dos Carballos, being the one that defines the pattern, fulfils all nine criteria (see Plate II: Fig. 2). The number of tips in the horns and the way they are distributed evokes some interesting astronomical numbers: thus 12 is the number of lunar months in a single solar year, while (12 + 3) x 2 = 30 is the whole number of days in a lunar month. We may also count the tips in a sequence suggested by the three isolated strokes next to the right horn. Starting at the rightmost one and counting three times (right-left-right) we obtain: 12 + (12 + 1) + 12 = 37, which is the number of lunar months in three solar years. The isolated stroke in the upper part of the left horn may represent the intercalary month.

The only distant horizon from Laxe dos Carballos opens to the south-east (see Plate II: Fig. 3). Importantly, it is in this direction that we find the only two written inscriptions in Campo Lameiro. These are two rocks with the inscription *'DIVI'*. They are located at the top of two low hills on a ridge in front of the far horizon, which is itself dominated by a distant mountain. Around 800 BC, the winter solstice sunrise and the major southern lunistice moonrise occurred close to the locations of the two *'DIVI'* inscriptions (see Plate II: Fig. 3).

Rotea de Mendo

This panel is located to one side of the Campo Lameiro complex. The great deer is surrounded by other deer and circular motifs, including a large circle to its right (see Fig. 4). It is facing right and it fulfils eight of the nine criteria that define our pattern. The only exception is the absence of the three isolated strokes. The deer has two large symmetric antlers with 13 tips each, although the left one seems to have an extra feature with another 4 tips. The count, 13 + 13 + 4 = 30, again presents a lunar number as at Laxe dos Carballos.

The location of the Rotea de Mendo panel on the eastern slopes of a hill means that the distant horizon is located to the east and south-east. However, the panel is now deep inside a eucalyptus forest, which prevents direct observation of the horizon. We decided to reconstruct this horizon using digital elevation data from

Fig. 4. The great deer at Rotea de Mendo surrounded by circular motifs. The deer has two symmetric antlers, each with 13 tips. The left antler has an extension with 4 additional tips.

the area within the visibility envelope of the Rotea de Mendo site. We find once again that winter solstice sunrise and, to a lesser extent, moonrise at the southern major lunistice (SML), would occur at interesting points of this horizon such as intersections of closer and more distant lines of mountains.

Laxe das Cruces

The actual confirmation that we might be dealing with an intentional and very distinctive pattern came from a site 20 km away from Campo Lameiro, in the wonderful panel known as Laxe das Cruces (Tourón). The large deer in this panel (Fig. 5) complies with all the criteria of the pattern, including the three vertical isolated strokes next to the right antler. They could be counted in the following way: (11 + 2) + 12 + 12 = 37, again yielding the number of lunar months in three solar years. A more speculative suggestion is that the double tip at the bottom of the right antler could be indicating the need to introduce an extra month.There is a distant horizon to the south-east, but in this case there is no clear prominent feature associated with the winter solstice sunrise. On the other hand, moonrise at the SML occurs at the intersection of this distant horizon with a closer mountain.

Campo de Cuñas

The last great deer in this region is located at Campo de Cuñas, next to Ponte Caldelas (Tourón; Fig. 1(d)). However, apart from its size, none of the characteristics so far analyzed applies to this deer. Hence we would see this as just a large representation of a deer without further implications.

Os Mouchos

We conclude our analysis with a further deer petroglyph. Unlike our other examples it is of average size; however, it is peculiar owing to its overgrown antlers, which resemble those in the first three cases. There are at least 12 tips on each antler (Plate II: Fig. 6). The horizon from this carving opens out to the south-west (not to the south-east) and over the sea (not over the mountains). In 800 BC, winter solstice sunset would occur over Cape de Cruz and moonset at the SML would take place over the sea. We believe that we are observing a similar phenomenon to the previous cases, although less spectacular and less elaborated.

Discussion and conclusions

Anyone can verify the facts that we have presented in this paper. We are clearly dealing with a common cultural phenomenon spread over different areas. This leads us to think that the areas considered were of special interest to the peoples who carved such panels. It is important to note the need for special observations in order to locate such areas.

It is difficult to find cultural parallels for these observations. However, an association between deer and/or horses and the Sun is common in the European Bronze Age (Briard 1987; Kristiansen and Larsson 2006), and, indeed, is incorporated in several ancient mythologies. The sun/deer association is evident in decorations on Iberian bell-beakers (Garrido and Muñoz 2000). In addition, Fredell (2006) has proposed a solar interpretation for the circular motifs associated with deer in Bohuslan (Sweden). Deer with unnatural number of tips on their horns are also found among the petroglyphs of Valcamonica (Italy); in the light of our proposal it could be important to analyse these in further detail.

Finally, there is some evidence from the Celtic world of the deer being associated with the Celtic god Cernnunos, who is depicted by deer antlers. The Gundestrup cauldron and the coin from Petersfield, for example, bear a close resemblance to our carvings. In the Iberian Peninsula, F. Beltrán et al. (2005, p.938-9) describe a

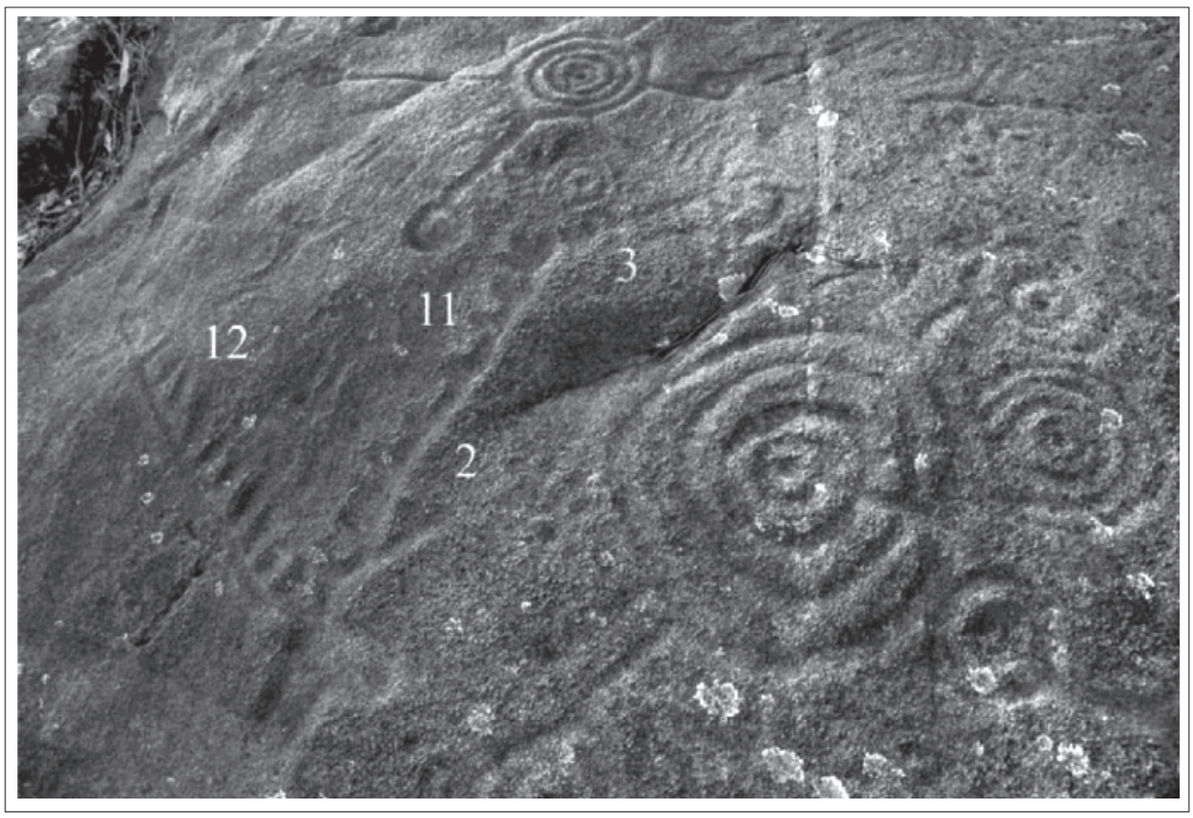

Fig. 5. Detail of the Laxe das Cruces panel showing the great deer and the large circular motif to its right. The large antlers have 11 and 12 tips protruding inwards, with two additional tips protruding outwards at the bottom of the right antler. Note the three isolated strokes next to the right antler, as at Laxe dos Carballos.

newly discovered Lati inscription found at the Celtiberian sanctuary of Peñalba de Villastar (Teruel, Spain). In this inscription a local god, 'Cor-donus', is identified by the Latin epithet Cornutus, which is strongly suggestive of the god Cernunnos, up until now only known in Gaul. The authors also mention a carved human figure, similar to those of the god Cernunnos found in France, and other inscriptions at the same site relating to the winter solstice and a feast during the last days of April, perhaps linked with the Celtic Beltaine.

We are convinced that the carvings depicting large deer with oversized antlers and an unnatural number of tips are more than mere hunting scenes. In our view they are likely to constitute true cult images, perhaps linked to Cernnunos or a local god of the same typology, that rendered sacred a landscape in which certain important astral configurations were evident. Symbolism showing some recognition of very simple luni-solar cycles was incorporated in the depictions. In particular, we believe that the panels from Laxe dos Carballos and Laxe das Cruces, showing the three isolated strokes next to the right antler, are most probably an indication of the existence of a luni-solar cycle of three years, after which Nature's clock would have been reset in a simple and effective way.

Acknowledgments

We wish to thank Yolanda Seoane Veiga, Asa Fredell, and César Parcero Oubiña for their help and assistance. This work is partially financed under the framework of projects P310793 'Arqueoastronomia' of the Instituto de Astrofísica de Canarias, AYA2004-01010 'Orientatio ad Sidera' of the Spanish Ministry of Education and Science, and project PGIDIT06PXIB236147PR 'Arqueología e relixión no noroeste peninsular' of the Xunta de Galicia.

References

BELMONTE, J. A., 2006. La Investigación Arqueoastronómica. In: J. LULL, ed. *Trabajos de Arqueoastronomía*, 41-79.

BELMONTE, J.V., GARCÍA QUÍNTELA, M.V. and GONZÁLEZ-GARCÍA, A.C., 2009. Ciervos, tiempo y paisaje. In : F. C. BOADO, A. M. CORTIZAS, eds. *Arte Rupestre, Paleoambiente y Paisaje. Miradas Interdisciplinares sobre Campo Lameiro. Col. Trabajos de Arqueología y Patrimonio*, CSIC-IEGPS. Madrid. In press.

BELTRÁN LLORIS, F., JORDÁN CÓLERA, C., MARCO SIMÓN, F., 2005. Novedades Epigráficas en Peñalba de Villastar (Teruel), *Palaeo-hispanica*, 5, 911-956

BRIARD, J., 1987. *Mythes et symboles de l'Europe préceltique: les religions de l'Age du Bronze : (2500-800 av. J.C.)*. Paris: Errance.

DE LA PEÑA SANTOS, A., REY GARCÍA, J. M., 2001. *Petroglifos de Galicia*. Perillo, Oleiros: Vía Láctea.

DE LA PEÑA SANTOS, A., VÁZQUEZ VÁRELA, J. M., 1999. *Los Petroglifos Gallegos. Grabados rupestres prehistóricos al aire libre en Galicia*. Sada: Castro.

FREDELL, ASA, 2006. Solhjorten' fanns den?: fallsrudium av ett galiciskt bildtema och dess relationer till identiteit. In : R. BARNDON, S. M. INNSELET, K. K. KRISTOFFERSEN AND T. K. LØDØEN, eds. *Samfunn, sym-boler og identiteit - Festskrift til Gro Mandt på 70-årsdagen.* UBAS Nosdisk, 3, 121-133.

GARRIDO PENA, R., MUÑOZ LOPEZ-ASTILLEROS, K., 2000. Visiones Sagradas para los Líderes. Cerémicas campaniformes con decoración simbólica en la Península Ibérica, *Complutum*, 11, 285-300.

KRISTIANSEN, K., LARSSON, T.B., 2006. *La Emergencia de la Sociedad del Bronce. Viajes, transmisiones y transformaciones*. Barcelona: Bellaterra.

SANTOS ESTÉVEZ, M., 2003. Arte Rupestre y Recintos Rituales en la Edad del Hierro. In: M. CASTIÑEIRAS, F. DIEZ, eds. *Profano y Pagano en el Arte Gallego,* USC. Santiago. 39-94.

SANTOS ESTÉVEZ, M., 2008. *Petroglifos y Paisaje Social en la Prehistoria Reciente del Noroeste de la Península Ibérica*. Santiago: CSIC.

Received: 26 October 2007; Revised: 6 Jun 2008

KALENDORINIS ELNIAS, LAIKO SKAIČIAVIMAS IR GELEŽIES AMŽIAUS KRAŠTOVAIZDIS ŠIAURĖS VAKARŲ ISPANIJOJE

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Santrauka

Ryšys tarp petroglifų ir archeoastronomijos praeityje buvo interpretuojamas įvairiai. Šiame straipsnyje nagrinėjamas konkretus motyvas, aptinkamas tarp uolų raižinių, esančių šiaurės vakarinėje Iberijos pusiasalio dalyje, vaizduojantis stambų elnią su didžiuliais ragais ir nenatūraliu kiekiu šakų ant kiekvieno rago. Autoriai pateikia galimą šio motyvo interpretaciją, remdamiesi tarpdalykiniu metodu, apimančiu kraštovaizdžio archeologiją, lyginamąją istorinę religiją ir archeoastronomiją. Tai leidžia nagrinėjamame vaizdinyje atskleisti savotišką kalendorinių motyvų sąsajų su kraštovaizdžio dariniais ir Saulės-Mėnulio reiškiniais sampyną. Autorių išvados gali būti svarbios keltų pasaulėžiūros, jos meninės išraiškos bei laiko ir kraštovaizdžio sąryšio studijų kontekste.

Vertė Algirdas Girininkas, Jonas Vaiškūnas

THE MYTHOLOGICAL MOON HORSE AS REFLECTED IN BALTIC ARCHAEOLOGY, FOLKLORE AND LINGUISTICS

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Abstract

In this article we discuss the phenomenon of crescent-shaped pendants dating back to the Late Roman Iron Age and Early Migration Period (3rd – 6th centuries AD). Placed on horse's foreheads, these crescent-shaped pendants evidently embodied a mythological link between the moon and the horse. The same link is clearly reflected in linguistic data and folklore right up until the 20th century.

We draw special attention to a horse with a white mark on its forehead called *laukas* (adj.), *laukis* (noun) in Lithuanian, which derives from the I-E root **louk-* 'shining, bright', as also does the Latin *luna* (< **louksnā*). Considering the data as a whole, we propose an unexpected link between the Baltic and Roman traditions.

Keywords: the Moon, horse, crescent-shaped pendants, Roman Iron Age.

The moon has been a prolific symbol around the Baltic since prehistoric times. Crescent-shaped Neolithic amber figurines, bronze pendants dating to the Roman Iron Age, and silver jewelry with impressed ornamentation represent some of the wide variety of visual symbols of the moon found in prehistoric times. Christian iconography in a rich variety of forms (drawings, frescos, figurines, etc.) certainly follows the same tradition. In the late 19th and 20th centuries the moon symbol was still popular in decorations on various handmade objects in everyday use – especially in the countryside.

The role of the moon and its relation to the sun in Baltic mythology and religion has been discussed by several authors (cf. Tsivian 1988; Greimas 1990, pp. 171ff; Vaiškūnas 1992; Klimka 1999; Vaitkevičienė 2001, pp. 130ff; Vaiškūnas 2006). The great importance of the moon in the past as well as in modern culture is also indicated by the large number of prayers to the New Moon recorded during the 20th century (see Balys 1951, pp. 17ff).

This article presents some detailed and complex evidence relating to the mythological Moon Horse among the Balts. Some archaeological, folkloric and linguistic data are selected and discussed.

Crescent-shaped pendants and other horse harness fittings

Well known in Baltic prehistory, symbols of the moon became especially abundant in the Roman Iron Age (1st to 4th centuries AD). During this period, crescent-shaped pendants of different forms and patterns of manufacture were often attached to fibulas, neck-rings, pins, headbands, temple ornaments, and horse harnesses. Necklaces consisting of sets of crescent-shaped pendants as well as spirals, glass, and metal beads, were also prevalent.

It was only recently that a number of crescent-shaped pendants with small knobs were examined (Simniškytė 2002). Over 400 pendants of this type were recorded in 70 find spots covering an area from the lower Nemunas in the south to the southwestern coasts of Finland in the north. In the late 2nd century, crescent-shaped pendants with knobs spread into the Curonian Spit. In the 3rd and 4th centuries, communities living further to the east and north took over their manufacture. Such pendants were widely used as ornaments by women but rarely by children or men (according to the data obtained from burials).

On this occasion we will focus mainly on crescent-shaped pendants (originally *lunulae*) that were attached to horse harnesses. This custom was prevalent among Roman cavalrymen as well as in *Barbaricum* in north and north-east Europe. However, the use of crescent-shaped pendants as harness pendants might have been restricted in the cavalry, used perhaps as a kind of *dona militaria* or award for courage. Roman crescent-shaped pendants of different sizes (usually from 2 to 8 cm in width) were attached to different places on the harness. In this way pendants were used to decorate different parts of the horse's body, such as its head (smaller items) or sides (larger ones). From the late 2nd century onwards, particular harness plates

Fig. 1. Base of the column of Antoninus Pius set up in commemoration of the emperor (died in 161 AD) (Vatican Museums). Scene depicting ritual cavalry parade which encircled the pyre three times in the course of the funeral. Crescent-shaped pendants and pendants of other forms are attached to horse harness (Claridge 1998, p.193). Photograph by V. Vaitkevičius.

mainly replaced harness pendants, although *lunulae* were still in use (Lawson 1982, p. 151ff; cf. Szirmai 1994) (Fig. 1).

Crescent-shaped harness pendants were also prevalent among Baltic tribes. It is very likely that their manufacture and use as harness pendants were influenced by examples of Roman origin (cf. Nowakowski 1998, p. 82; Simniškytė 2002, p. 114). However, it is important to note that harness sets (with or without crescent-shaped pendants) dating from the Late Roman Iron Age (*ca.* 250–350 AD) to the Early Migration Period (*ca.* 450–550 AD) were found in elite graves without horses. A magnificent harness set was found in an inhumation grave in Szwajcaria barrow 2 (the so-called "chieftain grave") (Suwałki district, Poland – Antoniewicz *et al.* 1958, p.23 ff). In inhumation grave 2 in Żywa Woda barrow 14 (a "warrior's grave") a horse harness was found that had been placed directly on the body of the deceased (Suwałki district, Poland – Ziemlińska-Odojowa 1961, p. 196 ff). In richly furnished cremation grave 79 in Netta (a collective family grave) an unburned harness was found among other grave goods (Augustów district, Poland – Bitner-Wróblewska 2007, pp. 220ff). Some horse harness fittings, including a crescent-shaped pendant and dozens of bronze rivets, were collected in inhumation grave Mo a barrow 1 (another "warrior's grave") (Trakai district, Lithuania – Abaravičius 1996). Magnificent harness fittings (openwork pendants and strap dividers) were found in Maudžiorai (Kelmė district, Lithuania; inhumation grave 1; partly destroyed warrior's grave – Valatka 1984, p. 12ff) and in Althof-Insterburg (Cherniakhovsk, Kaliningrad region) in grave 135 (Nowakowski 1998, Plate 104; excavations took place before the World War II and are not sufficiently documented). A harness set (or perhaps two of them) was found in inhumation grave 47 in Žviliai (Šilalė district, Lithuania) (an impressive funerary deposit in warrior's grave – Vaitkunskienė 1999, pp. 187ff) (Fig. 2).

Finally we must mention a harness set of special interest for the present purpose. It was found in horse grave 6/1992 in the Lazdininkai cemetery (Kretinga district, Lithuania) and includes a crescent-shaped pendant, strap dividers, and some other fittings (Bliujienė and Butkus 2007, Fig. 8:2).

In this way elaborate harness sets in each of above mentioned grave-good assemblages represent prestigious items and should be regarded as reflecting the high social status of the deceased. The exact position of the crescent-shaped pendants in harness sets found in burials – whether inhumations and cremations – tends to be unclear because the leather straps are not usually preserved (or at best only partly preserved thanks to bronze rivets). Nevertheless, we do know that crescent-shaped pendants were particular fittings of the harnesses.

The form of harness strap dividers also deserves consideration. The most prevalent one was cruciform. Four bronze, silver-plated or tin dividers were

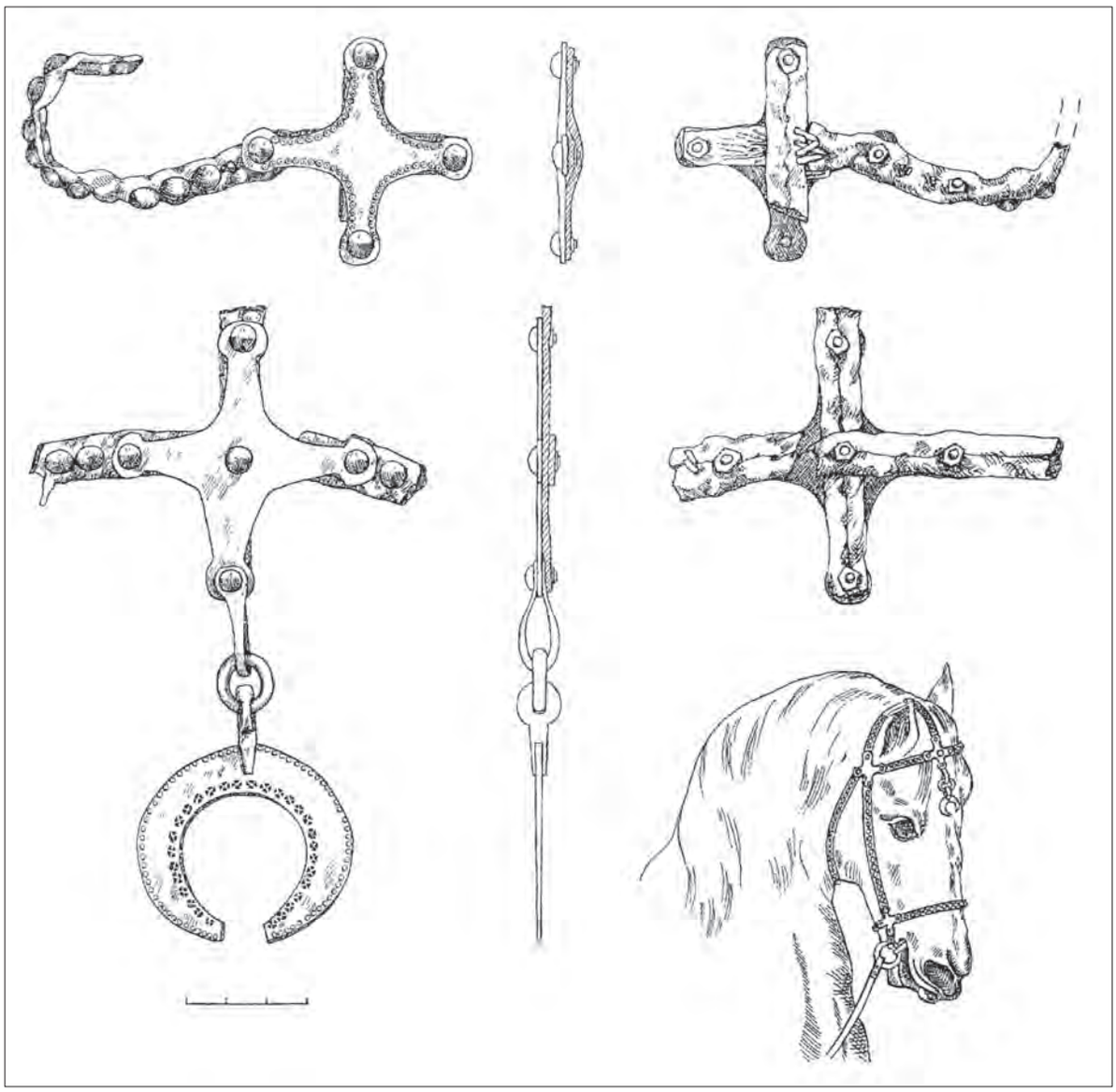

Fig. 2. A crescent-shaped pendant and four cruciform dividers found in the Žviliai cemetery. Reconstruction of the horse harness used by riders from Žviliai in ca. 450–550 AD (according to Vaitkunskienė 1999, p.188 (Fig. 214)).

usually found in harness sets, suggesting that the moon was actually accompanied by stars. The next form of strap dividers, which is of particular interest, is circular. Two pairs of openwork circular dividers have been found so far, in Maudžiorai (Kelmė district, Lithuania). As an additional decoration for the harness, dozens of bronze rivets with semi-spherical heads were used for studding the leather straps.

Summarizing the archaeological evidence, we should stress that the Roman custom of decorating a horse's harness with crescent-shaped pendants was also prevalent among Baltic tribes. The Baltic evidence (perhaps imitations of Roman items of the same kind) is dated to the Late Roman Iron Age – Early Migration Period (3rd to 6th centuries). These show a great variety of form and pattern of manufacture but share one thing in common – the elite of that time used to decorate their horses with an elaborate and impressive harness. Up until then, horses' heads had been decorated with symbols of the moon (crescent-shaped pendants) primarily, though probably also with symbols of other heavenly bodies (in the form of cruciform and circular strap dividers as well as ranges of bronze rivets). This fact certainly allows us to turn to Baltic folklore and linguistic data in order to explore this further.

The Mythological Moon Horse according to Folklore

The personified Moon in Lithuanian folklore overtly takes the form of a horse. For example, the hero of a Lithuanian fairy tale recorded in 1887 is looking for a girl who must be somewhere "over the river of milk, over the wood of honey". He asks the Moon, whom he has incidentally met with, the way to her. The Moon, as it were, agrees to show the way, gives our hero a

b r i d l e and says: "Go behind my hut and tinkle the bridle, and when m y h o r s e arrives, follow him". After a while it transpires that the Moon's horse is the Moon himself turned into a horse (*tas mėnuo, į arklį paverstas*) (Davainis-Silvestraitis 1973, pp. 52ff).

In another Lithuanian fairy tale recorded in 1920 the hero-fool, while watching over the oat crop for the third night, beholds "the little horse coming, bright as the moon, and proceeding to eat the oats"; afterwards he "mounts the m o o n - h o r s e (*mėnesio arkliuką*) and rides away" (TŽ, 1923, pp.124ff).

At least one type of Lithuanian riddle also deserves serious consideration, an example being: *Pėtnyčiom, subatom gimė kumeliukas aukso patkavom* "On the Friday, on the Saturday the foal was born wearing golden horseshoes". This is the moon (LT, 1968, p. 455, No 5420). Another version is: *Seredoj, subatoj gimė Dievo kumeliukas auksinėm kamanom, sidabrinėm padkavom* "On the Wednesday, on the Saturday God's foal was born with a golden bridle and silver horseshoes". Again, this is the moon (LKŽ, 1962, p. 870).

Some scholars, such as Algirdas Julius Greimas and Pranė Dundulienė, have already studied Lithuanian fairy tales and riddles such as these and connected them with a winter festival known as *Kumeliuko krikštynos* ("The Christening of the foal"), celebrated at the first New Moon after the New Year. It was the new crescent moon, they maintain, that was regarded as the "foal" of this festival (Greimas 1990, pp. 320ff; Dundulienė 1988, p. 28; 1990, p. 49). Consequently, the moon was commonly identified with a horse in Lithuanian folklore, and this association was confirmed ritually.

In some Latvian folk songs "God's horse" or "God's foal" (*Dieva kumeliņš*) makes an appearance, sometimes covered with a "starry saddlecloth" or "saddlecloth made of stars" (*zvaigžņu deķis*). This "God's foal" is also identified with the Moon (Kursīte 1996, pp.14ff; Šmits 1926, p.15). Compare the following Latvian riddle: *No jūriņas izpeldēja divi sirmi kumeliņi: vienam bija zvaigžņu sega, otram zelta iemauktiņi* "Two grey horses (foals) have swum out of the sea: one with a starry saddlecloth, the other with the golden bridle (halter)". These are the moon and the sun (LTM, 1954, p. 241, No 2712).

Other particularly interesting riddles concerning the moon exist in several versions in both Baltic and Slavic folklore. The Lithuanian variants include *L a u k a s arklys pro (per) vartus žiūri* "The horse with a white forehead is looking througt the gate" (LT, 1968, p. 454, No 5418; on the popularity of this riddle in Lithuania see Kensminienė 2001, p. 194, No 89) and *L a u k a s kumelys per vartus daboja* "The stallion with a white forehead is watching through the gate". Both refer to the moon (TŽ, 1928, p. 585, No 136).

These have an exact Belarussian equivalent: *Lysy kon' tseraz varoty gliadzic'* "The horse with a white forehead is looking through the gate" – This, again, is the moon (Zagadki, 2004, p. 25, No 53). Compare also the Russian equivalents: *Sivyi zherebets pod vorotnei uviaz* "The grey stallion hangs up under the gates" and *L y s y i zherebets s belymi glazami, kruglyi, kak venec, svoimi ochami na vse on gliadit* "The stallion with a white forehead, round as a wreath, is watching everything with his white eyes" (Zagadki, 1968, p. 20, Nos 82 and 86). Then again, a description of a miraculous horse in a Russian fairy-tale indicates the moon on its forehead: *...po bokam chasty zvezdy, vo lbu iasnyi mesiats* "the frequent stars on the sides, the bright moon on the forehead" (Propp 1998, p. 266). Here it is essential to recognise that in Russian words having the same root as that used in this epithet for the moon-horse *lysyi* denote the appropriate parts of the horse harness, for instance: *lysina* "the white mark on the forehead (of an animal)" and also "the bright forehead-flap" and *lyska* "the middle girdle of harness on the horse's forehead" (Dal' 1981, pp. 276, 277).

The Mythological Moon Horse according to Linguistics

The description of the horse with a white forehead (with a white mark or even a blaze on the forehead) (Fig. 3) as *laukas* in Lithuanian and **lysъ(jь)* in Slavic deserves special attention. These adjectives derive from the Indo-European root **leuk(')-* / **louk(')-* 'shining, bright' from which – to be precise, from the I.-E. noun **louksnā* 'luminary' – also derive the Slavic **luna*, Middle Irish *luan*, *lōn*, and the Latin *lūna* 'the moon', as is well known (for further comments see: Fraenkel 1962, pp. 344ff; Smoczyński 2007, p. 339; ESSIA 1990, pp. 45ff; Walde, Hofmann 1938, pp. 833ff; Pokorny 1959, pp. 687ff; Klein 2003, p. 433; Smoczyński 2007, p.339)[1].

It should be mentioned here that the Old Prussian word **lauksnā* (pl. *lauxnos*), also deriving from the I.-E. **louksnā* 'luminary', does not mean'the moon' but the 'star' (Toporov 1990, pp. 179ff; Mažiulis 1996, pp. 53ff). Likewise, a white mark on the forehead of an animal, especially a horse, which in Lithuanian is called *laukas*, can also be called a "star": examples include

[1] We thank Stanisław Iwaniszewski for pointing out, when this paper was presented in Klaipėda in July 2007, that the Polish *łysy* 'with the white forehead' (or 'bald' when referring to a man) could be applied directly to the moon. In other words, the moon itself in Polish acquires the appellation *łysy*.

Fig. 3. *Laukas* – a horse with the white forehead. Photograph by V. Vaitkevičius.

Arkliukas su žvaigžde kaktoj "A horse with a star on its forehead"; *Mūs arklys su balta žvaigžde kakton* "Our horse has a white star on its forehead"; and *Par tą arklį žvaigždukė kaktoj buvo* "That horse had a little star on its forehead". The adjective *žvaigždėtas* 'starry' also has the meaning 'with the white mark on its forehead'; compare *žvaigždėtas arklys* "The horse with the white spot on its forehead" (namely "The starry horse") and *žvaigždgalvis*, meaning the same thing (namely "starry-head") (LKŽ, 2002, pp. 1022ff).

As V. Toporov has pointed out, West Baltic (> Slavic) together with Italic speakers in the late 1st millennium BC actually occupied a relatively compact territory which was also connected to the area where people spoke Celtic and Illyrian. Consequently the fact that here and only here the I.-E. **louk-snā* has been applied to nocturnal luminaries "terminologically" could not have occurred by chance (Toporov 1990, p. 183). In other I.-E. languages where it has survived it usually means light and brightness in general, as in Avestic *raoxšnā*, etc.

As we have shown, significant evidence exists that the mythological moon-horse survives in contemporary traditions, both Baltic and Slavic. The results of the present examination permit us to establish an unexpected link between the Baltic (and perhaps the Balto-Slavic?) and Roman traditions. Moreover, a careful consideration of the Baltic materials may help us offer a satisfactory explanation of the Roman evidence.

Conclusions

In terms of mythology, the horse (and especially the one with a white forehead called *laukas*) represents the moon. The adjectives *laukas* in Lithuanian and **lysъ(jь)* in Slavic are cognate with the Slavic **luna* and the Latin *lūna* 'the moon' (< I.-E. **louk-snā*), and the words of the same root in Russian denote the appropriate parts of the harness. The white mark on the forehead of the horse can also be described as "star", and the Old Prussian word for the stars *lauxnos* (sg. **lauksnā*) derives from the same I.-E. noun.

The placing of crescent-shaped and star-shaped glittering pendants on a horse's forehead, which is clear from the Baltic and Roman archaeological evidence, fits clearly into the mythological and linguistic context that we have presented.

Abbrevations

References

ESSIA, 1990. *Etimologicheskii slovar' slavianskikh iazykov: praslavianskii leksicheskii fond*, 17. O. N. TRUBACHEV, ed. Moskva: Nauka.

LKŽ, 1962. *Lietuvių kalbos žodynas*, 6. Vilnius: Mintis.

LKŽ, 2002. *Lietuvių kalbos žodynas*, 20. Vilnius: Lietuvių kalbos instituto leidykla.

LT, 1968. *Lietuvių tautosaka. Smulkioji tautosaka, žaidimai ir šokiai*, 5. Vilnius: Mintis.

LTM, 1954. *Latviešu tautas mīklas. Izlase*. Rīgā: Latvijas PSR Zinātņu Akademijas izdevniecība.

TŽ, 1923. *Tauta ir žodis*, 1. Kaunas: Lietuvos universiteto Humanitarinių mokslų fakultetas.

TŽ, 1928. *Tauta ir žodis*, 5. Kaunas: Lietuvos universiteto Humanitarinių mokslų fakultetas.

ABARAVIČIUS, G., 1996. Mošos (Naujasodų) pilkapyno kasinėjimai 1994 metais. *In: Archeologiniai tyrinėjimai Lietuvoje 1994 ir 1995 metais.* Vilnius: Lietuvos istorijos instituto leidykla, 77-78.

ANTONIEWICZ, J., KACZYŃSKI, M. and OKULICZ, J., 1958. Wyniki badań przeprowadzonych w 1956 roku na

cmentarzysku kurhanowym w miejsc. Szwajcaria, pow. Suwałki. *Wiadomośći archeologiczne*, XXV: 1-2, 22-57.
BALYS, J. ed., 1951. *Liaudies magija ir medicina*. Bloomington.
BITNER-WRÓBLEWSKA, A., 2007. Netta. A Balt Cemetery in Northeastern Poland. *Monumenta Archaeologica Barbarica*, XII.
BLIUJIENĖ, A.; BUTKUS, D., 2007. Armed men and their riding horses as a reflection of the warrior hierarchy in Western Lithuania during the Roman Iron Age. *Archaeologia Baltica*, 8, 95-116.
CLARIDGE, A., 1998. *Rome. An Oxford Archaeological Guide*. Oxford University Press.
DAL', V., 1981. *Tolkovyi slovar' zhivogo velikorusskogo iazyka*, 2. Moskva: Russkii iazyk.
DAVAINIS-SILVESTRAITIS, M., 1973. *Pasakos, sakmės, oracijos*. Vilnius: Vaga.
DUNDULIENĖ, P., 1988. *Lietuvių liaudies kosmologija*. Vilnius: Mokslas.
DUNDULIENĖ, P., 1990. *Senovės lietuvių mitologija ir religija*. Vilnius: Mokslas.
FRAENKEL, E., 1962. *Litauisches etymologisches Wörterbuch*, 1. Heidelberg: Carl Winter, Universitätsverlag – Göttingen: Vandenhoeck & Ruprecht.
GREIMAS, A. J., 1990. *Tautos atminties beieškant. Apie dievus ir žmones.* Vilnius–Chicago: Algimanto Mackaus knygų leidimo fondas.
JOVAIŠA, E., 2007. Vėluikių kapinynas. *Archeologiniai tyrinėjimai Lietuvoje 2006 metais*. Vilnius: Lietuvos archeologijos draugija, 153-154.
KENSMINIENĖ, A., 2001. Kūniškumas lietuvių mįslėse – liaudies juoko kultūros įnašas. *Tautosakos darbai*, 14(21), 182-196.
KLEIN, E., 2003. *A Comprehensive Etymological dictionary of the English Language*. Amsterdam-Boston-London: Elsevier.
KLIMKA, L., 1999. Mėnulis etnožinijoje. *Darbai ir dienos*, 11(20), 121-130.
KURSĪTE, J., 1996. *Latviešu folklora mītu spogulī*. Rīga: Zinātne.
LAWSON, A. K., 1982. Studien zum römischen Pferdegeschirr. *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz*, 25 (1978), 131-160.
MAŽIULIS, V., 1996. *Prūsų kalbos etimologijos žodynas*, 3. Vilnius: Mokslo ir enciklopedijų leidykla.
NOWAKOWSKI, A., 1998. *Die Funde der römischen Kaiserzeit und der Völkerwanderungszeit in Masuren*. Berlin: Museum für Vor- und Frühgeschichte.
POKORNY, J., 1959. *Indogermanisches etymologisches Wörterbuch*, 1. Bern-München: Francke Verlag.
PROPP, V., 1998. *Sobranie trudov*. Moskva: Labirint.
SIMNIŠKYTĖ, A., 2002. Roman Period Metal Half-moon Shaped Pendants with Knobs in Eastern Baltic Region. *Archaeologia Baltica*, 5, 95-122.
SMOCZYŃSKI, W., 2007. *Słownik etymologyczny języka litevskiego*, Wilno: Uniwersytet Wileński.
SZIRMAI, K., 1994. Eine Pferdegeschirr-Gattung mit Lunulaverzierung aus Aquincum. *In: Akten der 10. Internationalen Tagung über antike Bronzen,Freiburg, 18.-22. Juli 1988*. Stuttgart, 405-409.
TOPOROV, V. N., 1990. *Prusskii iazyk: Slovar'*, 5. Moskva: Nauka.
TSIVIAN, T.V., 1988. Motiv nakazania mesiatsa v siuzhete nebesnoi svad'by. *In: Balto-slavianskie issledovania 1986*. Moskva: Nauka.
VAIŠKŪNAS, J., 1992. Saulės ir mėnulio simbolika baltų pasaulėžiūroje. *In: Senovės baltų simboliai*. Vilnius: Academia, 131-149.
VAIŠKŪNAS, J., 2006. The Moon in Lithuanian Folk Tradition. *Folklore*, 32, 157-184.
VAITKEVIČIENĖ, D., 2001. *Ugnies metaforos. Lietuvių ir latvių mitologijos studija*. Vilnius: Lietuvių literatūros ir tautosakos institutas.
VAITKUNSKIENĖ, L., 1999. Žvilių kapinynas. *Lietuvos archeologija*, 17.
VALATKA, V., 1984. Maudžiorų plokštinis kapinynas (1964 ir 1966 m. tyrinėjimų duomenys). *Lietuvos archeologija*, 3, 6-24.
WALDE, A., HOFMANN, J. B., 1938. *Lateinisches etymologisches Wörterbuch von A. Walde. 3., neubearbeitete Auflage von J. B. Hofmann*, 1. Heidelberg: Carl Winter's Universitätsbuchhandlung.
ZIEMLIŃSKA-ODOJOWA, W., 1961. Badania wykopaliskowe w 1959 r. na cmentarzysku kurhanowym w miejsc. Żywa Woda, pow. Suwałki. *Rocznik Białostocki*, 1, 193-221.
ZAGADKI, 1968. *Zagadki*. Leningrad: Nauka.
ZAGADKI, 2004. *Zagadki*. Minsk: Belaruskaja navuka. (The 2nd ed.).
ŠMITS, P., 1926. *Latviešu mitoloģija*. Rīgā: Valtera un Rapas akc. sab. izdevums.

Received: 2 November 2007; Revised: 30 November 2008.

MITINIS MĖNUO-ŽIRGAS BALTŲ ARCHEOLOGIJOS, FOLKLORO IR KALBOS DUOMENIMIS

Dainius Razauskas, Vykintas Vaitkevičius

Santrauka

Mėnulis baltų priešistorėje – svarbus ir populiarus simbolis. Didelį susidomėjimą kelia dailūs pusmėnulio (= jauno mėnulio) formos kabučiai, datuojami vėlyvuoju romėniškuoju – ankstyvuoju migracijų laikotarpiu (III–VI a.). Plačiai paplitę pusmėnulio formos kabučiai tuo metu puošė moterų krūtinę ir kaklą, taip pat buvo žirgų kamanų elementas. Pastarieji ir yra šio straipsnio dėmesio centre.

Panašiai kaip Romos imperijos kavalerija ir kai kurių kitų „barbarų" kraštų raiteliai, žirgų kamanas baltai mėgo puošti pusmėnulio formos kabučiais. Iki šiol jų rasta aukščiausiam (kartu kariniam) to meto visuomenės sluoksniui atstovaujančių asmenų kapuose Lietuvoje, Lenkijoje, Kaliningrado srities teritorijoje (Lazdininkai, Maudžiorai, Moša, Neta, Šveicarija, Žviliai ir kiti laidojimo paminklai). Tikslią kabučių padėtį kamanose dažnai sunku nustatyti dėl prastos pastarųjų būklės, tačiau pagal išlikusius pavyzdžius matyti, jog kabučiai puošė žirgo kaktą. Kryžiaus ir apskritimo for-

mos kamanų dirželių skirstikliai bei dirželius puošusios spurgelių formos kniedės minėtame jauno mėnulio kontekste gali būti siejami su kitais dangaus kūnais – saule ir žvaigždėmis.

Duomenys rodo, jog baltų naudotų pusmėnulio formos kabučių (žmonių ir žirgų papuošalų) prototipai veikiausiai buvo pavyzdžiai iš Romos imperijos ir kitų „barbarų“ kraštų. Taip pat neatmestina, jog kai kurie baltų kraštuose archeologų rasti kabučiai yra tiesiog importuoti. Tačiau didelis kabučių populiarumas Rytų Pabaltijyje (vien moterų papuošalų – per 400 radinių) ir savita idėjos raiška (elitas puošia savo žirgų kaktas) verčia manyti, jog tradicija atitiko baltų mitologijos vaizdinius (glaudus mėnulio-žirgo ryšys) ir taip papildomai realizavo būdingą jauno mėnulio simboliką.

Būdinga, jog baltų ir slavų tautosakoje mėnulis prilyginamas arkliui ir kartais tiesiog pasirodo arklio pavidalu. Nagrinėjamai temai ypač svarbus mėnulio-arklio epitetas lie. laukas, la. lauks „su balta kakta“ ir jų slaviškasis atitikmuo **lysъ(jь)* ta pačia reikšme, nes jie yra giminiški slavų bei lotynų mėnulio pavadinimams, atitinkamai **luna* ir *lūna* (< ide. **louk-snā*). Tas pats žodis prūsų kalboje **lauk-snā* reiškia žvaigždę, o lietuviai bei latviai savo ruožtu žvaigžde vadina baltą dėmę gyvūno kaktoje. Be to, rusų pasakose stebuklingas žirgas kartais vaizduojamas su mėnesiu kaktoje ir žvaigždėmis iš šonų, o tos pačios, kaip minėjieji, šaknies žodžiai *лысина* ir *лыска* žymi atitinkamas žirgo kamanų dalis – žvilgantį kabutį, skirstiklį arba plokštelę ant kaktos bei vidurinį per kaktą einantį kamanų dirželį.

Visa tai liudija iki šiol baltų ir slavų tradicijose gyvą kalbinį-mitinį kontekstą, kuris galbūt davė pagrindą mėnulį bei žvaigždes simbolizuojantiems žirgo kamanų elementams atsirasti, ypač kai pusmėnulį vaizduojantis kabutis puošė žirgo kaktą. Savo ruožtu šis baltų ir slavų kalbinis-mitinis kontekstas kartu su jau minėtu lotyniškuoju mėnulio pavadinimu *lūna* suteikia daugiau duomenų apie atitinkamą romėnų raitelių tradiciją.

THE VISUAL AND THE MYTHICAL–POETIC INTERPRETATIONS OF SKY LUMINARIES IN LITHUANIAN TRADITIONAL TEXTILES

VYTAUTAS TUMĖNAS

Abstract

This paper analyses some interconnected aspects of Lithuanian folk astronomy. The same mythical–poetic images linking sky luminaries, things in the natural world, and mythological beings as well as human beings are present in Lithuanian mythical-poetic folklore and in the names of textile ornamentations. Their semiotic net generally comprises flowers, plants, wild and domestic animals, celestial luminaries and mythical people as well as human beings and their artefacts. The investigation of images reveals the mythical-poetic linkage between all the celestial luminaries and concepts of light, marriage and fertility that belong more generally to the Sun Maiden mythology complex.

Key words: ornamentation symbolism, Lithuanian textiles, folkloric images, sky luminaries, Baltic mythology.

Introduction

The phenomenon of the sky has various interpretations in the semiotics of language, folk art and mythical poetry that are manifestations of the traditional worldview. Mythical-poetic images of folklore associated with the authentic names of patterns on folk textiles (woven bands) represent a particular tradition of astronomical knowledge deriving from archaic mythology. Here celestial luminaries, the local natural world and human beings are all interwoven into the holistic concept of a universe inhabited by mythical beings that are strongly associated with one another.

The main ornamentations have been replicated without modification since the earliest known geometrically ornamented textiles in Baltic cultures, which date from the 11th century. The semantic space of pattern names and their forms reveals a set of associations with the phenomenon of the sky that operates at several levels.

The aim of this study is to identify interconnected aspects of folk astronomy and to reveal regional peculiarities and the universal features of mythical-poetic concepts in the Lithuanian tradition linking sky luminaries, objects or elements in the natural world (local flora and fauna) and mythological beings as well as the human with his artefacts into the one meaningful cosmic net.

The main tasks are to classify the different forms of Lithuanian traditional textile ornamentation and their folk names as mythical-poetic images associated symbolically with the stars and celestial luminaries; to reveal their links with the peasant environment and worldview; and to trace their mythological origins.

We use data from Lithuanian and other Baltic and neighbouring cultures. These data derive from folk textiles, archaeological material, mythology, and mythical-poeti aspects of folklore and language. The collection of textile pattern forms and names together with the analysis of their cultural and historical context and semiotics reveals an astounding continuity of folk-weaving tradition and mental interpretation in Lithuanian folk culture. It unveils many archetypal features and similarities that are not strongly bounded to any particular time, space or culture. Comparative and contextual analysis is necessary in order to reveal the traditional Lithuanian ornamentation symbolism because it is not clearly enough explained in the oral tradition.

Ornament as a Part of Mythical World Structure

The principal myth in any tradition is attested by having many applications in very different fields and aspects of folk memory and customs. The results of such a multiply supported codification of mythology are found in various elements of culture operating both in everyday life and in spiritual practices (Toporov 2000 p. 127-129). Owing to the subordination of elements of the world into one global semiotic structure, a network of various correspondences exists between different types of object: sky luminaries, elements of clothing, landscape, biosphere, and so on (Baiburin 1989). The historical, comparative, typological, and also contextual methods of archaeology, art history, mythology and cultural anthropology (Rybakov 1965, 1, p.24-47; 2, p. 13-33; Hodder 1989) are often used for the investigation of Baltic traditional folk art, especially orna-

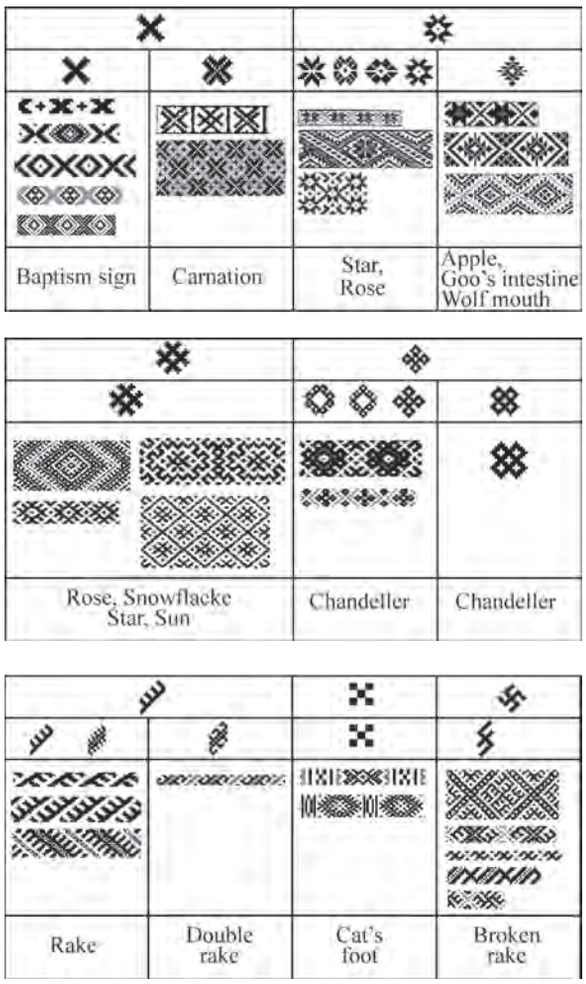

Fig. 1. Archetypal signs in the ornamentation on Lithuanian woven bands, derived pattern types, and their names, which are associated with celestial luminaries.

mentation, folklore and language semiotics (Gimbutas, 1958; Vastokas 1977; Urbanavičienė 2000; Rizhakova, 2002; Tumėnas 2002; Vaitkevičienė 2003). Methods similar to the phenomenology of religion (M. Eliade) are often used to interpret local art symbolism based on the analysis of worldwide similarities, i.e. analogues of their form and features (Eisler 1910; Gimbutas 1958; Vastokas 1977).

Geometrical signs and the sky luminaries

Careful and detailed analysis of the evolution of the form of many different signs in Lithuanian woven band decorations showed that they are based on just a few primal, archetypal signs that are international in nature but locally interpreted, refined using various formal/decorative stylistic elaborations. They are 17 in total: a rhombus, a diagonal cross, a snake, a herringbone, a goat's foot, a zigzag, a frog, a rose, horses, a rake, a meander, a diagonal line, a star, a five-square star, a swastika, a roof, and a chessboard pattern. These primitive signs serve as the basis for many other sophisticated types of sign and their variations. Some of these signs are associated with the sky luminaries and their semantic space (Fig. 1).

A historical and typological comparative analysis of their form and their place in the compositional arrangement helps to elucidate these signs' cosmological associations.

The Lithuanian band signs have analogues in signs of ownership found on 12th- to 14th-century Latvian fishing floats (Caune 1988, p.114). A direct historical linkage is evident between Lithuanian and Latvian woven band decorations from the 19th century and 11th- to 13th-century textile signs from Latvia (Dzērvīte, Ģinters 1936, att. 36; 32, 44, 27, 26 (tab. 2) and West Russia (Levinson 1959). They are characterised by compositions of separate signs: a five-square cross/star, a cross, a horned rhombus, a swastika, and a toothed star.

Ancient decorated bands containing the same type of geometric ornamentation are known from 10th- to 13th-century archaeological finds in Lithuania (Valatka 1974, p.74-75) and Latvia (Zariņa 1999). Similar textile ornamentations have been found in Finland (Lehtosalo-Hilander 1984), Sweden (Geijer 1938) and Denmark (Hald 1980, p.225-231).

In pre-Christian times their symbolism was associated with mythological world-view. The ornamentation, general structure and sign composition on Latvian 10th- to 13th-century wraps (Zariņa 1999, p. 22, 25; Dzērvīte, Ģinters 1936) suggests what this celestial symbolism was: the triangles in the margins signify mountains, roofs, or other mediators between the sky and the earth, while the horned rhombus, crosses, and swastikas in the middle part symbolize the celestial luminaries. This carpet-like clothing was worn as a ceremonial funerary costume by noblewomen. Such types of shawl and coat, decorated with sky luminaries in figurative or schematic ways, are well known from many traditions: they were for liturgical and ceremonial use by priests and kings (Eisler 1910). Consequently, a similar interpretation is reasonable for similar pieces in Latvian traditional (archaeological, folk) art. The same composition of sky symbols surrounded by earthly signs is found in the organization of the mandala, where the earthly lower level with the gates is situated at the periphery and the highest holy celestial level occupies the centre. Similar hierarchical compositions with the solar signs in the centre are characteristic of Saami shamanic drums (Ahlbäck 1991). The decorations on Persian carpets are based on similar compositions: the highest, most significant place is in the middle of the carpet and represents the

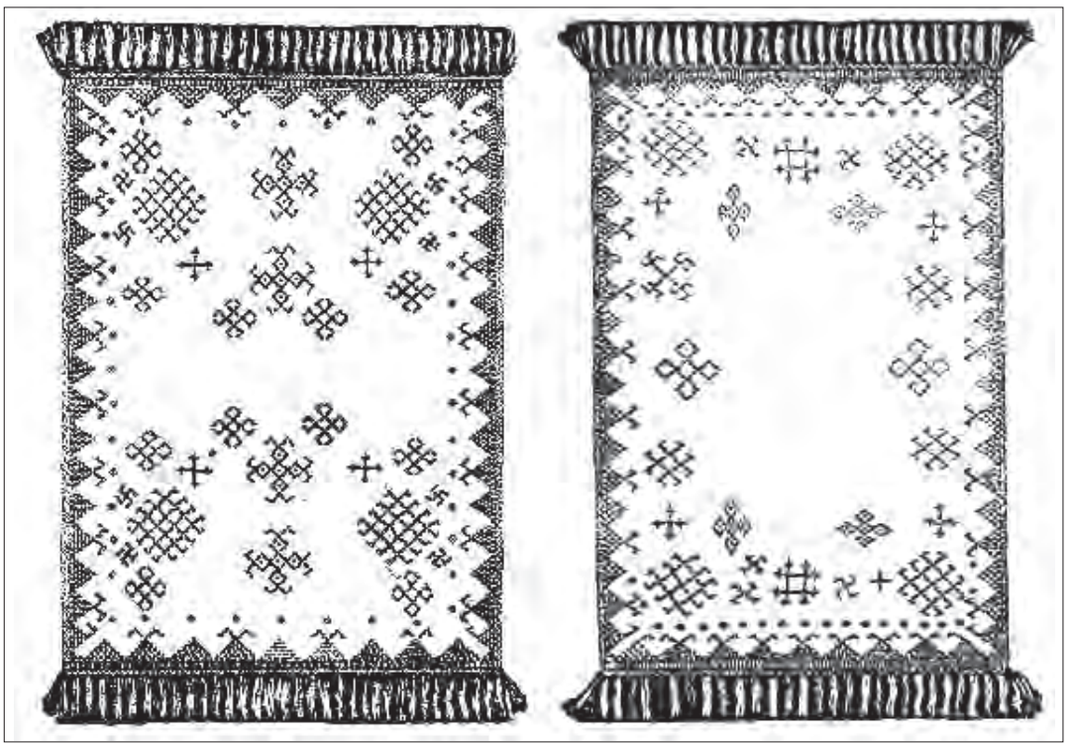

Fig. 2. 10th- to 13th c. textile ornamentations from Latvia similar to Lithuanian traditional woven band designs.

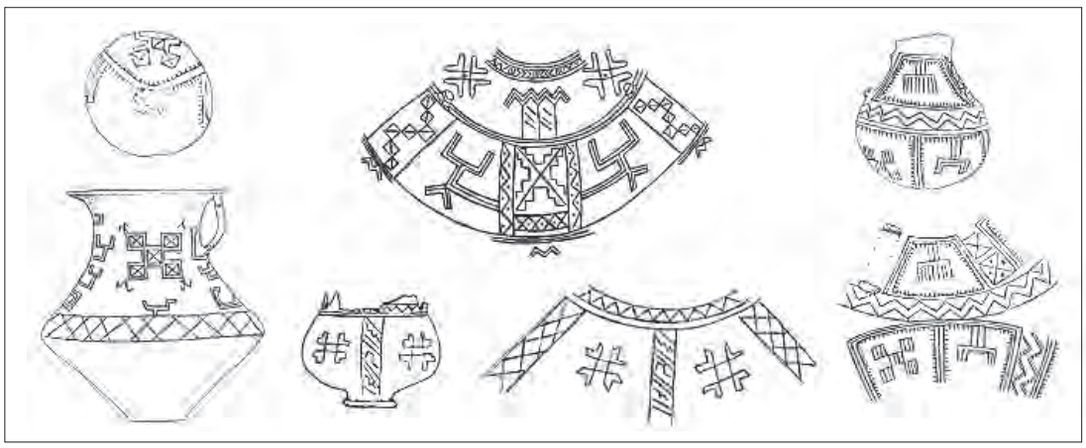

Fig. 3. Celestial signs in Early Bronze Age Hungarian ceramics.

celestial garden. The same composition is also common in East Prussian folk carpets (connected with the West Balts' tradition), which were used by newly wed couples as bed covers (Hahm 1937, p. 34, 94). People, animals and small trees are very often represented in the periphery of these carpets but the ideograms of the sky luminaries – stars, crosses, and flowers – are represented in the central part of the carpet (Fig. 4).

This means that it is possible to identify several geometrical signs on Lithuanian, Latvian and East Prussian textiles as the symbols of celestial luminaries: the horned rhombus, the toothed rhombus, the double diagonal cross, the swastika, the chessboard pattern, and the five-square cross.

The ancient and stable tradition of these signs' symbolism in Eastern Europe is evident from Early Bronze Age (2100-2000 BCE) Hungarian ceramics where rose, cat's paw, and candelabra-type ornamentations are used. Their separate – surrounded by free space – and hierarchical composition suggests associations with the concept of celestial luminaries in the structure of the Cosmos (Fig. 3). Their origin can be traced back to the Neolithic (Kalicz – Schreiber 1990, p.59-100).

Similarly, the most ancient analogues of known Lithuanian textile ornamentation motifs are found in decorations and abstract sign systems from the Neolithic Old European Civilization (Tumėnas 2002, p.73; Gimbutas 1989; Harman 1996).

Another channel of investigation into the symbolism of the signs is the association of their authentic names with the semiotics of language, folklore and mythology.

The celestial symbolism of patterns

The patterns on Lithuanian woven bands have many symbolically meaningful names (Fig. 1). What is the imagined cultural context of these signs' names and what are the interactive semantic connections they imply? The analysis of the mythical-poetic context of Lithuanian textile pattern folk names (collected by the author in ethnographic expeditions as well as by other investigators) (Tumėnas 2002, p.112-123) reveals the role of celestial luminaries, and especially the stars, as key symbols strongly associated with other luminaries, as well as with the country's flora and fauna.

1. **The Cross** has several types.

a) The Simple cross also has associations with christening/baptism, because the name for this sign *small cross – kryžiukas* (EMO 3561), *baptism sign – krikštelis* (E 3023), links with the word *krikštas,* which in Lithuanian has the meaning – baptism, sanctification, protection and also – the beginning and the end. The simple cross sign in Latvian ancient textiles seems to be first of all a symbol of the celestial luminaries. The cross sign links with star symbolism: this sign – *krikštelis* also is linked with the start of a new life after the ending of previous one. In the Lithuanian traditional worldview *Verpėja* (Spinner – another word for the goddess *Laima*, who has many similarities with the Greek Fortuna and Aphrodite) supervises man's life's thread, which ends in the star (Gizevijus 1970, p.147). According to the Lithuanian folk song of baptism, the goddess *Laumė* (or *Laima*) wants to prepare beer and to invite all the stars for the celebration, but she forgets to invite the Sun (Slaviūnas 1959, Nr. 1202). Here, *Laumė*'s association with the stars and baptism is similar to *Aušrinė* (Morning star)'s resemblance to all the stars and also to the Sun (who is treated like one of the stars). On the other hand, Aušrinė has a particular difference from the Sun, who sometimes appears forgotten by her. The connection of the star Aušrinė with baptism is reminiscent of Greek mythology where Aphrodite's birth from the sea can be interpreted in terms of the rituals of purification and ritual bathing that ensure her ever-renewed virginity. Aphrodite is clearly rooted in the ancient tradition of goddesses of renewal and regeneration (Eliade 1987 15, p.278).

b) The Double-line cross in the Lithuanian band tradition is called *carnation flower – gvazdikas* (EMO 8108). But it seems that this name has come from the Polish name for the star *gwiazda*. On the other hand, the shape of the carnation flower is indeed very similar to a sparkling star. The flower name given to the double-cross sign in general allows us to suggest that it symbolically represents the stars.

In Baltic mythology and folklore, the Morning and Evening Star are both strictly associated with the Sun - they are known as the Sun and Moon daughters – *Saulės dukrytės.* Sometimes all the stars were treated as their children (Narbutt 1835, p.126-134). This could explain why we sometimes find the sun and a star being designated by the same motif in textiles.

2. **The Star sign** has two types.

a) The Star sign is most commonly called *star – žvaigždutė* (ES b. 134, l. 87) but also *snowflake with leaves – lapuota snaigė* (ES b. 1983, l. 3) and sometimes *sun – saulutė* (ES b. 1983, l. 3). The sun and a star are feminine sky luminaries in Lithuanian. The snowflakes are similar to stars because they look like a star falling from the sky.

Similarly the star signs are named *rose* (*rozha*), *sun* (*sontsa*), *flower* (*kvietok*), star (*zviozdachka*), and star/sun (*zviozdachka/sontsa*) in Belarussian textiles (this culture being distinctive in having a mixture of Baltic and Slavic traditions) (Niachaeva 2004, p.76-77, 79-80, 83-84, 89, 127).

A star-like pattern whose Lithuanian name is *clover – dobiliukai* (ES b. 1958, l. 10) is associated with the five-leaf clover, which brings good luck according to Lithuanian folk beliefs.

In short, in both Lithuanian and Belarussian traditions there were strong associations between the stars and the sun and roses and other flowers.

b) The Toothed rhombus/Star sign has the names *star* (ES b. 1959, l. 8; EMO 1826) and *apple – obuoliukas* (E 2876). An apple or an apple tree in Lithuanian folklore often stands for the symbol of fertility, matchmaking and marriage (Basanavičius 1970, p.393-403). The motif of golden apples in Indo-European mythical poetry is associated with eternal youth and immortality.

This sign also has important name *wolf's mouth – vilko gerklė* (ES b. 1983, l. 4). In Lithuanian folk dream symbolism, wolves signify matchmakers and bridegrooms (Tumėnas 2002, p.204). A woman after childbirth first entering the bathhouse was called *the wolf* (Urbanavičienė 2000, p.90). The wolf also appears in fertility magic: if you want your bees to steal the honey from other bees, you must let the beehive fly through the opened mouth of the wolf (Elisonas 1932, p.128). The mythological wolf's mouth symbol is probably similar to the *vagina dentate* image, well known in the

European tradition, which serves to make boys fear having sexual interaction with girls (Lévi-Strauss 1997, p.125).

Another name *goose's intestine – žųsiąžarnis* (EMO 2193) and the Belarussian denomination *swan* (Niachaeva 2004, p.84) are associated with water birds. In Lithuanian folklore, water birds are popular bridal and marriage symbols. In archaic wedding dances the limping steps of the woman resemble the way water birds walk (Račiūnaitė 2000, p.39). Advent songs describe a boy who ties up some ducks and sends them to his beloved girl as a strong symbol of romance (Ūsaitytė 2007, p.116-118). Other songs present direct parallels between the duck hen, who builds a nest and hatches her chicks, and the young girl (bride) who walks in the rue garden of the palace (Valiulytė 2000, p.62-63). Other wedding songs compare the duck hen, who is swimming and diving in the lake, with the young girl (bride), who cries because of the inappropriateness of the chosen boy (husband) (Burkšaitienė, Krištopaitė 1990, p.353-355). The belief is that if the duck jumps on the fence, the wedding will happen (Elisonas 1932, p.66). In this mythical-poetic context it is easy to understand another Belarussian denomination for this sign type – *a heart* (Niachaeva 2004, p.160).

Fig. 4. The Rose Bush or World Tree with blossoms on an East Prussian carpet 19th c.

In this way, the notion of a star is associated with local plants and fauna and with idea of marriage.

3. The Horned rhombus (Rose) is another star-like sign which has the name *star* (ES b.1958, l. 6) but also *flower – gėlytė* (ES b. 1954, l. 9)*, rose – rožėlė* (EMO 505), and *snowflake – snaigė* (ES b. 1983, l. 3).

This sign is placed in the top or centre of cosmic structure compositions in the aforementioned Latvian and Hungarian artefacts, as well as in East Prussian 19th-century carpets *koc* (Hahm 1937, p.34, 94) (Fig. 4.). The context of Baltic folklore and mythology demonstrates the strong association of the rose sign with sun or star symbolism; with mythical images of the flowers of the World Tree, Sun Garden or Sun Bush at the centre of the World or Sky; and with the highest level in the cosmological structure. In Latvian songs, the rising and setting sun is depicted as a rose wreath, bush or garden. A rose garden is one of the most characteristic motifs in Baltic mythology. The association between the Sun as celestial fire and the image of a rose is known in Lithuanian and Latvian mythological traditional folklore (Vaitkevičienė 2003, p.23-29).

The horned rhombus represents the sun, and sometimes it is called *Sun* (in Lithuanian – *saulukė* (ES b. 1949, l. 5) and in Latvian – *saulyte*) (Slava 1992, p.17). In Lithuanian folklore, the Sun rising on Christmas morning is associated with, or replaced by, the flowering rose and has marriage symbolism (*On Christmas morning the rose fell into blossom/ The reindeer with the nine horns on head is coming/ On the first horn the fire burns/ On the second – the smiths are hammering/ Oh smiths, my brothers/ Please make me a golden ring…*) (Valiulytė 2000, p.70). This song resembles the image of the Sun, forged by a *Smith – Kalvelis (Televelis)* (the name being similar to the Estonian mythical hero Kalev) who, in Lithuanian mythology, is the servant of the Thunder God Perkūnas (Obolenskii 1851, p.19-21).

Another association of the mythical-poetic image of the rose with a star, the sun and fertility is evident in the names of the flax laid out for drying in the sun as was done during harvest rituals. The figure so formed – the circle of rays – was called: *rose, star, wreath, circle* (Vyšniauskaitė 1977, p.68-70).

The other name *star* also refers to the sky luminaries and its synonymous name *snowflake* designates snowflakes as sky elements, given their similarity to falling stars. Another name for this sign – *cat's paw – katės pėdukė* (ES b. 1949, l. 5) again harks back to the love and marriage symbolism of the sky luminaries in Lithuanian folklore (see section 6 below).

4. The Five-square cross/star has two types: **a) vertical star-like cross**; and **b) diagonal cross**. They both have the name *chandelier – liktoriukai* (ES b. 1983, l. 3). All over the world the stars have been called luminaries, lamps, campfires and similar terms. The Bible calls all the celestial bodies luminaries. In the book of Genesis, the Sun and Moon are called the great and the small luminaries. A lamp is a good metaphor for a star, because it also shines in the dark. It is not by chance that the Pleiades in Lithuanian are similarly named - *Candelabra* (*Sietynas*). Another name for this sign – *wild rose – erškėtrožė* (ES b. 319 (73)) – is again similar to the star symbols already discussed.

5. The Rake or E sign is of two types: **a) Rake with simple teeth,** and **b) Rake with crooked teeth.** They are called *rake, raker – grėbliukai* (ES b. 1954, l. 9) and *comb – šukos* (ES b. 1985, l. 45) respectively. **The Rake** pattern is connected with the image of the rake and comb. In Lithuanian mythical-poetic Shrovetide folk songs, a girl in a boat in the middle of the sea, a lake or a river combs her hair with a fish-bone comb and then floats it across the water to her beloved, asking whether he loves her. But the boy answers that he does not, and that he is willing to make a rake from her fingers (Kriščiūnienė 1992, p. 62, 64-65). It is evident that the images of the rake and comb are associated with the idea (or problems) of courtship and matchmaking. The image of a girl sitting in a floating ship and combing her hair is also used in folklore sung during hair-combing rites on the eve of a wedding (Burkšaitienė, Krištopaitė 1990, p.223-227), and corresponds to the ritual of hair combing. On the other hand, these actions are similar to the mythological images of the solar or morning-star Goddess: her hair is the metaphor of the rays of the Sun or the star Venus (Aušrinė). The association of the sign of the Rake with the symbolism of the rays is also clear where it appears in the ornamentational compositions of other cultures. It is often placed near to, or together with, symbols of celestial luminaries, as, for example, in Hungarian Bronze Age (Kalicz – Schreiber 1990, p.59-100) (Fig. 3) and Spanish Late Neolithic ceramics (Fig. 5) (Sandars 1985, p.231).

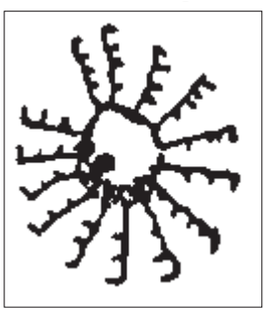

Fig. 5. The sun with rake-like rays on a piece of clay (Tajo de las Figuras, Spain).

6. The chessboard pattern consists of a combination of five dark squares and four light ones. It bears the name of *rose – rožytė* (ES b. 1953, l. 2), but also *star – žvaigždukė* (ES b. 1958, l. 24), as well as *cat's paw – katpėdėlė* (Kišūnaitė 1971, p.45). *A cat's paw* resembles a feline paw-print, and is also like a four-leaved flower with a spot in the middle. In the Lithuanian folkloric tradition, cats are associated with the female sex and married life. In one folk song, a young wife asks her husband: *Tell me, young boy, when I will return to my mother?* He answers: *When buckwheat has become seed in the oven and cats are harrowing the fields* (*Pasakyk berneli, pasakyk jaunasis, kadu aš sugrįšiu pas savo močiutį / Kai un pečiaus grikius sės, katės nagom priakės, tai tadu, tai tadu par mačiutį sugryši*…– Vyžiai, Utena r., recorded by the author on the eve of a wedding, 1985). The image of seeding the fields symbolises fertility. By examining the wedding symbolism of the cat we can explain the connection between the *cat's paw* pattern and the rose and star images.

7. The Swastika (fragmented half-swastika) is occasionally named *rake* (ES b. 2029, l. 2). Its Latvian names are of disputable origin: *Laima cross* (*Laimos kryžius*); *Perkūnas cross* (*Perkūno kryžius*); *fire cross* (*uguns krusts)* (Brastiņš 1923, p.71-72). The thunder god *Perkūnas* and his wife *Laima* (literally – happiness) are celestial deities in Baltic mythology. This suggests that in the Baltic tradition the swastika is associated with the symbolism of light, lightning, power and happiness. In textile decorations from the Latvian Bronze Age, swastikas may signify sky luminaries, because they are placed in the otherwise quite empty central space that represented the celestial world. In textiles from western Russia (10th-13th-centuries), the swastika is also placed centrally, near to other star or sun symbols such as the star and horned rhombus (Levinson 1959).

Conclusions

In the ornamentation on Lithuanian woven bands there are several types of sign whose form and meaning is associated with sky luminaries: 1) the Cross: a) the Simple cross, b) the Double-line cross; 2) the Star: a) the Flower/Star; b) the Toothed diamond; 3) the Horned rhombus; 4) the Five-square cross/star: a) the Vertical star-like cross; b) the Diagonal cross; 5) the Rake: a) the Rake with simple teeth, b) the Rake with crooked teeth; 6) the Chessboard pattern; and 7) the Swastika.

The signs on Lithuanian woven bans that have been investigated so far have direct links with 11th- to 13th-century pre-Christian wraps found in Latvia, where similar signs are placed in an otherwise quite empty central area evidently reserved to represent the celestial realm.

The folk names for the patterns reveal associations with mythical-poetic images of the stars and sun, and also of flowers (roses, carnations, clovers), baptism, apples, wolves, geese, cats, combs, chandeliers, the celestial goddess *Laima* and the god *Perkūnas*. In particular, the complex links (star-rose-sun-cats' paw etc.) indicate that these denominations are not fortuitous. Strong associations between different elements of the world are characteristic of traditional and archaic word-views. The semantic net of these images in the Lithuanian mythical-poetic tradition reveals linkages mainly with fertility and marriage symbolism, and with Sun Maiden mythology. The net includes names connected with the stars, artificial light sources, noble flowers, plants, water birds, domestic and wild animals, and attributes or artefacts used by, the mythical-poetic beings.

The star-like signs in Lithuanian textiles refer first of all to the star Aušrinė/Vakarinė (Venus – the Morning and Evening star, the daughter of the Sun and Moon, the bride) and the Sun (female gender in Baltic languages) and other stars. The mythical-poetic image of Venus Aušrinė (Aušra) is an archetype deeply rooted in Lithuanian tradition. It is the key concept in defining a semiotic kinship of very different cultural phenomena that appears at first to be accidental.

Abbreviations

E – The National M. K. Čiurlionis Art Museum accession book.
EMO – The Lithuanian National Museum accession book.
ES – The Lithuanian Institute of History, Ethnology Department Archive.

References

AHLBÄCK, T., BERGMAN, J., eds., 1991. *The Saami Shaman Drum*. Stocholm/Åbo: Scripta Instituti Donneriani Abonensis.

BAIBURIN, A. K., 1989. Semioticheskie aspekty funkcionirovaniia veshchei. In: A. S. MYLNIKOV, ed. *Etnograficheskoe izuchenie znakovyh sredstv kul'tury*. Leningrad: Nauka, 63-88.

BASANAVIČIUS, J., 1970. *Rinktiniai raštai.* Vilnius: Vaga.

BURKŠAITIENĖ, L., KRIŠTOPAITĖ, D., eds., 1990. *Aukštaičių melodijos*. Vilnius: Vaga.

CAUNE, A., 1989. Rizhskie dereviannye izdeliia XII-XIV vv. – predmety narodnogo prikladnogo iskusstva. In: S. CIMERMANIS, red. *Narodnoe prikladnoe iskusstvo. Aktual'nye voprosy istorii i razvitiia.* Rīga: Zīnatne.

DZĒRVĪTE, A., ĢINTERS, V., 1936. *Ievads latviešu tautas tērpu vēsturē*. Rīga: J. Grinbergs.

EISLER, R., 1910. *Weltenmantel und Himmelszelt, Religionsgeschichtliche Untersuchungen zur Urgeschichte des antiken Weltbildes*. München: Oskar Beck.

ELIADE, M., ed., 1987. *Encyclopedia of Religion*. 15. New York, London: Macmillan Publishing Company A Division of Macmillan, Inc.

ELISONAS, J., 1932. Mūsų krašto fauna lietuvių tautosakoje. *Mūsų tautosaka*, 5.

GEIJER, A., 1938. *Die Textilfunde aus den Gräbern.* Birka: Untersuchungen und Studien III. Uppsala: Almkvist and Wiksells B.A., Kungl. Vitterhets Antikvitets Akadamien.

GIMBUTAS, M., 1958. *The Ancient Symbolism in Lithuanian Folk Art. (Memoirs of the American Folklore Society).* Philadelphia: American Folklore Society.

GIMBUTAS, M., 1989. *The Language of the Goddess.* New York, London etc: Harper & Row.

GIZEVIJUS, E., 1970. Kai kurie dar prieš keletą dešimtmečių buvę lietuvininkų gimtuvių ir krikštynų papročiai. In: V. MILIUS, ed. *Lietuvininkai.* Vilnius: Vaga.

HAHM, K., 1937. *Ostpreussische Bauernteppiche*. Jena: Diederichs.

HARMAN, H., 1996. *Early Civilization and Literacy in Europe: an Inquiry into Cultural Continuity in the Mediterranean World*. Berlin, New York: Mouton de Gruyter.

HODDER, I., ed., 1989. *The Meanings of Things. Material culture and symbolic expression.* London: Routledge.

KALICZ – SCHREIBER, R., 1990. Symbolic Representations on Early Bronze Age Vessels. *The Journal of Indo-European Studies,* 18(1-2), 59-108.

KIŠŪNAITĖ, B., 1971. *Lietuvių liaudies tautinės juostos* (P. Dundulienė, advisor). Diplominis darbas. VVU istorijos fakulteto Lietuvos TSR istorijos katedra, Vilnius (manuscript).

LEHTOSALO-HILANDER, P.-L., 1984. *Ancient Finnish Costumes.* Helsinki: The Finish Archaeological Society.

LÈVI-STRAUSS, C., 1997. *Laukinis mąstymas*. Vilnius: Baltos lankos.

LEVINSON-NECHAEVA, M., 1959. Tkachestvo (Tkani iz raskopok sel'skich kurganov X-XIII vv. srednerusskoi polosy), *Trudy gosudarstvennogo istoricheskogo muzeia*. Moskva, 33, 14-27.

NARBUTT, T., 1835. *Dzieje starożytne narodu litewskiego.* 1. *Mytologia Litewska*. Wilno: A. Marcinowski.

NIACHAEVA, G., ed., 2004. *Arnamenty Padniaprouia*. Minsk: Belarusskaia Navuka.

OBOLENSKII, K. M., 1851. Letopisec Pereslavlia-Suzdal'skogo. In: *Vremennik imperatorskogo Moskovskogo obshchestva istorii i drevnostei Rossiiskikh.* Vol. 9. Moskva: Moskovskii universitet.

RAČIŪNAITĖ – VYČINIENĖ, D., 2000. *Sutartinių atlikimo tradicijos*. Vilnius: Kronta.

RIZHAKOVA, S. I., 2002. *Iazyk ornamenta v latyshskoi kul'ture.* Moskva: Indrik.

RYBAKOV, B. A., 1965. Kosmogoniia i mifologiia zemledel'tsev eneolita. *Sovetskaia arkheologiia*, 1, 24-47; 2, 13-33.

SANDARS, N. K., 1985. *Prehistoric Art in Europe*. London: Penguin Books.

SLAVA, M., 1992. *Latviešu rakstainie cimdi.* Rīga: Zinātne.

SLAVIŪNAS, Z., ed., 1959. *Sutartinės.* Vol. 2. Vilnius: Valstybinė grožinės literatūros leidykla.

TOPOROV, V., 2000. *Baltų mitologijos ir ritualo tyrimai. Rinktinė.* N. MIKHAILOV, ed. Vilnius: Aidai.

TUMĖNAS, V., 2002. Lietuvių tradicinių rinktinių juostų ornamentas: tipologija ir semantika. In: *Lietuvos etnologija,* 9. Vilnius: Diemedis.
URBANAVIČIENĖ, D., 2000. *Lietuvių apeiginė etnochoreografija*. Vilnius: Lietuvos muzikos akademija.
ŪSAITYTĖ, J., ŽIČKIENĖ, A., eds., 2007. *Kalendorinių apeigų dainos. Part. 1. Advento – Kalėdų dainos. Lietuvių liaudies dainynas*. Vol. XX. Vilnius: Lietuvių literatūros ir tautosakos institutas.
VAITKEVIČIENĖ, D., 2003. The Rose and Blood: Images of Fire in Baltic Mythology. *Cosmos (The Journal of the Traditional Cosmology Society)*, 19, No 1, 21-42.
VALATKA, V., 1974. Paragaudžio (Šilalės r.) senkapis. In: A. TAUTAVIČIUS, V. MORKŪNAS, eds. *Archeologiniai ir etnografiniai tyrinėjimai Lietuvoje 1972 ir 1973 metais*. Vilnius: Lietuvos TSR Mokslų Akademijos Istorijos Institutas, 74-75.
VALIULYTĖ, S., ed., 2000. *Atvažiuoja Kalėdos. Advento-Kalėdų papročiai ir tautosaka*. Vilnius: Lietuvos liaudies kultūros centras.
VASTOKAS, J. M., 1977. The Shamanic Tree of Life. In: A. T. BRODZKY, ed. *Stones, Bones and Skin (Ritual and Shamanic Art)*. Toronto, Ontario: Artscanada, 93-117.
VYŠNIAUSKAITĖ, A., 1997. Lietuvių valstiečių linininkystė. In: A. VYŠNIAUSKAITĖ, J. LANIAUSKAITĖ, eds. *Valstiečių linininkystė ir transportas. Iš lietuvių kultūros istorijos*, Vol. 9. Vilnius: Mokslas, 7-138.
ZARIŅA, A., 1999. *Apģērbs Latvijā 7-17 gs.,* Rīga: Zinātne.

Received: 2 November 2007; Revised: 30 November 2008

VIZUALINĖS IR MITOPOETINĖS DANGAUS ŠVIESULIŲ INTERPRETACIJOS LIETUVIŲ TRADICINĖJE TEKSTILĖJE

Vytautas Tumėnas

Santrauka

Straipsnyje nagrinėjami integralieji lietuvių etnoastronomijos aspektai.

Dangaus reiškiniai įvairiai interpretuojami žodžių semiotikoje, tradiciniame liaudies mene ir mitopoetikoje. Tie patys mitopoetiniai įvaizdžiai aptinkami mitologinių elementų turinčioje lietuvių tautosakoje ir tekstilės (juostų) raštų liaudiškuose pavadinimuose.

Straipsnyje nagrinėjama dangaus šviesulių sąsaja su regiono gamtos objektais, mitinėmis būtybėmis ir žmonėmis. Siekiama atskleisti regioninius ir universaliuosius tautosakos ir audinių raštų pavadinimų mitopoetinių įvaizdžių aspektus, semantiškai jungiančius dangaus šviesulius, šalies gamtą (gėles, vaisius, laukinius ir naminius gyvūnus), žmones bei mitines būtybes ir jų artefaktus į vieną reikšmių tinklą.

Pagrindinių tekstilės ornamentų tradicija Baltų kraštuose aiškiai atsekama nuo XI a. Straipsnyje klasifikuojami šių raštų ir jų pavadinimų, kaip mitopoetinių įvaizdžių, tipai, susiję su dangaus šviesulių simbolika. Atskleidžiamos tų mitopoetinių įvaizdžių sąsajos su kaimo žmogaus aplinka, realijomis, atsekamos jų mitologinės ištakos.

Tyrime remiamasi lietuvių ir kitų baltų kultūrų duomenimis: etnografine bei archeologine tekstile, mitologija ir mitopoetiniais tautosakos bei kalbos aspektais. Komparatyviniai tyrimai ir kontekstinė analizė yra būtina tiriant lietuvių tradicinio ornamento simboliką, kadangi vietiniai žodinės tradicijos aiškinimai yra nepakankami.

Dauguma lietuvių juostų raštų atitinka XI–XIII a. ikikrikščioniškos epochos audinių, rastų Latvijoje, raštus, kurie būna centrinėje skarų dalyje, priskirtinoje dangaus sferai. Šių ženklų ir jų kompozicijos simbolikos analogų randame ir kitų kultūrų ornamentuose.

Išskirti šie lietuvių juostų ornamento tipai, simboliškai susiję su dangaus šviesulių semantikos lauku: 1) Įstrižas kryžiukas: a) paprastas, b) dvigubų linijų; 2) Žvaigždė: a) gėlė (roželė) / žvaigždė; b) dantytas rombas; 3) Rombas su ataugėlėmis; 4) Penkialangis kryžiukas / žvaigždė: a) vertikalus žvaigždinis; b) įstrižas; 5) Grėbliukai: a) paprasti, b) su užlaužtais dantukais; 6) Katpėdėlė; 7) Svastika.

Raštų liaudiški vardai siejasi su mitopoetiniais žvaigždžių ir saulės, taip pat gėlių (rožių, gvazdikų, dobiliukų), krikšto ženklo, obuoliuko, vilko, žąsies, katės, šukų, sietyno (žvakių), dangaus mitinių personažų Laimos ir Perkūno įvaizdžiais.

Šie mitopoetiniai įvaizdžiai semantiškai sieja dangaus šviesulių ir šviesos, vestuvių, vaisingumo koncepcijas, kilusias iš Saulės mergelės mitologijos: jie apima vardus, susijusius su žvaigždėmis, dirbtiniais šviesos šaltiniais, kilniomis gėlėmis, vaismedžių vaisiais, vandens paukščiais, naminiais ir laukiniais gyvūnais, mitinių būtybių artefaktais – atributais.

Žvaigždės tipo ženklai lietuvių tekstilėje visų pirma sietini su Venera (Aušrine / Vakarine žvaigžde, kuri baltų mitologijoje yra Saulės ir Mėnulio dukra, nuotaka) ir Saule bei kitomis žvaigždėmis. Aušrinės mitema itin reikšminga lietuvių tradicijoje. Ji yra tarsi pamatas, kuris semiotiškai jungia labai skirtingus (ir iš pirmo žvilgsnio menkai susijusius) kultūros reiškinius. Jie suaudžiami į holistinę visatos sampratą, kurios visi elementai – ir dangaus šviesuliai, ir supanti žemiška erdvė, ir audiniai – vieni su kitais itin glaudžiai susiję. Tai savita lietuvių etnoastronominė koncepcija.

SOME PERIPHERAL FORMS OF THE MEDITERRANEAN AND ORIENTAL ZODIAC TRADITIONS IN HEATHEN LITHUANIA

JONAS VAIŠKŪNAS

Abstract

I have previously presented some evidence concerning the possibility of a Baltic zodiac, documented by archaeological artefacts and supported by historical sources (Vaiškūnas 2000). It seems clear that such knowledge was imported into the Baltic region from Classical and Medieval cultures to the south. If the Baltic zodiac was a simple copy of the Mediterranean one, it would be of minor interest for the iconography of Baltic constellations, but in the Baltic versions we observe very important differences from the Classical model. In this paper I analyse the relevant traditions in more detail and discuss these differences in the hope that it can offer us valuable information about sky mythology in northern traditions.

Key words: ethnoastronomy, zodiac, constellations**,** mythology.

Introduction

The analysis of the decorations on a large wooden scoop (Fig. 1) found in the basement of the church in Grodno has presented strong arguments for the hypothesis that a distinctive zodiac was widely used in Lithuania in the late Middle Ages (16th c.) (Vaiškūnas 2000).

It is known that wooden scoops played an important role in pagan rituals in the Baltic and Slavic countries. In Lithuanian and Byelorussian museums there are several ancient drinking scoops, but the Grodno example is exceptionally large (half a metre in diameter). The reason for including a pagan ritual scoop among church furniture in the 16th and 17th centuries could very well have been the resistance of local people to its destruction or rejection. Using it to hold ancient objects of veneration could also have been a way of attracting people to the church. It is supposed that the Grodno scoop served as a baptismal font. When it was discovered, its surface was completely covered with polychromatic paintings typical of the 17th-century Christian tradition (Pan'shyna 1987, p.18). This later polychrome covered an earlier monochromatic linear decoration in which we recognize a pagan version of the zodiac. The scoop was taken to Moscow for restoration and it was there that the upper coat of polychrome was taken off and the older decoration uncovered.

Up until now there have been a lot of unanswered questions concerning the circumstances and details both of the discovery of the scoop and of its restoration. It is essential to know what scenes were depicted in the polychromatic painting. Only a small fragment of one of these paintings has been preserved near the handle on the outer surface of the scoop (Fig. 2). We see a bearded man wearing a big conical fur cap and looking as if he is holding a baby in his arms. It might represent a baptismal scene, in which case the complete decoration may have represented the whole ritual of baptism. This is very probable, taking in account that the scoop was used in the church for baptismal purposes. There are also polychromatic paintings preserved on the inner side of the scoop, but unfortunately these are not

Fig. 1. The ancient ritual scoop being held by the author (Raubichi Folk Arts and Crafts Museum, Byelorussia, 2007). Photograph by J.Vaiškūnas.

Fig. 2. A extant fragment of a polychromatic painting on the scoop. Photograph by J.Vaiškūnas.

informative as they consist only of depictions of vegetables. Some hope remains of eventually discovering the contents of the former Christian painting, because the restoration took place in 1956 and 1968 when it was customary to keep a full photographic record. This documentation must have survived somewhere.

Zodiacal signs on the scoop

Even more questions arise when we come to the original circle of 12 signs, executed using an archaic monochromatic technique. The ancient pictures are laid out around the outer surface of the scoop in a band 10 cm in height. Each of the 12 pictures is framed by geometrical ornamentation. The presence of images of the sun on most of the signs suggests that they are closely related to the sun's pathway through the stars, i.e. the zodiac. Images 4, 8, 10 and 11 in the sequence counting clockwise from the handle of the basin can easily be associated with the traditional zodiacal signs of **Gemini (4), Libra (8), Sagittarius (10)** and **Capricorn (11)** (Fig. 3; Plate III: 4; Plate IV: 8, 10, 11). Furthermore, the position of these signs in the sequence shows that this is not just coincidence. We can conclude that the pictures on the scoop undoubtedly represent the signs of the zodiac. Starting clockwise from the handle of the scoop we then have these signs (Fig. 3; Plate III: 1-6; Plate IV: 7-12):

1. (An image difficult to interpret) – 'Pisces'.
2. A figure in a fur coat – 'Aries'.
3. A horse rider (riding from the right to the left) – 'Taurus'.
4. Two fighting warriors with two Suns between them – 'Gemini'.
5. A bird reminiscent of a peacock (orientated to the left) with the Sun above its back – 'Cancer'.
6. A bird reminiscent of a peacock similar to the mentioned one in 5, but orientated to the right with the Sun above its back – 'Leo'.
7. A bird reminiscent of a crane or a stork (orientated to the right) with the Sun above its back – 'Virgo'.
8. Two Suns (one in the bottom-left corner of the frame with rays like a swastika and the other in the top-right corner with straight rays) – 'Libra'.
9. A big and a small deer with two Suns (one in the top-left corner of the frame with rays like a swastika and the other in the bottom-right corner the straight rays) and Moon (?) between them – 'Scorpio'.
10. A warrior with a pike in his right hand above his head and a disc of the Sun under his hand – 'Sagittarius'.
11. A goat galloping (from the right to the left) and the Sun above its back – 'Capricorn'.
12. A horse galloping (from the right to the left) and the Sun above its back – 'Aquarius' (Vaiškūnas 2000, p. 321).

A comparison of this Baltic scoop zodiac (BZ) and the traditional zodiac (TZ) permits us to distinguish 3 groups of zodiacal signs on the scoop. They are:

I. The signs preserving the same image as the TZ signs, namely Gemini (4), Libra (8), Sagittarius (10) and Capricorn (11).

II. Signs that differ from the TZ, but which can be understood as a variant: Aries (2) and perhaps Pisces (1).

III. Six signs that are absolutely original and differ completely from their equivalents in the TZ: Taurus (3), Cancer (5), Leo (6), Virgo (7), Scorpio (9) and Aquarius (12).

These three groups of signs seem to reflect the collision of two traditions – the Mediterranean and the Baltic (or perhaps even a wider, north-eastern European pagan tradition). The drastic replacement of certain signs of the zodiac with others that were completely different could be the result of a strong attachment to local mythological traditions.

This seems especially likely if the imported zodiac was used for practical purposes, i.e. if it served not only as a magical set of symbols but also as an observational star calendar corresponding to a distinctive local tradition – in other words, to well-rooted local constellations. An indication that this could be the case is that the first sign of the BZ is not that of Aries but that of Pisces. Thus, it seems, the local tradition took into account the real position of the vernal point and not the conven-

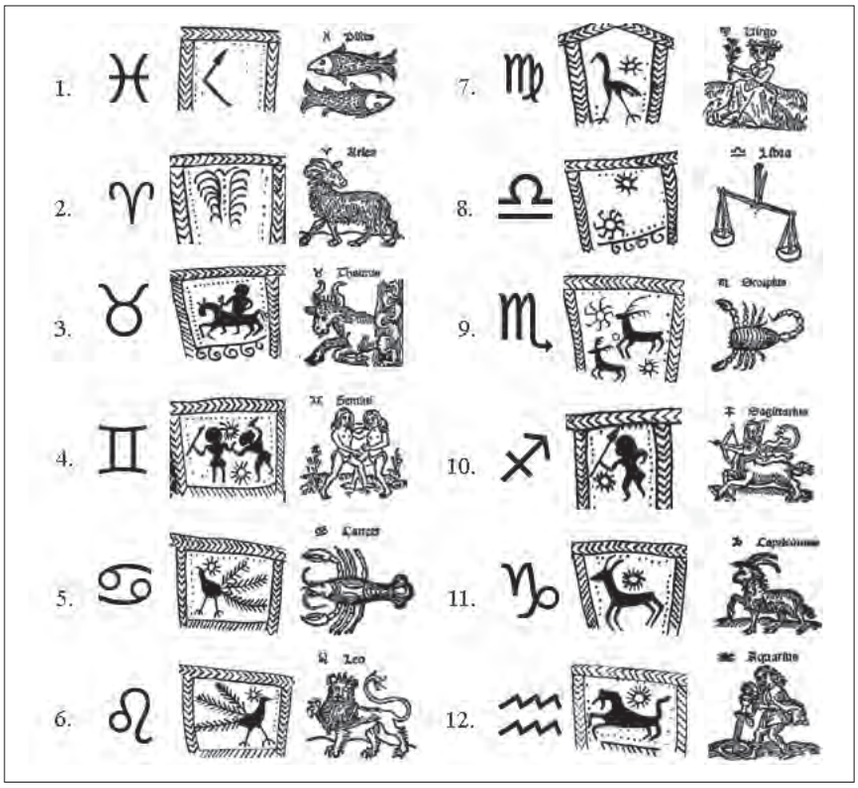

Fig. 3. The signs of the Baltic scoop zodiac (BZ) alongside European zodiacal signs from 16th-century medieval woodcuts.

tional one fossilized at the end of the first millennium BC. This implies that the classical Mediterranean zodiac was not merely imported but adapted to local use within a distinctive calendrical tradition based on actual observation of the sky. Let us accept this as a starting hypothesis in order to try and understand the six enigmatic signs. For this, we will need to investigate local calendrical traditions. As the folk calendar traditions that have reached modern times are mostly syncretic in character, it will be useful to examine some elements of the Christian calendrical tradition and in particular Christian hagiography, which has absorbed a great deal of pagan calendrical symbolism.

As shown in one of my previous studies, some of the BZ images are linked with winter solstice and Shrove Tuesday carnivals masks from the Baltic, Slavonic and other European nations. The most characteristic carnival characters are **a goat, a horse, a horse rider, a crane** and **a deer**, all of which are also found among the BZ signs. This permits us to suggest that the carnival figures had a solar-cosmological meaning and to explain them as a procession of mythic-astral creatures bringing back the imprisoned Sun to the world (Vaiškūnas 2000).

Zodiacal signs and seasonal calendar

N. Laurinkiene has studied the semantics of archaic Lithuanian calendar songs and revealed their main distinguishing symbols, motives for cosmological imagery, and myths. She independently distinguished the following images in their order of principal occurrence: water, a tree, **a deer, a horse, a peacock,** a building, a bridge, swingers, fire, and *Kalėda* (Laurinkiene 1990, p.83). We can see that the three zoomorphic signs in this list also occur in our eccentric BZ list: **a deer (9), a horse (12), and a peacock (5-6**). It is interesting to note that these signs are 90 degrees apart from each other in the Baltic Zodiac and mark quarters of the zodiac circle. If we join the constellation of Taurus, which corresponds to the rider, to these signs then we obtain a cardinally oriented cross dividing the zodiacal circle into four parts. This subdivision coincides with the so called Persian Cross comprising the four Royal Stars of Persia (Aldebaran, Regulus, Antares, Fomalhaut). These Guardians of the Sky were noticed by Persian astrologers around 3000 BC and used as a rudimentary seasonal calendar.

All four of these stars are among the brightest 25 stars in the sky, having an apparent magnitude of less than +1.5. However, this particular set of stars was chosen because they are distributed around the sky at approximately six-hour intervals in right ascension. The reason why they are called “royal” is that they appear to stand aside from the other stars in the sky. Throughout a year, each star is “dominant” for several months in the night sky and one can guess the season simply by noticing which star is dominant.

Lithuanian ethnoastronomical data provide evidence that an analogous four stars, corresponding to the four parts of the world, might have been familiar in the traditional folk calendar (Vaiškūnas 1993, p.334). However, there is no documentary evidence to suggest which particular stars were used. On the other hand, it is widely known that the heliacal rise of the Pleiades and Sickle asterisms, within the constellations of Taurus and Leo respectively, are associated with the beginning of spring and summer seasonal labours. Thus we have direct proof that in the traditional folk calendar these constellations were familiar as seasonal markers. It is not unreasonable to suggest that the seasonal star calendar might have been based on the observation of the heliacal rise and set of the constellations that marked seasonal periods of labour.

We have distinguished the synodic positions of the BZ signs that might have been linked with the following significant calendar dates in the 16th century:

Leo – Peacock		
Heliacal rising	**~ IX.23**	**Autumn equinox**
Heliacal setting	**~ VII.23**	**Beginning of rye harvest**
Morning culmination	~ I.25	Midwinter, holy day "a Colt baptizing"
Evening culmination	~ IV.23	St. George, beginning of spring labours
Scorpio – Deer		
Heliacal rising	**~ XII.23**	**Winter solstice**
Heliacal setting	**~ IX.23**	**Autumn equinox**
Evening culmination	~ VI.23	Summer solstice
Aquarius – Horse		
Heliacal rising	**~ III.23**	**Spring equinox**
Heliacal setting	**~ I.25**	**Midwinter, holy day "a Colt baptizing"**
Morning culmination	~ VII.23	Beginning of rye harvest
Evening culmination	~ XII.25	Kalėdos Christmas
Taurus – Rider		
Heliacal rising	**~ VII.10**	**"Seven sleeping brothers": the beginning of the rainy days of summer** (Vaiškūnas 1999)
Heliacal setting	**~ IV.23**	**St. George, beginning of spring labours**
Morning culmination	~ IX.10	Autumn sowing time
Evening culmination	~ II.25	St. Matthew, day when the lark returns

Leo – a Peacock

In the mythologies of various nations of the world, the image of a peacock is widely associated with astral symbolism – starting with the allegorical image of the peacock tail to represent the starry sky. In the ancient mythologies of Egypt, India and Southeast Asia a peacock is considered to be a solar symbol (MNM II 273). The image of a magic bird with glowing feathers, which occurs in the folklore of various nations of the world, is also linked with a peacock. The most familiar images are those of the Russian "zhar-ptica" and Slovak "fire bird".

The peacock is characteristically represented as a cosmological and astral symbol in the folk songs of Baltic, Slavic and other European nations (Laurinkienė 1990, p.81-83; Tokarev 1988, p.273-274). In Lithuanian and Russian tales we come across its analogue – a magic **bird** with glowing golden feathers. This bird is mentioned in fairy tales along with a glowing **horse** and a very beautiful **girl** *Aušrinė* – Venus. The hero of the tales brings back the girl, the horse and the bird from the prison of some chthonic creature that had seized them (Vėlius 1994, p.116-129). In the astronomical code this liberation might correspond to the first appearance of a celestial body, representing the hero of the myth, after its temporary invisibility, i.e. to the heliacal rise of a celestial body. If so, it could be linked to the emergence of Venus after a period of invisibility as well as the heliacal rise of **Aquarius (the horse) at the spring equinox** and **Leo or Cancer (the Peacock)** at the autumn equinox[1].

A motif occurs in East Slavonic songs where an image of a peacock is linked with the rising Sun and early morning: "Early in the morning the sun was dancing, la, la, lio, even earlier a peacock had been flying" (Laurinkienė 1990, p.82).

As we have already mentioned, the heliacal setting of Leo at the end of July is linked with the beginning of the rye harvest. Herein lies the origin of the name of the asterism in Leo known as the Sickle.

The stars of Leo and Cancer culminate before dawn about the beginning of November. Virgo, which corresponds to the Crane in the BZ, rises to the east of them. This triplet of BZ stars stretches from the east to the south covering half of the sky. November 11th is linked with birds in the folk calendar. This day is ascribed to St. Martin, the patron of birds. Lithuanians, Latvians and other European nations considered that St. Martin's day marked the beginning of winter (Lideks 1991, 518, 227; Tokarev 1983, p.97). On this day, Samogitians used to take a goose to church to offer it up. Goose was

[1] It is worth mentioning that in various world traditions Venus and Regulus are frequently confused. For example, Mesopotamian iconography shows Ishtar standing on a lion. In any case, the sign of the lion marks the Caniculus and is initiated on July 22nd by Saint Maria Magdalena, a Christian continuation of Venus. It is possible that parallel traditions were present in pagan North Eastern Europe, with Maria Magdalena being the Morning Star (A. Lebeuf, personal communication, 2007).

eaten on this day as a seasonal dish and it was called Martin's goose (Poška, 360-361; Lebeuf 1996, p.150-151). On Martin's day the Latvians used to offer up chickens and eat them (Lideks 1991, p.218-222).

Aquarius – a Horse

Replacing the sign of Aquarius with the Horse does not seem accidental bearing in mind that it is usual to depict horses next to Aquarius, examples being the Greek Pegasus and the Little Horse (Equuleus) and the Babylonian Horse (Rogers 1998, p.22-24). A constellation known as the Horse is familiar in Baltic and Slavic traditions. However, it is not reliably identified with particular stars.

A mythical horse is depicted in the Lithuanian calendar and in Latvian mythological songs. In Latvian song, a cosmic horse is directly linked with the dome of the sky and the ecliptic. It is said that the Sun rises at the saddle of the horse and the Moon rises at its bridle; and at the end of the reins *Auseklytis* (Venus) is rolling (Laurinkiene 1990, p.77-78).

Bearing in mind that the Horse serves as the Aquarius sign of the zodiac, it is interesting to note a visible link between a magic horse and water in Lithuanian and Russian fairy tales (NRS 133). Sometimes we notice that water seems to be the horses's living place. Such a horse or horses appear from the seas and are able to rise into the sky. A similar image of a horse can be traced in Celtic traditions. A ruler of the afterworld island *Riangabair* "the horse of the seas" was familiar to the Celts (MNM I p.636). Considering the Babylonian tradition linking the area of the constellation Aquarius with the cosmic ocean, replacing this sign with the symbol of the "Horse of the Seas" does not seem accidental. A reconstructed Lithuanian calendar festival called *Kumeliuko krikštynos* 'Baptism of the Colt' or *Krikštai* 'Baptisms' might also be linked with the image of the sky horse. It was celebrated all night long at the end of January or at the beginning of February. A. J. Greimas considered this festival to be lunar in character and maintained that it was the Lithuanian New Year (Greimas 1990, p.320-322). The position of the Horse in the BZ does not contradict A. J. Greimas' hypothesis. Aquarius is the last (12th) sign of the zodiac and its heliacal setting exactly coincides with the all-night celebration of the Colt baptism at the end of January and beginning of February. It is significant that the heliacal rise of the Horse constellation coincides with the spring equinox.

The zodiac considered here differs from the classical Mediterranean one in that the latter takes note of the situation of the Sun in each constellation and thus of the period of invisibility of that constellation, while the northern zodiac proposed here marks the first or last apparition of a constellation over the horizon.

Scorpio – a big and a small deer

Many researchers have studied the cosmological image of a mythical deer. T. Gamkrelidze and V. Ivanov (Gamkrelidze 1984, 519) maintained that a mythological deer might embody a constellation. V. Tumėnas supported this view using Lithuanian data (Tumėnas 1992, p.64).

In Bulgarian and Russian folk songs a heavenly deer is directly linked with the ecliptic and celestial bodies travelling in it: "– God turned himself to the deer / with a bright sun on his forehead, / with a moon on his chest, / with lots of stars over his body" (Bulgarian song); "I was on the bank of the Danube…/ a deer was drinking water… / a new moon was on his right thigh, / and a bright sun on his left thigh, / oh, in front there was a morning dawn / oh, lots of stars under the deer" (Russian song) (Bernshtam 1990, p.32).

In Lithuanian folklore a mythical deer is linked with Christmas celebrations. Folk songs sing of a deer with nine antlers, where a fire is burning and smiths are forging metal. The smiths make a golden cup, a golden ring or a crown of pearls, which symbolizes the Sun (Greimas 1990, 468). According to Lithuanian and Latvian mythology, a heavenly smith forged the Sun and hung it in the sky. Ipatij's manuscript (around 1252) and an insertion (1261) in the Russian translation of the Chronicle by John Malala mentions this heavenly smith and calls him *Teliaveli* (BRMŠ I p.260, 266).

It is not only the appearance of the Sun but also its further destiny that is linked with a smith and with forging. E. S. Picolomini (Pope Pius II), in his 1477 book, mentioned a Baltic tribe that worshipped a huge iron hammer, with the help of which the Sun was released from "the strongest tower", into which it had been locked by some powerful king. It is maintained by the tribe that the signs of the Zodiac or some Giant with a powerful hammer broke into the tower where the Sun was imprisoned (BRMŠ I p.589, 591, 595; Vaiškūnas 2000, p.319).

The Sun, then, is linked with the Heavenly smith and he is linked in turn with a deer of nine antlers and with Christmas. Stories about a white deer, which appears at Christmas, are still remembered now. As recently as 1984 a story was recorded in Southern Lithuania: "… children, wait and look through the windows – a deer will come. …he will be very nice /…/ white, white /…/ with a wonderful wreath /…/ his feet will be white,

so you can distinguish him… He fell, they say, from the sky, so the clouds washed his tail and coloured his hoofs. And when deer appears from the forest then Christmas will come'' (Ragevičienė 1996, p.9).

The appearance of the deer before Christmas might be linked with the heliacal rise of the stars of Scorpio. This constellation is released from the rays of the Sun and some of its stars appear over the south-east horizon just before Christmas.

In various European nations there is a very close link between the deer that brings back the Sun and the Christmas patron (Saint Nicholas, Santa Claus, Papa Noel, Father Christmas, etc.) who comes riding with deer. Santa Claus resembles the image of the returning Sun itself when he comes sitting in a sleigh with his deer in harness, wearing red clothes and delivering gifts. In Lithuanian folklore the image of the rising or riding cart and the Sun delivering gifts is well known. It is supposed that Lithuanian Christmas songs about *Kalėda*, who comes riding in cart and delivering gifts, are precisely about the Sun. It is so called owing to the name of the festival itself: Christmas is the festival for the Lithuanian *Kalėdos* (here *Kalėda* is the singular form of the word *Kalėdos*). In folklore *Kalėda* is audibly associated with the act of forging: Lith. ***Kal-ėda*** "Xmas, Christmas" // ***kal-ti*** 'to forge', ***kal-vis*** 'forger'. This serves to confirm the association between Christmas (*Kalėdos*) and the story of the cosmological forging of the Sun.

Alongside Santa Claus, another character is worth researching and that is Saint Hubert. He is linked with November 3rd, hunting, Christmas, and an unusual deer, and is patron of metalworking (!). According to the legend, on Christmas evening Hubert went hunting and saw a deer with huge antlers with ten branches. He got ready to throw a spear, but stumbled and fell down. At that moment the deer became lit up and Hubert saw a shining golden cross among his antlers. Here we have a reference not to the Sun, but to the spiritual light of faith, and accordingly, Jesus is traditionally represented as the new Sun[2].

Other research also proves the link between the returning Sun and the rebirth of the world for a better life. T. A. Bernstam researched the semantics of the Russian youth games "jashcher" (pangolin) and "olen'" (deer) by analysing the widespread image of a deer in various nations. She came to the conclusion that this image could be perceived as an embodied idea of spring, as a symbol of the Sun sending its warmth and awakening plants, animals and people (Bernshtam 1990, p.33). V. V. Ivanov and V. N. Toporov consider the deer a zoomorphic symbol of spring and virility (Ivanov, Toporov 1965, p.130-131). For N. Laurinkiene the image of the deer relates to the rebirth of the world. A deer is a symbol of rebirth and renewal for Evenks, Georgians, and some other nations. During the ritual of the *inkonipka* spring festival, Evenks staged the hunting of a cosmic deer. The cosmic deer was killed, but later, miraculously revived together with nature. In the Georgian traditions a deer was also related to the spring festival. Georgians believed that on St. George's day a deity would send a deer for the participants of the festival (Laurinkiene 2000, p.31).

We can see that a deer symbolizes light and the renewal of the world. But it is also linked to the shortest days and the lowest rise of the Sun in the dome of the sky. For instance, an Irish poem of the 9th century tells of a deer that announces the coming winter: "I have a message for you: / a deer was roaring, / the winter is snowing / and summer left. / The winds are cold / **the sun is close to the earth -/ its way is short**. / The sea is rough. /…/ The frost has frozen the wings of the birds. / This time is severe. / I have a message for you" (Šletė 1984).

After the autumn equinox, when the path of the Sun becomes shorter and the night becomes longer, the cosmic deer disappears in the evening rays of the Sun, announcing winter. During the winter solstice it emerges in the morning dawn after about two and half months of invisibility. The coincidence of the heliacal rise of Scorpio with the winter solstice is perhaps the reason for linking the stars of Scorpio with the mythical Deer that played such an important role in the myth of the returning Sun or recovery of the Sun (see also: Rappenglück 2008).

Taurus – a rider

It is known that the heliacal setting of the Pleiades, a swarm of stars that belongs to the constellation of Taurus, is linked to St. George's day. This day is very significant in the folk calendar, because it marks the beginning of the summer season and agricultural work. The rider that is depicted in Taurus is linked to iconography of St. George. St. George is considered to be a patron of horses and he is depicted as a rider on a white horse. The rider in the BZ might represent a pagan deity who was later replaced by the image of St. George. *Ūsiņš* might have been such a deity in Latvian mythology, *Avsen'* or *Jarilo* – in Slavic mythology and *Perkūnas* – in Lithuanian mythology. All of them are represented as horse riders. In the reconstructed Lithuanian mythological images, which interpret the disappearance of the Pleiades after their heliacal setting, *Perkūnas* emerges as a hero who goes down to

[2] A. Lebeuf, personal communication, 2007.

hell and retrieves Mary's Sieve (the Pleiades) from the chthonic creature (Vaiškūnas 1999, p.231–233). Considering the aforementioned folk stories about the hero who releases a glowing bird, a horse and an exceptionally beautiful girl (Venus), we can guess that in the constellation of Taurus could be found the third hero of this plot – a liberator. That would correspond to the story where St. George releases the girl from the dragon. Saint George, celebrated on April 23rd, can be considered the patron of the zodiacal sign Taurus 22 IV – 21 V.

Conclusions

From the analysis of the Grondo zodiac we can maintain:

1. That the distinctive signs of the BZ zodiac derived from local mythologies;
2. That the position of the signs corresponding to constellations related to local calendrical traditions;
3. That the signs of the BZ generally correspond to the colure points in the interval between the 12th and 17th centuries.

However, it is not clear how the original signs of the zodiac emerged. Had the original names of the constellations been familiar before colliding with the classical zodiac? Or were they simply created on the basis of the classical zodiac according to the local mythological calendrical images? Additional research is needed to answer this question. It is very probable that the signs, which replaced the signs of the classical zodiac, were familiar and of great importance in the local pagan tradition as constellations that played a significant role in the local seasonal calendar. We can even argue that these constellations played a very prominent role in the local tradition; otherwise they would not have replaced the original ones. We know that the northern pagan barbarians were fascinated by the Roman culture and dreamed of becoming Romans themselves. In the historical sources we can even trace legends about the origin of the Lithuanians from the Romans.

The substitution must have been motivated by strong needs. We can assume that the four most peculiar symbols in Lithuanian calendrical folklore – the Peacock, the Horse, the Deer and the Rider – can be interpreted as four cardinal seasonal star calendar points.

Another thing we cannot know is when this zodiac was taken over and modified. Knowledge of the zodiac from the Mediterranean and Eastern countries could have reached the shores of the Baltic Sea at any time from the 2nd millennium B.C. onwards, since, as we know, commerce and contacts had already been established between the Batltic and Mediterranean regions by this date. Amber trade routes stretched from the Baltic Sea to Greece, Italy and Asia Minor. Later, the trade was more intensive with the Roman Empire, and in the 5th -7th centuries with the Goths. Very close trade relations are documented between the Balts and the Arabian Peninsula (Gimbutiene p.127, 131). However, there is no doubt that in the case of the system of zodiacal signs found on the Grondo scoop we are not encountering a piece of folk art or a composition of mythical images, but two distinctive cosmological images and calendar systems, based on astronomical practice. Research concerning the adaptation of the classical zodiac into the pagan cultures of other European nations might reveal further valuable information in this field of pagan star lore.

Acknowledgements

I am grateful to Prof. Dr Arnold Lebeuf for his kind interest in my work, and for his valuable and very useful comments and feedback on this paper. We would like to thank the staff and management of the National Art Museum of the Republic of Belarus and their branch of Raubichi Folk Arts and Crafts Museum for the cooperation and for kindly providing access to the ritual scoop.

References

BERNSHTAM, T.A., 1990. Sledy arkhaicheskikh ritualov i kul'tov v russkikh molodezhnykh igrakh „iashcher" i „olen'" (opyt rekonstrukcini). In: *Fol'klor i etnografiia. Problemy rekonstrukcii faktov tradicionnoi kul'tury.* Leningrad: Nauka.

BRMŠ – VĖLIUS, N., compil., 1996. *Baltų religijos ir mitologijos šaltiniai*. I: Nuo seniausių laikų iki XV amžius pabaigos. Vilnius: Mokslo ir enciklopedijų leidykla.

GAMKRELIDZE, T.V., IVANOV, V.V., 1984. Indoevropeiskii iazyk i indoevropeicy 2. Tbilisi: Izd-vo Tbilisskogo un-ta.

GIMBUTIENĖ, M., 1985. *Baltai priešistoriniais laikais.* Vilnius: Mokslas.

GREIMAS, A.J., 1990. *Tautos atminties beieškant: apie dievus ir žmone.* Vilnius-Chicago: Mokslas & A.Mackaus knygų leidimo fondas.

IVANOV, V., TOPOROV, V.N., 1965. Slavianskie iazykvye modeliruiushchie semioticheskije sistemy: Drevini period. Maskva: Nauka.

LAURINKIENĖ, N., 1990. *Mito atšvaitai lietuvių kalendorinėse dainose.* Vilnius: Vaga.

LEBEUF, A., 1996. The Milky Way, a path of the souls. In: V. KOLEVA AND D. KOLEV eds. *Astronomical traditions in past cultures.* Proceedings of the first annual general meeting of the European Society for Astronomy in Culture, Smolyan, Bulgaria, 31 August-2 September 1993. Sofia: Institute of Astronomy, Bulgarian Academy of Sciences, National Astronomical Observatory Rozhen.

LĪDEKS, O., 1991. *Latviešu svētki. Latviešu svinamās dienas.* Rīga: Scientia.
MNM – TOKAREV, S.A., ed., 1987-1988. *Mify narodov mira I-II.* Encyklopedia. Moskva: Sovetskaia Encyklopediia.
PAN'SHYNA, I., 1987. Laddzia na khvaliakh chasu (Karecbracina XVI st.), *Belarus*', № 3, 18.
POŠKA, D., 1959. *Raštai.* Vilnius: Valstybinė grožinės literatūros leidykla.
RAGEVIČIENĖ, A., 1996. Kai dar baltieji elniai iš dangaus krisdavo. *Šiaurės Atenai,* 1996 12 14, No 48 (342).
RAPPENGLÜCK, M.A., 2008. Tracing the celestial deer - an ancient motif and its astronomical interpretation across cultures. *This volume*.
ROGERS J.H., 1998. Origins of the ancient constellations: I. The Mesopotamian traditions, *J.Br. Astron Assoc.* 108, 1.
ŠLETE, F., 1984. Keltai tarp Alezijos ir Pergamo. Vilnius: Mokslas.
TOKAREV, S.A., 1983. Obychai, obriady i poveriia, sviazannye s zhyvotnovodstvom. In: S.A.TOKAREV, ed. *Kalendarnye obychai i obriady v stranakh zarubezhnoi Evropy.* Maskva: Nauka, 90-97.
TUMĖNAS, V., 1992. Eglutės ir svastikos ornamentų simbolika Lietuvoje. In: A.GAIŽUTIS et al. eds. *Senovės baltų simboliai.* Vilnius: Academia, 56-66.
VAIŠKŪNAS, J., 1993. Apie žvaigždes Kražių apylinkėse. *Kražiai.* Vilnius – Kaunas.
VAIŠKŪNAS, J., 1999. Pleiades in Lithuanian ethnoastronomy. In: T.MIKOCKI, ed. *Actes de la V-eme Conférence Annuelle de la SEAC Gdansk 1997*. Światowit Supplement Series H: Antropology, vol. II. Warszawa – Gdansk: Institut d'Archéologie de I'Université de Varsovie, Musée Maritime Central, 225-237.
VAIŠKŪNAS, J., 2000. Did there exist the Baltic zodiac? In: C. ESTEBAN, J.A. BELMONTE, eds. *Astronomy and Cultural Diversity.* Santa Cruz de Tenerife: Organismo Autónomo de Museos y Centros. Cabildo de Tenerife, 319-325.
VĖLIUS N., 1994. Velnias ir Aušrinė, *Lietuvos mokslas,* T. II, 1(2), Vilnius: PI "Lietuvos mokslo" redakcija, 116-129.

Received: 26 October 26, 2007; Revised: 12 July 2008

PERIFERINĖS VIDURŽEMIO IR RYTIETIŠKOJO ZODIAKO TRADICIJŲ FORMOS PAGONIŠKOJE LIETUVOJE

Jonas Vaiškūnas

Santrauka

Straipsnyje nagrinėjama jau ankstesniuose autoriaus darbuose aptarta savito baltiškojo Zodiako egzistavimo galimybė. Folklorine medžiaga grindžiamas šios srities hipotezes (Vaiškūnas, 2000) patvirtinti ir išplėtoti leido pažintis su vienos iš Gardino bažnyčių rūsyje pokariu rasto, XVI a. datuojamo apeiginio kaušo dekoru, kurį sudaro praėjusio amžiaus 6-ajame dešimtmetyje restauruojant kaušą po polichromine tapyba aptikti senesni degintine technika atlikti kontūriniai piešiniai. Ornamentiniais rėmais vienas nuo kito atskirti 12 ženklų vaizduoja gyvūnus, paukščius ir žmones. Piešinių semantikos ir išdėstymo struktūros analizė parodė, jog šie atvaizdai atitinka 12-os tradicinių Zodiako ženklų sistemą.

Kaušo Zodiako ženklų atvaizdus lyginant su dabartinio tradicinio (TZ) zodiako ženklais galima suskirstyti į tris grupes (3 pav.; Plate III: 1-6; Plate IV: 7-12):

1. Ženklai, išsaugoję tą patį vaizdą kaip ir tradicinio Zodiako ženklai, būtent: Dvyniai (4), Svarstyklės (8), Šaulys (10) ir Ožiaragis (11).
2. Ženklai, besiskiriantys nuo TZ, tačiau galintys būti pripažinti TZ ženklų variantais: Avinas (2) ir galbūt Žuvys (1).
3. Originalūs, visiškai neatitinkantys TZ ekvivalentų ženklai: Jautis (3), Vėžys (5), Liūtas (6), Mergelė (7), Skorpionas (9) ir Vandenis (12).

Šeši originalūs Zodiako ženklai yra: Raitelis – Jautis (3); Povas I – Vėžys (5); Povas II – Liūtas (6); Gervė – Mergelė (7); Elnias su elniuku – Skorpionas (9); Žirgas – Vandenis (12). Šių ženklų svarbą vietinei mitologinei ir kalendorinei tradicijai liudija jų populiarumas tautosakoje. Elnias, arklys ir povas laikomi populiariausiais su kosmologiniais motyvais siejamais zoomorfiniais kalendorinių dainų personažais (Laurinkienė, 1990, p. 83). Kita vertus, Elnio (9), Povų (5–6) ir Žirgo (12) atvaizdų išsidėstymas Zodiako rate vienas kito atžvilgiu 90 laipsnių intervalu leidžia spėti šiuos ženklus galėjus būti svarbių kalendorinių sezonų orientyru. Prie šios trijulės pridėjus Jaučio žvaigždyną atitinkantį Raitelio ženklą, gauname Zodiako ratą į 4 ketvirčius dalijančius 2 koliūrus.

Nustatyta, kad šiuos 4 Zodiako ženklus atitinkančių žvaigždynų sinodinės pozicijos XII–XVII a. galėjo būti svarbios sezoninio žvaigždžių kalendoriaus gairės. Astronominiais duomenimis paremtas prielaidas bandoma tikrinti ieškant sąsajų tarp originalius Zodiako ženklus atitinkančių žvaigždynų sinodinių pozicijų ir kai kurių kalendorinių papročių bei kosmologinių folkloro vaizdinių.

Prieinama išvada, kad apeiginio kaušo piešinių visuma sudaro savitą vietinės tradicijos transformuotą tradicinį Vidužemio kultūros Zodiaką. Perimto Zodiako dalies ženklų pakeitimas vietinę tradiciją atitinkančiais ženklais gali rodyti egzistavus reikšmingas vietines pagoniškas astronomines-kalendorines praktikas ir tradicijas. Pakeitimų pobūdis, originalių zodiako ženklų padėtis ir jų semantinis kontekstas liudija vėlyvaisiais viduramžiais Lietuvoje dar buvus astronomine praktika pagristą ir savita kosmologija motyvuotą sezoninį žvaigždžių kalendorių.

IV. ASTRONOMICAL AND COSMOLOGICAL KNOWLEDGE IN HISTORICAL SOURCES AND LITERATURE

WERE THE 185 A.D. AND 369 A.D. "GUEST STARS" SEEN IN ROME?

VITO FRANCESCO POLCARO, ANDREA MARTOCCHIA

Abstract

Since Clark and Stephenson (1977) proposed that the supernova remnant (SNR) G315.4-2.3 should be identified with the historical supernova (SN) seen by Chinese observers in the year A.D. 185, a great deal of work has been done by theoreticians and observers to test the hypothesis. Some authors have proposed the SNR G320.4-1.2 as a better candidate, while, on the basis of a reinterpretation of the *Houhan-shu* original text, even the very nature of the A.D. 185 event has been questioned, leading to the hypotheses of a cometary transit (Chin and Huang 1994) or a combination of Comet P/Swift-Tuttle and a nova (Schaefer 1995, 1996). In fact, a cometary transit was apparently registered in one of the Priscilla Catacomb frescoes, an ancient Roman artwork dating from the end of the second century. During our examinations of Roman Catacomb frescoes in an attempt to discover representations of "guest star" apparitions in Imperial Rome, we also discovered what seems to be a record of SN 369, indicating that this may have been the explosion which originated Cas A.

Key words: historical supernovae, SN185, SN369, Cas A, catacombs, Paleo-Christian Art.

The 185 A.D. "Guest Star"

Galactic Supernovae (SNe) are rare events and sightings of them are extremely important from both the astrophysical and the historical points of view. Only nine astronomical events recorded in ancient chronicles are considered *bona fide* SNe. In many cases they are only reported in Far Eastern (Chinese, Japanese and Korean) sources, where they are usually named "guest stars" (see, e.g., Stephenson and Green 2002; Xu et al. 2000).

The earliest "new star" which is worthy of investigation as a possible SNe was seen in China in A.D. 185. This event is reported in just one independent source, the *Hou-Han-shu*, which was composed towards the end of the third century A.D. The new star was recorded as being visible for at least 8 months, or possibly even 20 months (depending on whether part of the record is taken to mean 'next year' or 'the year after next'). The star was reported to be within the *Nan-mên* asterism. Although some authors have questioned the identification of this asterism, a comparison with contemporary records and star charts supports the usual identification of *Nan-mên* with α and ß Cen, which lie close to the Galactic equator (Stephenson and Green 2002; Xu et al. 2000).

Here is the text in full, in the Clark and Stephenson (1977) translation:

Hou-Han-shu *(Astronomical treatise Chapter 22)*

"2nd year of the Chung-p'ing reign period [of Emperor Hsiao-ling][1] 10th month, day kuei-hai, a guest star appeared within *(chung)* Nan-mên. It was as large as half a mat; it showed the five colours and it scintillated. It gradually became smaller and disappeared in the 6th month of the year after the next *(hou-nien)*".

Rwc 86 or Rwc 89?

On the basis of the positional information given by the *Hou-han-shu*, Clark and Stephenson (1977) proposed that the SN 185 remnant was the nebula G315.4-2.3 (RCW86: R.A = 14h 43m 04s , decl = -62° 27.7'). However, one argument against this identification (among others) is the absence of any observed plerion (a supernova remnant with a filled centre) in RCW86. Not even the latest-generation of X-ray instruments

[1] The date corresponds to 7th December 185.

have been able to resolve this issue, detecting only uncertain point-like sources within the nebula (Gvaramadze and Vikhlinin 2003; Kaplan et al. 2004; Vink et al. 2000). The detection of a plerion would be a considerable help, among other things, in establish the age of the remnant. Indeed, estimates obtained from dynamical nebula expansion or ionization models are very uncertain, because of observational as well as theoretical difficulties. Rough Sedov-phase expansion estimates lead to ages that are too large (~7000 years: Chin and Huang 1994; Jones et al. 1998; Rosado et al. 1996; Borkowski et al. 2001 – the last having a contradictory result on the ionization age). More sophisticated models, including different expansion phases (i.e. varying shell velocities), can reconcile the SN 185 age with the dynamical model of RCW86 to some extent, but only when *ad hoc* assumptions are made concerning the explosion energy (Bocchino et al. 2000; see also: Petruk 1999, and Vink et al. 2006).

As an alternative to RCW86, several authors have proposed the SNR G320.4-1.2 (RCW89: R.A=15h 13m 35s, decl = -59° 00.2') as a better candidate. One of the reasons is the fact that a pulsar, PSR B1509-58, has actually been found in the latter remnant, and the plerion age is estimated to be reasonably coincident with the required value (Thorsett 1992; Kaspi et al. 1994).

On the other hand, the dynamical study and dating of RCW89 carries the same uncertainties as with most SNRs, namely that some authors derive ages that are too large from Sedov expansion models (e.g. Kamper et al. 1995).

More Doubts And Hypotheses

Doubts about the positional identification of SN 185 have also been raised, by Huang and Moriarty-Schieven (1987) and then others, which casts doubt upon both SNR hypotheses.

Added to this, on the basis of a reinterpretation of the *Hou-han-shu*, even the very nature of the 185 A.D. event has been questioned, leading to the suggestion that Chinese observers actually witnessed a comet transit (Chin and Huang 1994). These authors retranslated the text and in particular the sentence "within *(chung) Nan-mên*", suggesting that the exact translation is "emerging from *Nan-mên*", thus implying a motion.

Schaefer (1995, 1996) has stressed that a comet does not "scintillate", owing to its large size, and that a comet appearing near α or β Cen (the component stars of *Nan-mên*) must be of m_v –7 to be visible to naked eye, because of the high extinction due to its low height over the horizon. In other words, it would be far too bright for a comet. However, he also noticed that the historical event "light curve" was too short for it to be a supernova - although Thorsett (1992) has argued that the position of RCW86 in the sky would have made it invisible after a short time to southern-Chinese observers.

Furthermore, Schaefer (1995) noticed that the term *hou-nien* is better translated by "a few years later". He thus concluded that the event was most probably a combination of a nova exploding in Centaurus in 185 A.D. and the transit of comet P/Swift-Tuttle, three years later, recorded in the same *Hou-han-shu*, Chapter 20 (Yoke 1962):

"*Chung-p'ing* reign period 5th year, 6th month, day *ting-mao* [28th July 188 AD]. A guest star as large as a vessel with a capacity of three pints appeared at *Kuan-so*. It moved south-west and entered the *T'ien-ahih* [Enclosure]. It reached *Wei* [the 6th Lunar Mansion] and then disappeared".

The question of the nature of the 185 AD "guest star" is thus fully open and it is worth looking for other possible sources concerning this event.

Possible Witnesses in Rome at the End of tThe Second Century

The other highly developed civilization in the 2nd century was the Roman Empire. Though there is no reference, to our knowledge, to astronomical events in Roman texts of this period, we can look for them in the arts, in order to see if some unusual celestial phenomenon is recorded – as in the case of Giotto's fresco representing the Halley's Comet transit of 1301, or the fresco of San Pietro in Valle representing the apparition of SN 1181 (Polcaro 2005). Some clues suggesting an unexpected and impressive phenomenon in the sky of Rome at the end of the 2nd century have been actually found in one of the oldest of the Christian catacombs of Rome: the Priscilla Catacomb on Via Salaria.

Excavated from soft volcanic terrain, the galleries of this Catacomb stretch out for approximately 13 kilometres with an irregular pattern. The bodies of the deceased were laid in the *loculi*, narrow rectangular tombs carved out of the gallery walls. These *loculi* were sealed using marble or terracotta slabs. Today, these slabs are no longer *in situ* owing to the almost complete despoliation of the galleries in the past. However, some fragments of these stones with their Latin or Greek inscriptions can be seen on the walls of the galleries, and sometimes these inscriptions report a date, giving a precise time reference. Sometimes one comes upon a cubicle that was used as a family or group tomb

or for the burial of a martyr: these cubicles are often decorated by frescoes.

Inside one of these cubicles, on the ceiling of a niche dug out from the upper wall of a gallery for a venerated tomb, there is a very evocative image of the Madonna and Child with a prophet in a tunic and *pallium* (see Plate V: Fig. 1, left) pointing to a star. This has been considered (see, e.g., Biamonte 1997, and references therein) to be an allusion to the biblical prophecy of Balaam (Num 24:15-17):

"A star shall come forth out of Jacob, and a sceptre shall rise out of Israel".

The style of the fresco and its location (in one of the oldest areas of the cemetery) indicate a date around the end of the second century A.D., making it the oldest known image of the Mother of God.

We thus have an image of a man (who may be Balaam) indicating a star, depicted a few years (at most) after the apparition of the 185 A.D. "guest star". We now have to investigate whether these two facts are in some way connected, bearing in mind, of course, that if the 185 A.D. "guest star" was actually the SN that originated RCW86, it could not have been seen in Rome, since it was far too far South, and the same holds if we choose RCW89 as the remnant of SN 185.

Let us suppose first that the man in the fresco actually represents Balaam. He is not a very common character in Christian paintings (for a discussion of the role of Balaam in Christian Art see, e.g., Merlini 1987). Furthermore, Priscilla's Catacomb is one of the very few places, to our knowledge, where he is represented in the act of indicating a star. Everywhere else, he is represented in the framework of the episode of his meeting with the Angel and of the "speaking donkey". This is true in the fresco of the "Via Latina Anonymous Catacomb" (mid-4th century), right up to the famous painting by Rembrandt, passing through most of the few existing images of Balaam in Christian art. We thus have a representation of a star painted during the right period, associated in an unusual way with an unusual biblical character: we can thus imagine that this has something to do with an unusual astronomical phenomenon.

However, this is not enough to state firmly that the 185 A.D. Chinese "guest star" was seen in Rome: we may actually be dealing with an event that occurred a few years later. Actually, P/Swift-Tuttle is a huge comet (2 km in diameter) and in 188 A.D. its minimum distance from Earth was only 0.6 AU. Furthermore, it appeared in the constellation of "Corona Borealis": it was thus perfectly visible in the sky of Rome. The astronomical event that was impressive enough to inspire the Christian painter of Priscilla's Catacomb was thus, more likely, the 188 A.D. passage of the comet P/Swift-Tuttle.

On the other hand, let us now imagine that the character indicating the Star is not Balaam: the fresco then becomes a quite normal representation of the Nativity. It is the first, but it is not unusual, since it fully reflects the symbolism of the Cosmos paying tribute to Christ, the Saviour. In this case, we do not need to suppose that the painter was inspired by some exceptional celestial phenomenon.

The answer to the question: "Was the 185 AD 'guest star' seen in Rome?" is thus most probably negative. But, in this case, it was P/Swift-Tuttle that was seen, and the question of the 185 A.D. "guest star" seen by the Chinese remains fully open.

The Case of the 369 A.D. Guest Star

Let us return to the "Via Latina Anonymous Catacomb". It is a relatively newly discovered (1952) catacomb. It is not a "common cemetery", owned and managed by the whole Christian community, but a private cemetery, most probably owned by a single rich family whose members were both Christians and pagans. It was in use for just a few decades in the middle of the 4th century, and is so richly decorated by magnificent frescoes that it has been called the "Sistine Chapel of the 4th Century" (Biamonte 1997).

Another of its paintings has been interpreted as the prophet Balaam (Ferrua 1960). It simply shows a man, dressed as a typical Roman knight, indicating a star (see Plate V: Fig. 1, right). Another fresco shows the "Crossing of the Red Sea" with a bright star shining over the Jews - though there is no reference to a star anywhere in the Book of Exodus. We thus have two unusual representations of stars, painted more or less at the same time in this catacomb.

Furthermore, a fresco dating to the middle of the 4th century, recovered from another catacomb that was randomly discovered (and destroyed!) during road works, shows two characters seen from behind: one of the two, again identified as Balaam, is indicating something in the sky (Biamonte 1997).

Therefore, three more or less contemporary paintings (mid-4th century) are found in Rome, all referring to something unusual in the sky. It is thus worth checking in the Ho Peng Yoke (1962) list of references to astronomical events reported by Far Eastern sources to see whether an impressive comet or "guest star" is reported in that period. Apart from a number of short-lasting and apparently not very luminous comets, just

one event seems to have been noticed. The related text is the following (Yoke 1962):

Chin Shu (chapter 13/20a)

"During the second month of the fourth year of the *Thai-Ho* reign period of Hai-Hsi-Kung a 'guest star' appeared at the western wall of the *Tzu-Wei*. It went out of sight during the seventh month".

The date of the appearance corresponds to March-April, 369 A.D., and the reported coordinates are roughly equivalent to α = 23h 21m, δ =+58°, i.e. the object was in a circumpolar position easily visible from Rome. Within a radius of a few degrees from that location there is only one very young SN remnant: SNR 111.7-02.1 ($\alpha = 23^h\ 23^m\ 24^s$ δ =+58° 48.9'). This SNR is better known by the name of Cas A.

The age of this intriguing object has been estimated, on the basis of dynamical models, to be of the order of a few centuries, and it is generally believed to be the remnant of a supernova that exploded at the end of the 18th century. However, although the telescope was commonly in use by that time and many illustrious astronomers, such as Flamsteed, were active during that period, none seems to have noticed any long-lasting "new star" (see, e.g., Green and Stephenson 2003).

To date, the 369 A.D. guest star has not been considered a reasonable progenitor of Cas A, both because of the dynamical age of the SNR and because it is only reported by a single historical source, and so is not fully accepted as an actual supernova event.

Our possible discovery of an independent confirmation of the event, though still speculative, could support the assertion that Cas A is the only remnant compatible with the 369 A.D. guest star as reported by the *Chin Shu*. However, further studies on the subject are needed in order to test this hypothesis.

Acknowledgments

We would like to thank Dr Giuseppe Biamonte, Dr Elena Merlini and Dr Giulia Tamanti for useful discussions and suggestions concerning Paleo-Christian art and the representation of Balaam. This work has made use of the Simbad database, operated by the CDS (Strasbourg).

References

BIAMONTE, G., 1997. Le catacombe di Roma. Rome: Newton & Compton.

BOCCHINO, F., VINK, J., FAVATA, F., MAGGIO, A., SCIORTINO, S., 2000. A BeppoSAX and ROSAT view of the RCW86 supernova remnant, *Astronomy & Astrophysics*, 360, 671-682.

BORKOWSKI, K.J., RHO, J., REYNOLDS, S.P., DYER, K.K., 2001. Thermal and Nonthermal X-Ray Emission in Supernova Remnant RCW 86, *Astrophysical Journal,* 550, 334-345.

CHIN, Y.N., HUANG, Y.L., 1994. Identification of the Guest Star of AD 185 as a Comet Rather than a Supernova. *Nature,* 371, 398-399.

CLARK, D.H., STEPHENSON, F.R., 1977. *The Historical Supernovae.* Oxford: Pergamon Press.

FERRUA, A., 1960. *Le pitture della nuova Catacomba di Via Latina.* Vatican City: Pontificio Istituto di Archeologia Cristiana.

GREEN, D.A., STEPHENSON, F.R., 2003. *Historical Supernovae*, In: K.W. WEILER, ed. *Supernovae and Gamma Ray Bursters. Lecture Notes in Physics.* New York: Springer-Verlag, 7-19.

GVARAMADZE, V.V., VIKHLININ, A.A., 2003. Point X-ray sources in the SNR G 315.4-2.30 (MSH 14-63, RCW 86). *Astronomy & Astrophysics,* 401, 625-630.

HUANG, Y.L., MORIARTY-SCHIEVAN, G.H., 1987. A Revisit to the Guest Star of 185A.D.. *Science,* 235, 59-60.

JONES, T.W., RUDNICK, L., JUN, B.I., et al., 1998. 10^{51} Ergs: The Evolution of Shell Supernova Remnants. *The Publications of the Astronomical Society of the Pacific,* 110, 125-151.

KAMPER, K.W., VAN DEN BERGH, S., WESTERLUND, B., 1995. Proper Motions in the SNR RCW86 and the Guest Star of 185AD. *Bulletin of the American Astronomical Society,* 27, 865.

KAPLAN, D.L., FRAIL, D.A., GAENSLER, B.M., et al., 2004. An X-Ray Search for Compact Central Sources in Supernova Remnants. I. SNRS G093.3+6.9, G315.4-2.3, G084.2+0.8, and G127.1+0.5. *Astrophysical Journal Supplement Series,* 153, 269-315.

KASPI, V.M., MANCHESTER, R.N., SIEGMAN, B., JOHNSTON, S., LYNE, A.G. 1994, On the spin-down of PSR B1509-58. *Astrophysical Journal,* 422, L83-L86.

MERLINI, E., 1987. Il trittico eburneo della Certosa di Pavia: iconografia e committenza - Parte I. *Arte Cristiana*, LXXV (711), 369- 384.

PETRUK, O., 1999. Evolution of supernova remnants in the interstellar medium with a large-scale density gradient. II. The 2-D modelling of the evolution and X-ray emission of supernova remnant RCW 86, *Astronomy & Astrophysics,* 346, 961-968.

POLCARO, V.F., 2005. A Possible European Witness of SN 1181. In: T. BOSTWICK and B. BATES eds. *Viewing the Sky through Past and Present Cultures,* Proc. of the 7th Oxford International Archaeoastronomy Conference, Flagstaff (AZ), June 19-23, 2004, Pueblo Grande Museum Anthropological Papers, City of Phoenix, USA, 399-408.

ROSADO, M., AMBROCIO-CRUZ, P., LE COARER, E., MARCELIN, M., 1996. Kinematics of the galactic supernova remnants RCW 86, MSH 15-56 and MSH 11-61A. *Astronomy & Astrophysics,* 315, 243-252.

SCHAEFER, B.E., 1995. `Supernova' 185 is Really a Nova Plus Comet P/Swift-Tuttle. *Astronomical Journal,* 110, 1793.

SCHAEFER, B.E., 1996. Peak Brightnesses of Historical Supernovae and the Hubble Constant. *Astrophysical Journal,* 459, 438.

STEPHENSON, F.R., GREEN, D.A., 2002. *Historical Supernovae and Their Remnants*. Oxford: Oxford University Press.

THORSETT, S.E., 1992. Identification of the pulsar PSR1509 - 58 with the 'guest star' of AD 185. *Nature,* 356, 690.

VINK, J., BOCCHINO, F., DAMIANI, F., KAASTRA, J. S., 2000. An unresolved X-ray source inside the supernova remnant RCW 86. *Astronomy & Astrophysics,* 362, 711-721.

VINK, J., BLEEKER, J., VAN DER HEYDEN, K., et al., 2006. The X-Ray Synchrotron Emission of RCW 86 and the Implications for Its Age. *Astrophysical Journal*, 648, L33-L37.

XU, ZH.T., PANKENIER, D.W., JIANG, Y.T., 2000. *East Asian Archaeoastronomy: Historical Records of Astronomical Observations of China, Japan and Korea.* Amsterdam: Gordon and Breach Science.

YOKE, H.P., 1962. Ancient and Medieval Observations of Comets and Novae in Chinese Sources. *Vistas in Astronomy,* 451, 127-225.

Received: 1 November 2007; Revised: 24 July 2008

AR ROMOJE 185 IR 369 M. BUVO MATOMA „NAUJA ŽVAIGŽDĖ“?

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Santrauka

Han dinastijos Kinijos metraštyje 185 m. paminėta „nauja žvaigždė“ (pažodžiui – „žvaigždė viešnia“), manoma, buvusi supernova, kurios liekana yra dujų ūkas (SNR) RWC 86. Jei šią hipotezę laikytume patikima, tai būtų pati seniausia identifikuota ir datuota istorinė supernova. Tikslios šio sprogimo datos žinojimas būtų labai svarbus faktas supernovų liekanų tyrimui. Tačiau Y. N. Chin, Y. L. Huang (1994) ir Shaefer (1995) yra abejoję dėl 185 m. reiškinio sąsajų su supernova ir savo ruožtu yra siūlę jį sieti su P/Swifto kometos tranzitu.

Siekdami ištirti šią galimybę, mes analizavome romėniškų katakombų paleokrikščioniską tapybą ir priėjome nuomonę, kad II a. pabaigoje Romos danguje iš tikrųjų buvo stebėtas kažkoks neįprastas šviesulys. Manome, kad šis reiškinys tikriausiai bus buvęs būtent P/Swifto kometos tranzitas. Tačiau klausimas dėl 185 m. reiškinio prigimties vis dėlto kol kas lieka atviras.

Romos katakombų paleokrikščioniška tapyba duoda tvirtą pagrindą teigti buvus ir kitą neįprastą dangaus reiškinį, stebėtą IV a. viduryje. Ho Peng Yoke (1962) sudarytame astronominių reiškinių, minėtų rytietiškuose šaltiniuose, sąraše, ieškodami įspūdingos kometos ar „naujos žvaigždės“ paminėjimo Dzin dinastijos istorijai skirtoje Dzin Šu knygoje aprašytu laiko periodu, randame tiktai vieną vertą dėmesio įrašą, kuriame sakoma, kad 369 m. kovo – balandžio mėnesį pasirodžiusi „nauja žvaigždė“ buvo matoma keturis mėnesius. Minimos šio šviesulio koordinatės atitinka apytikriai α = 23h 21m, δ = +58°, tai reiškia, kad šviesulys yra poliarinėje dangaus srityje, gerai matomoje Romoje. Šioje vietoje kelių laipsnių spinduliu aptinkame vienos labai jaunos supernovos SNR 111.7-02.1 (α = 23h 23m 24s, δ = +58° 48.9') liekaną. Ši supernovos liekana yra žinoma Cas A vardu. Jos amžius buvo apskaičiuotas, remiantis dinaminiu modeliu. Laikoma, kad Cas A amžius yra keli šimtmečiai ir manoma, kad tai yra XVIII a. pabaigoje sprogusios supernovos liekana. Tačiau tuo laiku jau buvo plačiai naudojami teleskopai, bet nė vienas žymus astronomas, pavyzdžiui, Flamstidas, aktyviai dirbęs tuo metu, nėra pastebėjęs jokios „naujos žvaigždės“ (žr., pvz., Green and Stephenson, 2003).

369 m. „nauja žvaigždė“ nebuvo laikoma pagrįstu Cas A pirmtaku dėl dviejų priežasčių: 1) remiantis dinaminiu modeliu, buvo apskaičiuotas kitoks supernovos liekanos amžius; 2) 369 m. „nauja žvaigždė“ tebuvo paminėta tik viename istoriniame šaltinyje. Mūsų pateiktas nepriklausomas šio reiškinio patvirtinimas, nors kol kas ir spekuliatyvus, galėtų sustiprinti nuomonę, kad Cas A yra būtent 369 m. Dzin Šu knygoje paminėtos „naujos žvaigždės“ liekana.

Vertė Jonas Vaiškūnas

INDIGENOUS ASTRONOMICAL TRADITIONS AS RELATED BY THE FIRST ETHNOLOGISTS IN BRAZIL

FLAVIA PEDROZA LIMA, SILVIA FERNANDA DE M. FIGUEIRÔA

Abstract

This work aims to present a panorama of the space-time of certain Brazilian native peoples, and especially the Tupi-Guarani and the Apinayé, as reported by some of the early ethnologists who traveled to Brazil, including Paul Ehrenheich, Theodor Koch-Grünberg and Curt "Nimuendajú" Unkel, as well the Canadian naturalist C. F. Hartt. This ethnohistoric data is compared to recent fieldwork.

Key words: ethnoastronomy, Indians, Brazil, German Ethnologists, C. F. Hartt.

Introduction

According to Penny (2002), during the German Imperial period (1871-1918), a number of German cities began the movement to build up museums and to fill them with collections from all over the world. Ethnology began to emerge as a scientific discipline in Europe in the late 1860s, inspired by the travel literature that became popular at this time. Adolf Bastian, director of Berlin's ethnographic museum from 1873 to 1905, was inspired by the Humboldtian cosmopolitan vision and efforts to gather all knowledge of human history, and so motivated an array of scientists to travel and collect material traces of human culture across the globe.

In this context, some German ethnologists travelled to Brazil to study the indigenous cultures: they included Paul Ehrenheich, Theodor Koch-Grünberg, and Curt "Nimuendajú" Unkel. These authors contributed decisively to Brazilian ethnology, as they engaged in extensive fieldwork and published the *corpus mythorum* of a variety of native peoples. Before this outstanding period of Brazilian ethnology, however, came the work of a Canadian naturalist with a deep interest in ethnology called Charles Frederick Hartt (1840-1878). Hartt was chief of the Brazilian Geological Commission, which existed from 1875 to 1878**.**

Charles Frederick Hartt

Hartt was born in 1840 in New Brunswick, Canada. His interest in Brazil began with the Thayer expedition (1865), under the leadership of Prof. Louis Agassiz. Hartt was appointed one of the geologists in the team of naturalists who would make scientific explorations in the Amazon. In 1868, Hartt accepted the chair of Geology at Cornell University. After several expeditions to Brazil, he founded the Brazilian Geological Commission (CGB), with the support of the Brazilian government. The Commission was established in 1875, with Hartt as its chief. His plan was to make a preliminary survey of the country in order to prepare a Geological Chart of the Empire, and "to study the archeology and ethnology of existing tribes, collecting and classifying samples that can illustrate them conveniently" (Figueirôa 1997). It is interesting to note that the inclusion of archaeology and ethnology was not usual in the USA's geological surveys, although their institutions were taken as the model for the CGB. Rather, it was an adaptation of the institutional model to the local reality (Brazil being rich in ethnographic material), besides reflecting Hartt's particular interest in these fields. Hartt was fluent in Portuguese, and knew the Tupi language and its dialects.

At the end of the fieldwork, in 1876, the Commission started to organize the immense geological, paleontological and archaeological collections. Hartt began to write the Memoirs of the work, of which—according to Orville A. Derby, one of Hartt's assistants—"it may almost be said without exaggeration that in the geological and archeological literature of Brazil Hartt´s contributions outweigh all the rest put together" (Hay 1899, p.163). His publications include *Brazilian Rock Inscriptions* (1871), *The Ancient Indian Pottery of Marajó, Brazil* (1871), *On the Occurrence of Face Urns in Brazil* (1872), *Notes on the Lingoa Geral or Modern Tupi of the Amazonas* (1872), *Beginnings of Art, or Evolution in Ornament* (1873), *Notes on the Manufacture of Pottery among Savage Races* (1875), and *Amazonian Tortoise Myths* (1875).

The Commission was closed down in January, 1878. Two months later, Hartt died from Yellow Fever in Rio de Janeiro.

Amazonian Tortoise Myths

The book *Amazonian Tortoise Myths* (Hartt 1875) presents a collection of animal stories related to the Brazilian land-tortoise (*Jabuti* in Portuguese, and *Yautí* in "Língua Geral", an indigenous common language). The myths, according to Hartt, appear to be current wherever Lingua Geral is spoken. Hartt interprets the myths as ancient indigenous astronomical theories, based on De Gubernatis' book *Zoological Mythology*. About the first myths – "How the tortoise out-ran the deer", "The Jabuti that cheated the Man", and "How a Tortoise killed two Jaguars" – Hartt says that in ancient world mythology, myths of the race between the Tortoise and some swift animal have been explained as referring to the race between the slow one, the Sun, and the swift one, the Moon, and "it seems to me eminently probable that the similar Amazonian myth may have the same signification" (Hartt 1875, p.15).

In the Myth "The Jabuti avenges himself on the tapir", "a tapir met with a jabuti in a wet place, and stepping upon him, buried him deep in the mud, where the tortoise remained two years before he could extricate himself" (Hartt 1875, p.30-32). When at last the jabuti succeeded, he follows the track of the tapir and kills him by biting his leg.

According to Hartt, "The Amazonian story seems susceptible of the following interpretation: The tapir is the Sun, the tortoise is the Moon. The rising Sun extinguishes the old Moon, and buries her, but after a time, the new Moon appears and begins the pursuit of the Sun. The fact that the race continues day after day, and that the scent grows constantly stronger suggests, however, that the pursuer may, after all, be the Sun. May not the story, perhaps, have been confused through an interchange of characters?" (Hartt 1875, p.33).

Hartt frequently quotes Brazilian authors, such as Couto de Magalhães, a politician, serviceman, folklorist, and writer. They exchanged Amazonian stories frequently, and Couto de Magalhães presented another interpretation of the same myth (Magalhães 1935, p.235-237), associating the jabuti with the Sun and the Tapir with Venus: "In the first part of the myth the jabuti is buried by the tapir. The explanation seems very natural, being in a time of the year when Venus appears while the Sun sets in the west [Venus as the 'Evening Star']. When wintertime comes, the jabuti goes out, and pursuing the tapir, repeatedly meets various trails, but always arrives after the tapir has left. It really happens with the Sun and Venus; the latter appears early in the morning [Venus as the 'Morning Star'] but when the Sun rises, it disappears. The jabuti finally kills the Tapir. As Venus has an orbit between us and the Sun, there is a time in the year when Venus does not appear in the morning any more, but in the evening. The burial of the jabuti is the first conjunction, when the Sun disappears under the horizon and lets Venus shine. The killing of the tapir by the jabuti is the second conjunction, when Venus disappears and lets the Sun shine" (Magalhães 1935, p.225).

Hartt quotes the French Capuchin monk Claude d'Abbeville, who wrote about Tupi astronomical traditions[1] and reports a name of a large star, *iaouáre* or dog (more properly 'jaguar') that follows close to the Moon, and which was supposed by the Indians to pursue her in order to devour her (Hartt 1875, p.38). Hartt says: "In the myths I have given, I have interpreted the jaguar to be the Moon, having been led to this opinion from analogy. It may, however, be fairly questioned whether it may not, at least, in some instances, mean the star just named" (Hartt 1875, 39).

Another Brazilian engineer, Major Silva Coutinho, a specialist in Amazonia, told Hartt that "The two stars that form the shoulders of Orion are said to be an old man and a boy in a canoe, chasing a *peixe-boi* [Amazonian Manatee], by which name is designated a dark spot in the sky near the above constellation. The Indians say that originally the old man, the large star, was in the bow, the boy, the small star, being in the stern, steering. When the man caught sight of the *peixe-boi* he became too much excited to shoot, and so he exchanged places with the boy. There is a constellation, called by the Indians the palmtree, and near by is a line of stars which they call monkeys coming to eat the fruit. Another constellation is called *jaburú* crane (Ciconia) and another the white crane" (Hartt 1875, p.39).

Câmara Cascudo, who wrote the notes for the Portuguese version of *Amazonian Tortoise Myths* (Hartt 1952), says that Silva Coutinho's information is precise and reliable. However, another version is reported by Stradelli: "Cacuri [indigenous fish trap], indigenous constellation corresponding more or less to the Southern Cross. The four stars of the cross form the *cacuri*, and the central stars are the fishes trapped. The Coal Sack is a *Peixe-Boi*, and the two stars from Centaurus, A[lpha] and B[eta], are the fishermen who come to shoot him. Long ago, they say, the younger Indian, B[eta], who is in the bow today, ready for shooting, was in the jacumã, i.e., the stern. The elder couldn´t hold the harpoon any more, so exchanged places with the young Indian" (Hartt 1952, p.68-69).

[1] This subject is detailed discussed in Lima et al 2006.

Theodor Koch-Grünberg

Koch-Grünberg (1872-1924) studied Classical philology, and from 1898 to 1900 took part in Herrmann Meyer's second expedition to the Xingu area. After his Ph.D. in Philosophy, he was charged, by the Museum of Berlin, with surveying the northwestern borders of Brazil, from 1903 to 1905. His expedition from Roraima to the Orinoco river (1911-1913) is considered one of the major exploits of scientific exploration through Brazil and South America (Koch-Grünberg 1953, 10 - preface), and resulted in the monumental work *Vom Roraima zum Orinoco* (5 volumes).

Vom Roraima zum Orinoco vol. II, published in Portuguese, received the title *Mitos e Lendas dos Índios Taulipáng e Arekuná* (Koch-Grünberg 1953). In this book, we can find cosmogonic myths and legends of heroes, stories, and fables of animals, as well as good-humoured narratives.

In the collection of fifty myths of the Taulipáng and the Arekuná, from Roraima and Venezuela, several Taulipáng legends tell the adventures of the tribal hero Makunaíma and the anthropophagous giant Piaíma. The form of Makunaíma is sometimes presented in solar character, sometimes in lunar character (Koch-Grünberg 1953, p.22-23). In one legend, he is caught in a lasso made by Piaíma, who then carries off Makunaíma in his basket. Makunaíma steals a magical formula from the giant, and escapes (Koch-Grünberg 1953, p.57-58). According to Koch-Grunberg's interpretation, based on Paul Ehrenreich (1905), the capture of the Sun in a bow may refer to the solstices, and it is a very common motif**.**

The lunar phases are explained in myth 16, "The Moon and his two wives": "The moon, called Kapéi, has two wives, both called Kaiuanóg, one in the East, the other one in the West. He is always with one of them. First, he stays with one who feeds him heartily, so he gets fatter and fatter. Then he leaves the first one and goes with the other wife, who barely feeds him and he loses weight. Then he meets again with the first wife, who makes him gain weight, and so on. The woman of the East fights with the moon because she gets jealous. She says: 'Go back to the other woman! So you get fat again! You can't gain weight with me!' Then he goes to stay with the other one. Therefore, the two women are enemies, and they are always far from each other" (Koch-Grünberg 1953, p.65)

According to Koch-Grünberg, his informant explained that the two women of Kaipei are two planets that walk with the Moon. In a footnote, Koch-Grünberg says that they are Venus and Jupiter. We think it more plausible that both women are Venus, as the Morning Star (in the East) and as the Evening Star (in the West). The West woman feeds Kaipei, so that when the Evening Star is in the West after sunset, the Moon waxes. When the Moon is close to the Morning Star, before sunrise, the Moon wanes.

Myth 18, "Jilijoaíbu turns into Tamekan (Pleiades)" (Koch-Grünberg 1953, p.65-69), describes how the Pleiades appeared in the sky. According to this indigenous interpretation, the Pleiades, the Hyades, and part of Orion form the figure of a one-legged man, Jilikawai ou Jilizoaibu (Jilijuaipu), who dies after his leg is cut off by his adulteress wife. Before his ascension to the sky, Jilikawai talks to his brother, and gives him his wife and son. He announces that the rainy season will start when he arrives in the sky, and there will be a great quantity of fish, so there will be plenty of food. In fact, "the Pleiades play an important role for the Indians in establishing the seasons and the right time to sow. When they disappear behind the western horizon, the rainy season starts, and when they reappear above the eastern horizon, they indicate the dry season" (Koch-Grünberg 1953, p.29).

According to Koch-Grünberg (1953, p.29), the Pleiades represent the head of the hero, while the Hyades and Aldebaran only have a secondary role. Therefore, in the indigenous text, the hero has the name Jilike-Pupai, meaning "starred head".

Curt Nimuendajú

According to the preface of the Portuguese version of his book on the Apinayé (Nimuendajú 1983), Curt Unkel was born in Jena, Germany, in 1883. He emigrated to Brazil in 1903, and two years later he was living in a Guarani settlement in the state of São Paulo, where he was baptized and received the Guarani name "Nimuendajú". He adopted this name, and so became known in the ethnological literature as Curt Nimuendajú. After more than 40 years living among several native groups in Brazil, Nimuendajú died in 1945, among the Ticuna indians. The author of several publications in German, Portuguese and English, he worked for the *Museu Paulista* (São Paulo, Brazil), the Museum of Gothenburg, the *Museu Nacional* (Rio de Janeiro, Brazil) the *Museu Paraense Emílio Goeldi* (Belém, Brazil) and the *Serviço de Proteção aos Índios*, a federal agency charged with protecting indigenous peoples.

The Apinayé

The Apinayé live in the state of Tocantins, and are linguistically classified within the Macro-Gê superfamily. According to Nimuendajú (1939), the Apinayé tribal

domain embraced the triangle between the Tocantins river and the lower Araguaia, extending southward to about 6° 30'. In the villages, "the houses form an approximate circle, their wide sides facing a central plaza, with a broad street, the 'boulevard', extending concentrically on the inner side of the house circle. The central plaza is, connected with each house by a straight, broad radial path" (Nimuendajú 1939, p.16). According to the Indian Matuk, the village is a representation of the Sun (Nimuendajú 1939, p.134).

The Apinayé are organized into moieties (men-ga-txa), each of which formerly occupied a well-defined part of the village. "The one localized in the northern half of the circle is called Kol-ti or Ko´lo-ti, i.e., Sapucaia chestnut (Lecythis ollaria); the complementary division bears the name of Kol-re or Ko´lo-re, i.e., Pará chestnut (Bertholletia excelsa)" (Nimuendajú 1939, p.21). According to Apinayé legend, the Kolti were created by the Sun and the Kolre by the Moon, and these beings localized them in the northern and southern halves respectively (Nimuendajú 1939, p.164).

The Apinayé subjected all young males to a warrior initiation. There were two phases that "jointly occupied more than a year, but the period is now considerably shortened" (Nimuendajú 1939, p.37). Nimuendajú witnessed part of the initiation in the village of Gato Preto, in 1937. The date of the beginning of the first phase is not given, but we can deduce from the text that it lasted for several weeks. The festival that closed the first phase of the initiation took place on July, 28th 1927. The second phase of initiation would have begun some months later, after the completion of the clearing of timber (Nimuendajú 1939, p.56).

During the second phase, the men performed the *Peny-tag* ceremony, a rubber ball (*peny-krã*) game played with battledores [light bats] (Nimuendajú 1939, p.61). The *pemb* (warriors) themselves do not, in fact, take part in the *Peny-tag* game, but remain under their mats in the house in at the eastern extremity of the village while it is played. During this time they may not so much as glance at the plaza where the *uyapé* (mature men) alone play the game (Nimuendajú 1939, p.64). Nimuendajú describes the *Peny-tag* festival, which he thinks is related to an ancient Apinayé Sun cult, though "the memory of any such association has completely vanished from these Indians' consciousness" (Nimuendajú 1939, p.67):

"On the eve of the festival the two lines of Kolti and Kolre, each with its ceremonial director at its right wing, danced me-ang-rõ[2] in the plaza. ... At nightfall there were heard from the house in the east, where the pemb met, the melodious me-amni´a[3] songs. When it had grown wholly dark, the old counselor Ngoklua (Kolti) emerged from the door of the house, holding the large rubber ball in his uplifted right hand while walking very slowly, solemnly, and silently along the boulevard around the periphery of the houses from the east by way of the north. No one saw him in the dark... It took the old man a very long time to complete his circuit, for he moved forward only during the brief intermissions of the me-ang-rõ. But finally people discovered that he had again returned inside his residence...

"The next morning the uyapé began their me-anrõ as early as 4:30, the two moiety groups dancing round each other in a gradually contracting circle. Then they assumed the position sketched in Fig. 1, by the eastern exit of the plaza, made a brief stop, and began anew. The ceremonial directors carried their battledores by the corded loops; the others were holding their paddles in their right hands. The Kolti director was distinguished by a dorsal feather decoration mounted on some basketwork and by a double flute.

"When the sun was about to rise, the counselor once more stepped out of the house in the east (Fig. 1), holding in his raised right hand the large rubber ball, which now had paty wool[4] stuck on it. Very slowly – almost imperceptibly – he advanced in short stages without raising his feet from the ground. This continued as long as the me-anrõ dancers were standing still, but every time they began to stamp he stood quite still. In this manner he gradually approached the front of the dancers´ double line, reaching it just as the sun´s orb began to rise above the horizon of the steppe, precisely behind him. The Kolti director of ceremonies now approached the old man slowly and bent down before him. The counselor pretended to throw the ball, but actually put it into the director´s hand, who passed it on to the Kolre colleague beside him. This Kolre passed it over in turn to the Kolti opposite him, the Kolti handed it to the nearest Kolre obliquely facing him, and so on until the ball had zigzagged through the hands of all, whereupon

[2] "The *me-ang-rõ* ceremony is repeated several times during this initiation phase. The Kolti and the Kolre lines face each other, standing in an E-W direction, the former on the north, the latter on the south. First they rapidly tap their right feet, uttering a protracted cry, 'Ha-hã-a-hwu' (Kolti) and 'Ha-hã-a-hwi' (Kolre), which is followed by piercing shrieks. Then the Kolti shout briefly and rhythmically, 'Haã-[stamping] wu!'; and the Kolre similarly answer 'Haã-wi!' crying and stamping thus follow alternately from both sides with attention to accurate time." (Nimuendajú 1939, p.59)

[3] The pemb songs are called *me-amni´a*, which is rendered into portuguese as 'reza', prayer (Nimuendajú 1939, p.60).

[4] A light pinkish-yellow wool obtained by scraping the young leaf stalks of the paty palm (*Orcus* sp.).

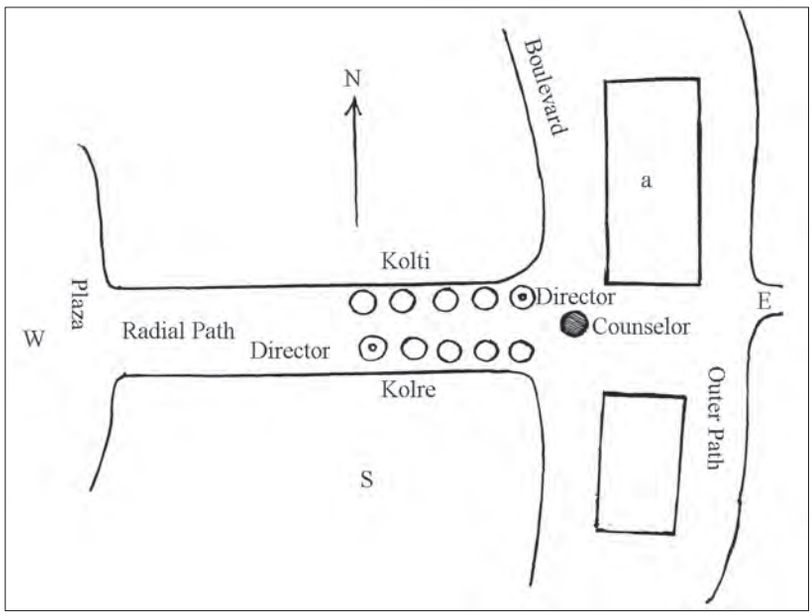

Fig. 1. Position of the Me-ang-rõ dancers at sunrise on day of Peny-ta´g (Nimuendajú 1939, p. 65).

the Kolti director took it back to the old man." (Nimuendajú 1939, p.64-66)

As a tentative interpretation, we could suggest that the zigzag path of the ball between the two rows is a representation of the peregrinations of the Sun between its northernmost and southernmost horizon extremes, the solstices. On the other hand, the change of the ball from the Kolti's hands to the Kolre's hands symbolizes the passage of the Sun from the northern half of the sky to the southern half and vice versa at the two equinoxes.

Turning to other celestial phenomena, the Apinayé regard meteors as evil demons. In case of a lunar eclipse, an old man lifts a girl towards the Moon, calling out: 'Look, here is your wife! Don´t die!'. They sing special chants until the darkness is gone, and the men shoot at the Moon with arrows (Nimuendajú 1939, p.139). The constellations are devoid of religious significance, and they recognize a giant Emu (*mã-ti*) in the Milky Way, but unlike other tribal groups in Brazil, they are not afraid of it. Another constellation is a big ant-eater (*pad-ti*) fighting a jaguar, and another is interpreted as a sting-ray (*bienče´d* or *bieneyéd*, as writen in the Portuguese version of the book). The Pleiades are called *Ngrôdo*; Venus and Jupiter, *Tamgaa´ga*; and Mars remains undesignated (Nimuendajú 1939, p.140).

Discussion

The analysis of the texts did not permit us to determine whether some of the interpretations mentioned by the different authors came originally from the informants, or whether they were simply the personal interpretations of the ethnologists.

The Emu and the 'one-legged man'[5] constellations are found among several ethnic groups in Brazil, including some that are culturally very dissimilar, such as the Guarani (related to the Tupi linguistic family) and the Apinayé (related to the Macro-Gê).

The Milky Way is the main point of reference in the sky for native Brazilians. As far as we know, there is no direct evidence or indirect indication (either from literature or fieldwork) that any importance was attached to the zodiac.

During interviews conducted with the Guarani people in the village of Paraty-Mirim, Rio de Janeiro, in 2004 and 2005 by one of the authors, part of their astronomical knowledge and lore started to be recounted by the tribe, and the village elder even gave an astronomical lesson to the children, something that has not happened for a very long time.

Acknowledgments

Thanks are due to all the Brazilian native groups that have been fighting for the last five centuries to keep their lands and to preserve their ethnic identities.

References

EHRENREICH, P., 1905. Die Mythen und Legenden der südamerikanischen Urvölker und ihre Beziehungen zu denen Nordamerikas und der alten Welt. *Zeitschrift für Ethnologie (Supplement)*, 37. Berlin: A. Asher & Co, 1-108.

FIGUEIRÔA, S. F. de M., 1997. *As ciências geológicas no Brasil: uma história social e institucional.* 1870-1934. São Paulo: HUCITEC.

HARTT, C. F., 1869. On the Botocudos of Brazil (abstract). In: *Proceedings of the American Association for the Advancement of Science, 18th meeting*, 273-274.

HARTT, C. F., 1872. Notes on the Lingoa Geral or Modern Tupi of the Amazonas. *Transactions of the Am. Philological Assoc*., 2-20.

[5] Koch-Grünberg (1953, p. 160-169) includes an extensive discussion about the one-legged man constellation among several Brazilian native groups.

HARTT, C. F., 1875a. Evolution in Ornament. *The Popular Science Monthly*. Vol. VI, January. New York: Western and Company. 266-275.

HARTT, C. F., 1875b. *Amazonian Tortoise Myths.* Rio de Janeiro: Willian Scully Publisher, Typographia Academica.

HARTT, C. F., 1879. Notes on the Manufacture of Pottery among savage races. *The American Naturalist.* Vol. XIII, No. 12, February, 78-93.

HARTT, C. F., 1952. *Os Mitos Amazônicos da Tartaruga*. Recife: Arquivo Público Estadual.

HAY, G. U., 1899. The Scientific Work of Professor Chas. Fred. Hartt. *Transactions of the Royal Society of Canada*. Second Series, Vol. V, Section IV, Geological and Biological Sciences, 154-163.

KOCH-GRÜNBERG, T., 1979. *Del Roraima al Orinoco.* Coleccion Historico-Economica, 40° aniversario. Caracas: Ediciones del Banco Central de Venezuela.

KOCH-GRÜNBERG, T., 1953. Mitos e Lendas dos Índios Taulipáng e Arekuná. *Revista do Museu Paulista.* Nova Série, Volume VII. São Paulo: Museu Paulista/USP.

LIMA, F. P., MOREIRA, I. de C., AFONSO, G. B., 2006. Tupi-Guarani Indigenous Knowledge on Relations Between Heavens and Earth. In: T. W. BOSTWICK, B.BATES, eds. *Viewing the sky through past and present cultures.* Selected Papers from the Oxford VII International Conference on Archaeoastronomy, Pueblo Grande Museum Anthropological Papers, no. 15, Phoenix: City of Phoenix Parks Recreation and Library, 125-138.

MAGALHÃES, J. V. C. de., 1935. *O Selvagem*. Brasiliana v. 52. São Paulo: Cia. Ed. Nacional

NIMUENDAJÚ, C., 1939. *The Apinayé.* Translated by ROBERT H. LOWIE. The Catholic University of America Anthropological Series, No 8. Washington, D.C.

NIMUENDAJÚ, C., 1983. *Os Apinayé*. Belém: Museu Paraense Emílio Goeldi.

NIMUENDAJÚ, C., 1987. *As lendas da criação e destruição do mundo como fundamentos da religião dos Apapocúva-Guarani.* São Paulo: HUCITEC Editora da Universidade de São Paulo.

PENNY, H. G., 2002. *The Civic Uses of Science: Ethnology and Civil Society in Imperial German.* In: L.K. NYHART AND T. BROMAN eds. *Science and Civil Society*. Osiris, 2nd Series, Vol. 17, 228-252.

Received: 1 November 2007; Revised: 2 July 2008

VIETINIŲ BRAZILIJOS GYVENTOJŲ ASTRONOMINĖS TRADICIJOS PIRMŲJŲ ETNOLOGŲ DARBUOSE

Flavia Pedroza Lima,
Silvia Fernanda De M. Figueirôa

Santrauka

Imperiniu periodu (1871–1918) daugelyje Vokietijos miestų vyko muziejų kūrimo ir aprūpinimo eksponatų kolekcijomis iš įvairių pasaulio vietovių sąjūdis. Vėlyvaisiais 1860 m. inspiruota populiarėjančios kelionių literatūros Europoje formavosi etnologijos disciplina. Berlyno etnografijos muziejaus direktoriumi nuo 1873 iki 1905 m. dirbęs Adolfas Bastianas (Adolf Bastian) įkvėptas Humboldto kosmopolitinių idėjų ir siekių surinkti visas žmonijos istorijos žinias, paskatino gausybę mokslininkų keliauti ir rinkti kultūros vertybes visame Žemės rutulyje. Dėl šios priežasties į Braziliją studijuoti vietinės kultūros atkeliavo nemažai vokiečių etnologų: Karlas fon den Šteinenas (Karl von den Steinen), Paulas Ehrenheichas (Paul Ehrenheich), Maksas Šmidtas (Max Schmidt), Teodoras Koch-Griunbergas (Theodor Koch-Grünberg), Fricas Krauzė (Fritz Krause) ir Kurtas Unkelis (Curt Unkel) (Nimuendajú). Šie autoriai įnešė reikšmingą indėlį į Brazilijos etnologiją. Jie įsitraukė į plačius lauko tyrimus, paskelbė čionykščių Brazilijos gyventojų mitų rinkinius. Prieš šį iškilų Brazilijos etnologijos periodą apie Amazonijos gyventojų Vėžlio mitą, indėnų poeziją, Tupi kalbą ir kt. rašė Čarlzas Fridrichas Hartas (Charles Frederick Hartt) (1840–1878), Kanados gamtininkas, giliai besidomintis etnologija, dirbęs Brazilijos geologijos komisijos viršininku.

Šiuo darbu siekiama pristatyti vietinių Brazilijos gyventojų etnoastronomines žinias, ypatingą dėmesį atkreipiant į Tupi-Guranų ir Apinaje etninių grupių medžiagą. Etnoistoriniai duomenys yra lyginami su šiuolaikinių lauko tyrimų medžiaga.

Vertė Jonas Vaiškūnas

A NEW ATTEMPT TO DATE THE XIA, SHANG AND WESTERN ZHOU DYNASTIES BY SOLAR ECLIPSES

GÖRAN HENRIKSSON

Abstract

The identification of six significant solar eclipses during specific years of the reigns of ancient Chinese kings from the Xia, Shang and Western Zhou Dynasties has made it possible to establish an absolute chronology back to the first year of King Yu, 2070 BC.

Keywords: Solar eclipses, Earth's rotation, Lunar Secular Acceleration, ancient Chinese Dynasties, ancient Chinese chronology.

Introduction

No original documents exist from the earliest dynasty, Xia, circa 2000 BC, but much later chronicles mention important solar eclipses during the reigns of the first kings of this dynasty. The earliest historical texts that contain systematic records of solar eclipses are the *Spring and Autumn Annals* (770-476 BC). Before that period, during the Xia, Shang and Western Zhou Dynasties, the solar eclipse records are vague and sporadic. Even if a text is well preserved and correctly translated, there may be no precise information about where the eclipse took place or in which month and day. An important method for eliminating false solutions is to find a reference to the day in the *ganzhi* 60-day cycle, which is known to have been used uninterruptedly since at least the 13th century BC.

The lengths of the reigns of Chinese rulers prior to 841 BC are still uncertain and during the 20th century several attempts were made to identify ancient eclipse records in order to date the earliest dynasties, for instance Kevin D. Pang (1987). In 1986, F. R. Stephenson and M. A. Houlden published the *Atlas of historical eclipse maps, East Asia 1550 B.C.-A.D. 1900* in order to finally solve the problems concerning the dating of the Chinese solar eclipses. Unfortunately this extensive publication was not a major step forward and, when it proved that not one of the oldest solar eclipse records could be identified, Stephenson came to the conclusion that the ancient Chinese texts were more or less useless. On the other hand, one cannot expect that Stephenson's method is sufficiently accurate for these early epochs because it consists mainly of extrapolations based on a value for the sidereal lunar secular acceleration, -26 ±2 arc seconds/century^2, determined from an analysis of the transits of Mercury 1677-1973 (Morrison and Ward 1975). In the same solution, the excess motion of the perihelion of Mercury was found to be +41.9 ±0.5 arc seconds/century, which deviates by 1.13 arc seconds/century from the prediction by Einstein's general theory of relativity, confirmed by other investigations.

Later an official Chinese group of archaeologists, astronomers, and historians started the Xia-Shang-Zhou Chronology Project (2000) to establish a historical reference frame. Astronomers lead by Ciyuan Liu, National Time Service Center at the Chinese Academy of Sciences, made new calculations with different values for the braking of the Earth's rotation (Liu, Liu and Ma 2003). With this method it was possible to make several new identifications, but it was mostly impossible to find a unique solution.

The author's method and earlier results

In 1985 I started to test my computer program by making comparisons with the Chinese solar eclipse records, but I soon realised that it was not possible to both determine one's own computation parameters and to identify the unknown dates for solar eclipses over such a wide area. The only Chinese solar eclipse record that gave a convincing solution was the so-called "double dawn" eclipse in Zheng, during the Zhou Dynasty, which could be dated to 899 BC. This result was presented in 1996 at the Oxford V Symposium in Santa Fe, Henriksson (2005). After the successful identification of the two total solar eclipse records in Babylon separated by 301/300 years with the total solar eclipses in 1859 BC and 1558 BC, it was possible to date the Old Babylonian Kingdom, the Old Assyrian Kingdom, the Old Hittite Kingdom and the 13th-20th dynasties in

Egypt, as presented in papers at the SEAC 2002 Conference in Tartu, Henriksson (2006) and at the SEAC 2004 Conference in Kecskemet, Henriksson (2007).

In my computer program I have always used Carl Schoch's values for the sidereal lunar secular acceleration, -29.68 arc seconds/century^2, and for the braking of the rotation of the earth, 36.28 seconds/century^2 (Schoch 1931). He calibrated the apparent acceleration of the moon from a very accurate direct observation, by Timocharis, of an occultation of Spica by the moon in 283 BC, visible in Alexandria, which gives a 2200-year-long time basis. This is more than 7 times longer than the 300-year interval primarily used to calibrate the corresponding parameters in the eclipse calculations by Stephenson *et al.* since 1984.

In the paper by Liu *et al.* (2003) there is a critical discussion of the different interpretations of the ancient texts that mention possible solar eclipses. When I compare my result with the historically possible alternative solutions for the ancient Chinese solar eclipses, suggested by Liu and his group, there is always one solution in common. All my dates are given in the Gregorian Calendar.

Eclipses during the Xia Dynasty

Three Miao eclipses. According to tradition, Emperor Yao had big problems with the flooding of the large Rivers and the skilful Gun was ordered to solve these problems. However, after nine years the situation had not improved, the emperor lost patience, and Gun was sentenced to death. Yu, the son of Gun, was promoted to fulfil his father's work and he was very successful and became a great hero.

After that there was great disorder among the Three Miao tribes who probably occupied a large area in the Yangtze River valley and south of the Huai River. There is a reference to eclipses related to the rebellion of these people in the "Against Aggressive Warfare" chapter of the *Mozi*, which reads as follows: "In ancient times, the three Miao tribes rebelled massively. Heaven ordered them to be killed. The demoniac Sun rose at night. It rained blood for three mornings. A dragon appeared in the temple. Dogs cried in the markets. In the summer there were floods, and the earth cracked until water gushed forth. The five grains mutated. The people were thus greatly frightened. Gaoyang thus issued an order in the Dark Palace. Yu himself upheld the auspicious command from the heaven to attack the Miao."

These bad omens are also mentioned in other texts and, according to them, this event occurred before the great Yu founded the Xia Dynasty. Pang and Yau (1996) have proposed that both "... the Sun rose at night" and "...the demoniac Sun rose at night" refer to the phenomenon of a double dusk or a double dawn.

From a combination of all available historical sources, the Xia-Shang-Zhou Chronology Project (2000) has chosen 2070 BC as the starting year of the Xia Dynasty (i.e. the year when Yu ascended the throne). Liu *et al.* (2003) found six possible double dusk eclipses and five possible double dawn eclipses between 2250 BC and 1850 BC using a fixed value, -26.0 arc seconds/century^2, for the lunar secular acceleration, but allowing the parameter *c*, the braking of the earth's rotation, to vary. With $c = 30 - 33$ seconds/century^2, a total eclipse took place in the region of the Three Miao at sunset on April 29, 2072 BC, which is in very good agreement with the date from the Xia-Shang-Zhou Chronology Project. However, this method is *in principle not correct* because the energy to accelerate the moon is taken from the deceleration of the rotation of the Earth. Every value for the secular acceleration of the moon corresponds to a unique value for the braking of the rotation of the Earth. (The sum of the angular momentum is constant.)

According to my calculations there were in fact three cases of "rising of the sun during the night" eclipses within four years at the time when Yu got the auspicious command from heaven to attack the Three Miao. The text also mentions that it rained blood on three mornings. The people living in the valley of the Xia-dominated Yellow River considered the Three Miao people living in the Yangtze River valley as uncivilised barbarians with a strange religion. The disorder in the heavens, mainly above the Three Miao territory, was a sign for Yu to punish them:

2075 BC, June 11: Annular solar eclipse before sunset in the eastern part of the area occupied by the Three Miao, and central in the Xia capital Luoyang, with magnitude 0.960.

2072 BC, April 11: Total solar eclipse before sunset completely covering the western area of the Three Miao.

2071 BC, March 31: Total solar eclipse at sunrise to the east of the Three Miao area, but the magnitude was still very great in the south-eastern part of their area.

These dramatic solar eclipses served later as a historical benchmark for the beginning of the Xia-Dynasty in 2070 BC, see Fig. 1.

Zhongkang eclipse. Zhongkang was the fourth King of the Xia Dynasty. From his fifth year there is the following passage in the "The Punitive Expedition of Yin" chapter of the *Book of Documents* that may be re-

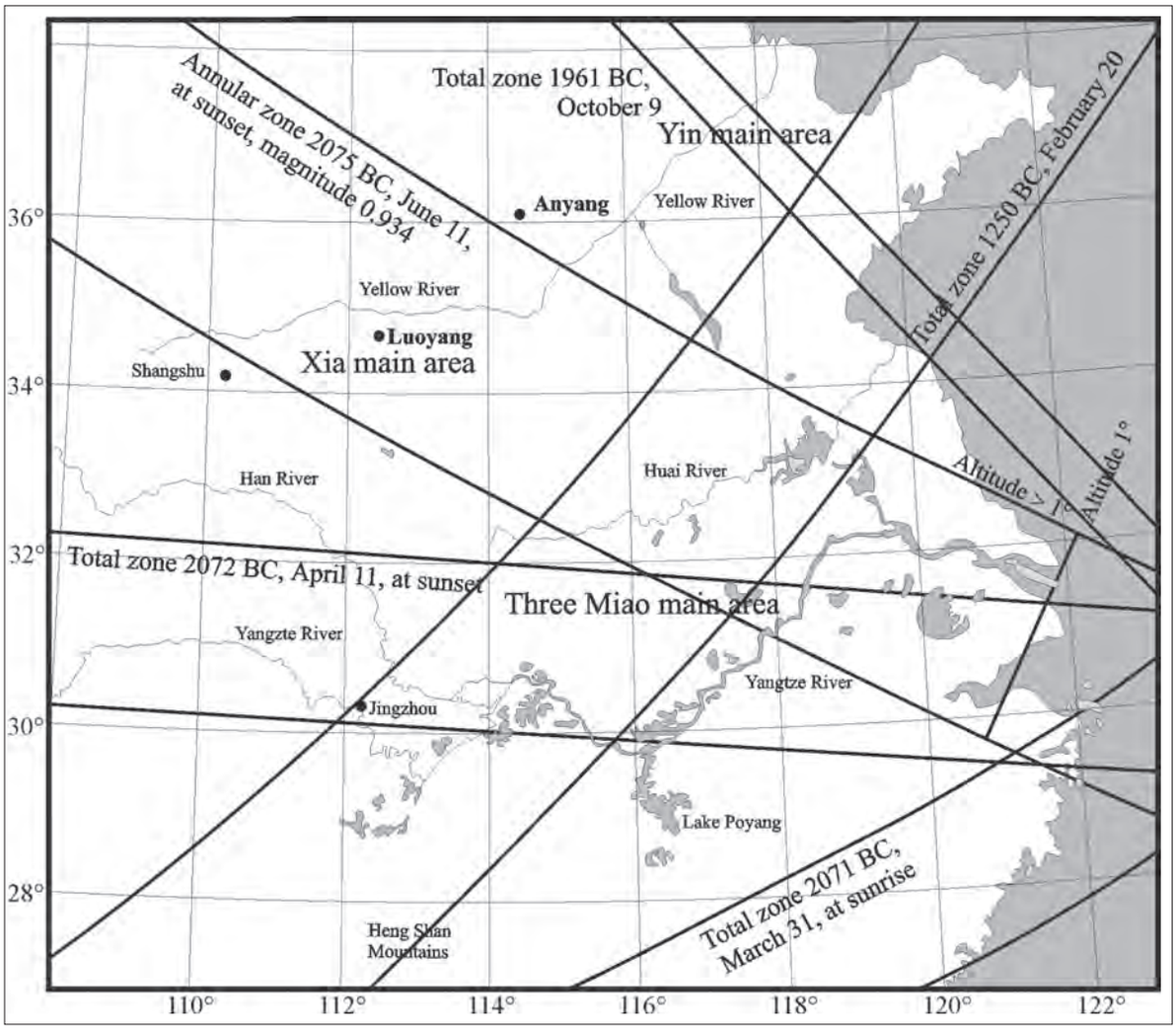

Fig. 1. Map of Central China with zones of total and annular eclipses.

garded as a reference to an eclipse: "On the first day of the last month of autumn, the sun and the moon did not meet harmoniously in Fang. The blind musicians beat their drums; the inferior officers and common people bustled and ran about. He and Ho, however, as if they were mere impersonators of the dead in their offices, heard nothing and knew nothing, so stupidly went they astray from their duty in the matter of the heavenly appearances, and rendering themselves liable to the death appointed by the former kings" (Legge 1893, p.165-166).

The prince of Yin was ordered to punish the astronomers He and Ho. The reason may have been that the eclipse was total in Yin and not in the Xia capital Luoyang. In the Xia-Shang-Zhou Chronology Project, Wu Shouxian (2000) proposes 2043, 2019, 1970 and 1961 BC as possible dates for this event.

According to my calculations this fits perfectly with the solar eclipse in 1961 BC, on October 9, which was total in the Yin territory in the eastern part of the Yellow River valley, but only had magnitude 0.865 in Luoyang, see Fig. 1. The central star in the Chinese constellation *Fang* was π Sco and the sun was close to this star in 1961 BC, on September 29. This means that the solar eclipse took place 10 days after the passage of the central star of the constellation Fang.

Western Zhou Dynasty

It is written in the Old Version of the *Bamboo Annals* that "During the first year of King Yi the day dawned twice at Zheng." Yi was a King of Western Zhou and the first year of his reign has been dated to between 966 BC and 899 BC by different authors. K. Pang (1987) analyzed this eclipse and dated it correctly to 899 BC, but his calculation of the brightness of the morning sky was not performed correctly.

At the Oxford V Conference in Santa Fe 1996 I presented my own calculations of the brightness of the morning sky for the annular solar eclipse on April 11,

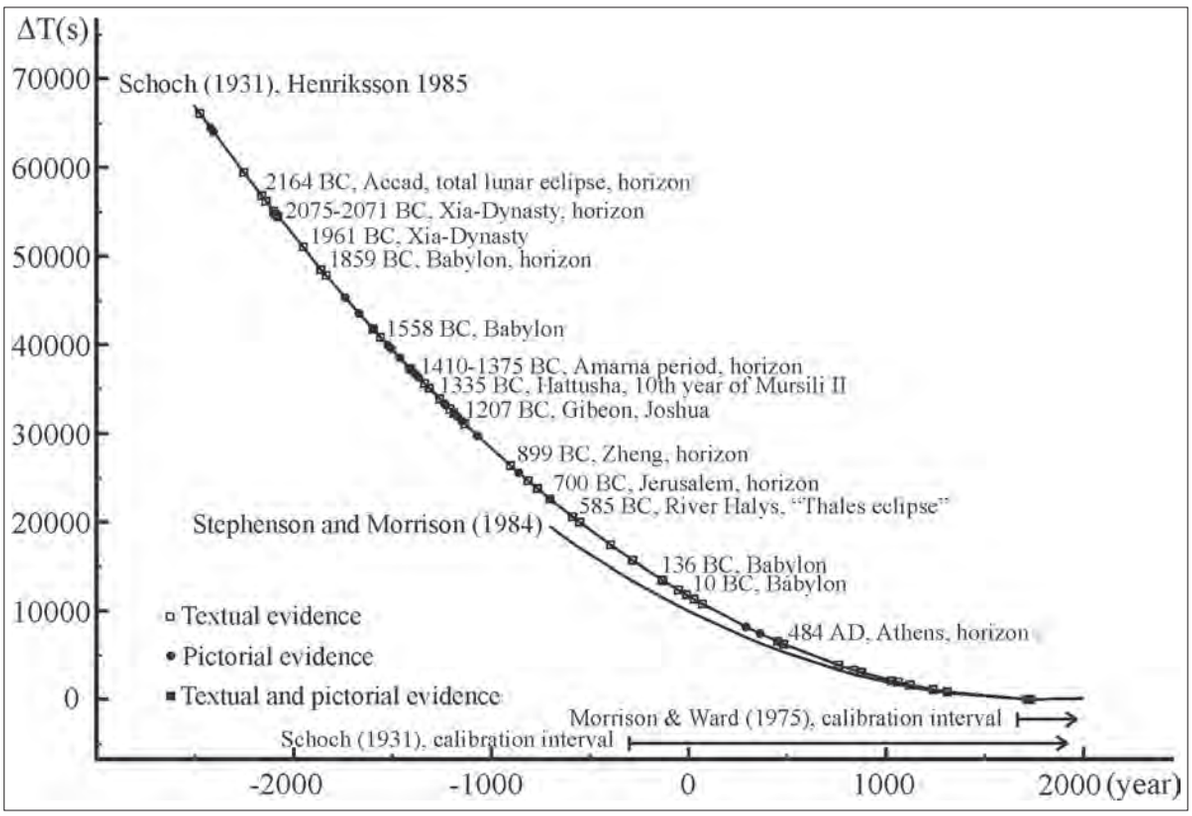

Fig. 2. The parabolic time-shift, ΔT, due to the tidal deceleration of the rotation of the Earth as a function of time with the coefficient 36.28 from Schoch (1931) and 31.0 from Stephenson and Morrison (1984). The unit for the coefficients is seconds/(century)^2 and the time is reckoned from 1800.0. The symbols correspond to identified solar eclipses, mostly total or annular. Most of the identified eclipses can be found in Henriksson (2005, 2006 and 2007).

899 BC, at 04.49 local mean solar time, ending 2 minutes before sunrise (Henriksson 2005).

A similar correct result is also independently presented by Liu, Liu and Ma (2003).

Discussion of Methods Used to Calculate Solar Eclipses

Almost all modern computer programs for the calculation of ancient solar eclipses are based on the theory by Stephenson and Morrison (1984) with tables for ΔT = (the time on the uniform time-scale Terrestrial Time (TT)) – (the Earth's rotational time-scale Universal Time (UT)). Before the introduction of atomic clocks in 1955 the Terrestrial Time must be calculated indirectly from old telescopic observations expressed in Universal Time (Martin 1969). There is no way to avoid circular arguments and the interval is so short that non-tidal effects are incorporated in the parabolic fit of ΔT, Fig. 2. Stephenson *et al*. extrapolate back to the ancient eclipses via low quality lunar eclipses. Great deviations are interpreted as unknown non-tidal effects (Morrison and Stephenson 2002). All time-dependent parameters in the theory by Schoch are expressed in UT. He used the best-defined ancient solar eclipses in his calibration, including Thales' eclipse in 585 BC and observations by Hipparchos. None of the solar eclipses plotted in Fig. 2 can be calculated correctly by Stephenson and his followers, not even the late solar eclipse in Athens in 484 AD, and they are working hard to explain why. I have removed non-tidal effects from Schoch's sidereal lunar secular acceleration and determined an improved value, -29.65 arc seconds/century^2.

Acknowledgments

I would like to thank Mary Blomberg, Dept. of Archaeology and Ancient History, Uppsala Univ., Sweden, and David Pankenier, Dept. of Chinese, Lehigh Univ., Bethlehem, USA, for their critical reading of my paper.

References

HENRIKSSON, G., 2005. Solar eclipses, supernova and Encke's comet on Swedish rock Carvings. In: J.W. FOUNTAIN, R.M. SINCLAIR, eds. *Proceedings of the Fifth Oxford International Conference on Archaeoastronomy, Santa Fe, August 1996*, Carolina Academic Press, Durham, North Carolina.

HENRIKSSON, G., 2006. A new Chronology of the Old Babylonian Kingdom and Ur I-III based on identification of solar and lunar eclipses. In: M. KOIVA, I. PUSTYLNIK and L. VESIK, eds. *Cosmic Catastrophies: a collection of articles* (Proceedings of the European Society for Astronomy in Culture (SEAC) 2002. Tartu, 63-70.

HENRIKSSON, G., 2007. Chronology for the Egyptian Pharaohs of the Amarna period and the Israeli leaders Moses and Joshua by correlation with eight solar eclipses. In: E. PÁSZTOR, ed. *Archaeoastronomy in Archaeology and Ethnography* (Papers from the annual meeting of the SEAC (European society for Astronomy in Culture) held in Kecskemét in Hungary in 2004). British Archaeological Reports International Series, 1647, 133-148.

LEGGE, J., 1893. *The Shoo King*. Vol. 3 of *The Chinese Classics: with a Translation, Critical and Exegetical Notes, Prolegomena and Copious Indexes*. Reprinted 1966, Taibei: Wenxing shudian.

LIU, C., LIU, X. and MA, L., 2003. Examination of early Chinese records of solar eclipses. *Journal of Astronomical History and Heritage*, 6(1), 53-63.

MARTIN, C.F., 1969. *A study of the rate of rotation of the Earth from occultations of stars by the Moon 1627-1860*. PhD Thesis, Yale University.

MORRISON, L. V. and WARD, C. G., 1975. An Analysis of the transits of Mercury: 1677-1973. *Mon. Not. R. Astr. Soc.*, 173, 183-206.

MORRISON L. V. and STEPHENSEN F. R., 2002. Ancient Eclipses and the Earth's Rotation. In: H. RICKMAN, ed. *Highlights of Astronomy,* 12. San Francisco, CA: Astronomical Society of the Pacific, 338-341.

PANG, K.D., 1987. Extraordinary floods in early Chinese history and their absolute dates. *Journal of Hydrology*, 96, 139-155.

PANG, K.D. and YAU, K.K., 1996. "The need for more accurate 4000-year Ephemerides". In: S. FERRAZ-MELLO, et al. eds. *Dynamics, Ephemerides and Astrometry of the Solar System*. Dordrecht: Kluwer, Holland, 113-116.

PANG, SUNJOO, 1977. *A Study of Western Chou Chronology*, PhD diss. Toronto Univ.

SCHOCH, C., 1931. Die säkulare Accelaration des Mondes und der Sonne. *Astronomische Abhandlungen, Ergänzungshefte zu den Astronomischen Nachrichten*, 8, B2. Kiel.

STEPHENSON, F. R. and MORRISON, L. V., 1984. Long-term changes in the rotation of the Earth: 700 B.C. to A.D. 1980. *Philosophical Transactions of the Royal Society,* Vol. A 313, 47-70.

STEPHENSON, F. R. and HOULDEN M. A., 1986. *Atlas of Historical Eclipse Maps East Asia 1550 B C.-A.D. 1900*. Cambridge: Cambridge University Press.

WU SHOUXIAN, 1998. A second look at the Zhongkang solar eclipse record. *Studies in the History of Natural Sciences*, 17, 250-253 (in Chinese).

XIA-SHANG-ZHOU Chronology Project, 2000. *The Concise Report of Xia-Shang-Zhou Chronology Project, 1996-2000*. World Book Company, Beijing (in Chinese).

Received: 2 November 2007; Revised: 29 September 2008

NAUJAS BANDYMAS DATUOTI SIA, ŠANG IR VAKARŲ DŽOU DINASTIJAS PAGAL SAULĖS UŽTEMIMŲ DUOMENIS

Göran Henriksson

Santrauka

Nėra išlikusių originalių dokumentų apie ankstyvąsias Sia dinastijas, valdžiusias apie 2000 m. pr. m. e., bet daug vėlesnėse kronikose minimi svarbūs saulės užtemimai pirmųjų valdovų valdymo laikotarpiu. XX a. keletą kartų buvo bandyta rasti senovinių įrašų apie saulės užtemimus, siekiant datuoti ankstyvąsias dinastijas (žr., pvz., Pang 1987). Oficiali Kinijos archeologų, astronomų ir istorikų grupė 2000 m. pradėjo Sia-Šang-Džou chronologinį projektą (Xia-Shang-Zhou 2000), siekdami nustatyti istorinių įvykių seką. Ciyuan Liu vadovaujami astronomai atliko naujus skaičiavimus, atsižvelgdami į Žemės sukimosi netolygumo reikšmes (Liu, Liu and Ma, 2003).

Sugretinus visus turimus istorinius šaltinius Sia-Šang-Džou chronologinis projektas (2000) Sia dinastijos pradžią nustatė 2070 m. pr. m. e. Prieš didžiajam Ju įkuriant Sia dinastiją, tekstuose buvo minimi bloga pranašaujantys ženklai, kaip antai, „demoniškoji Saulė patekėjo naktį". Tai galėjo reikšti vadinamąjį dvigubų sutemų ar dvigubos aušros fenomeną, susijusį su saulės užtemimu saulėtekio arba saulėlydžio metu. Mūsų skaičiavimais, trys vadinamieji „saulės patekėjimai naktį" galėję būti ketverių metų laikotarpiu įvykę trys saulės užtemimai tuo laiku, kai Ju sulaukė palankaus ženklo iš dangaus pulti San Miao („trejų Miao") gentį. Svarbiausias iš tų saulės užtemimų įvyko 2072 m. pr. m. e. balandžio 11 d. ir buvo matomas kaip visiškas saulės užtemimas visoje pagrindinėje San Miao teritorijoje. Penktaisiais ketvirtojo Sia valdovo Džongkango metais yra nuoroda į saulės užtemimą, kuris tiksliai sutampa su visišku saulės užtemimu 1961 m. pr. m. e. spalio 9 dieną.

Senojoje „Bambuko metraščių" versijoje taip pat rašoma, kad „pirmaisiais valdovo I valdymo metais Dženge diena išaušo du kartus". I buvo vakarų Džou valdovas, ir šį reiškinį galima aiškinti žiediniu saulės užtemimu prieš pat saulėtekį 899 m. pr. m. e. balandžio 11 d., pirmą kartą identifikuotą Pang Sunjoo (1977).

Vertė Jonas Marozas, Jonas Vaiškūnas

ELEVENTH-CENTURY SUPERNOVAE: ANOTHER WAY TO READ THE MEDIEVAL SOURCES?

ANTONELLA GHIGNOLI, ANDREA MARTOCCHIA, VITO FRANCESCO POLCARO

Abstract

The supernova explosions of 1006 AD and 1054 AD are, probably, the astronomical events most carefully studied through the analysis of historical sources. But contradictions are still present in several sources concerning SN 1054 and the historical records are not consistent with the astronomical data. This short analysis aims to highlight all these aspects.

Key words: historical supernovae, SN 1006, SN 1054, Crab Nebula, Middle Ages, historical astronomy.

The Eleventh-Century Supernovae

Two Supernovae (SN) were seen to explode during the 11th century: the first in 1006 and the second in 1054. SN 1006 presents no problem either from the historical or the astrophysical point of view, since there is good documentary evidence of its observation and the light curve that can be deduced from these sources agrees perfectly with the physics of the explosion of a Type Ia Supernova, as expected given the nature of its remnant. But it is not easy to study SN 1054 (or indeed to recognize it at all) in the historical sources. SN 1054 should have been much higher in the sky, and therefore much more visible than SN 1006 in the Northern Hemisphere; but the number of claimed historical references to SN 1054 is less than one half of the number of references to SN 1006. Work on the interpretation of Song Empire sources is still in progress (see for example Pankenier 2006), but despite much research and many publications, no convincing European references to SN 1054 have been uncovered.

Several explanations have been proposed to account for the relatively 'scarce' number of medieval European references: an absence of astronomical knowledge; censorship by the Roman Catholic Church; the supernova was unusually faint; and there was an unusual period of bad weather. But all these arguments are untenable and actually incorrect, because they ignore:

1. the political organization of the Church in the framework of the German Empire and of the Kingdom of Italy in the 11th. century;
2. the social dynamics of early medieval culture and the role of monasteries as individual *scriptoria*;
3. the development of medieval 'historiography' (histories – *historiae* – annals – *annales* – chronicles – *crhonicon*) and the evolution of this genre (McCormick 1975; Van Houts 1995); and last but not least
4. the phenomenology of the texts and their transmission.

It is certainly true that the first renaissance of astronomical science in Europe happened in the late 11th century, after the discovery of the Arabic scientific tradition and the circulation of its texts in Europe (Poulle 1981). Nevertheless comets, stars and the like were known, seen and often recorded. It is important to realise that these phenomena were also narrative elements in a genre of text that – despite the difficulty for us in characterising it – had a clear rhetoric and, most important of all, a clear aim. In fact, there are many references to astronomical phenomena (bright lights in the sky, stars etc.) in early medieval historiography: almost every year a bright new 'star' or an unusual light in the sky were registered in the *annales* or chronicles of some monastery or church, or else in some dynastic chronicles or town chronicles, or else in the *vitae* – biographies – of bishops, saints, or popes. The real problem for us, as historians, is to ascertain whether or not any given reference is a true description of a real phenomenon (see, e.g. Ghignoli and Polcaro 2007).

Besides this, our present-day knowledge of the Crab Nebula and Pulsar suggests that the original explosion was not a weak one, visible to the naked eye for up to two years. It is ludicrous to postulate a two-year-long period of cloudy skies.

The Song Empire Sources and the Problem of the SN 1054 Light Curve

The official history of the Song Dynasty (*Song shi*) was the first to be suggested as witnessing the birth of the Crab Nebula (Hubble 1928). Mayall (1936) found

that this source reports the date when the Song Emperor Renzong was informed by the astronomer Yang Weide about the appearance of the 1054 "guest star" (4th July), its luminosity on this date ("like Venus"), the length of the period during which this star was visible in daylight (23 days), the date when the Emperor was notified of the last sighting (April 17th, 1056) and the "guest star"'s position in the sky.

These data made it possible to identify, though with some problems, this event with the explosion of the precursor of the Crab Nebula (Mayall and Oort 1942; Duyvendak 1942) and Pulsar.

Following the traditional interpretation (see, e.g., Clark and Stephenson 1977), the official Song Court texts thus give us two photometric points: on July 4th 1054 it was "like Venus", i.e. of visual magnitude $\cong$ -4.5 , and on April 17th 1056 it was "visible no more", i.e., of visual magnitude $\geq$ 5.5 . However, as was stressed by Collins et al. (1999), if we assume July 4th 1054 to be the date of the Supernova explosion, these two photometric points do not fit any core-collapse supernova light curve, even taking into account the large error bars both in luminosity and time.

On the other hand, since SN 1054 was certainly a core-collapse SN (having generated a pulsar), the conclusion is unavoidable that. there is a contradiction between the usual reading of the "official" Song Court report and the present-day astrophysical models. A great deal of theoretical work has been done in order to build up an astrophysical model that can explain the SN 1054 light curve given by the official Song Court report (see, e.g., Sollerman et al. 2001; Utrobin 1978; Swartz 1991, and references therein). However, none of these models is fully convincing.

The Complete Set of Data Concerning SN 1054

Collins et al. (1999) have listed all the historical observations that might possibly relate to the Crab Supernova. Polcaro and Martocchia (2006) attempted a hypothetical reconstruction of the SN 1054 light curve from this data set. However, a more detailed analysis revealed that none of these sources is fully reliable: most of the dates are actually highly speculative, and several Western and Eastern sources must be further checked in order to be sure that they actually refer to the Supernova.

Consequently, all we can be reasonably sure about to date, from sources all around the world, is that something unusual, probably the SN, was seen in the sky here and there between April and the beginning of July 1054. Since at this time of year the Crab is only over the horizon during the daytime, we can specify a lower limit of v<-4 between April and June 1054.

Furthermore, the Song Court sources need to be interpreted with care. Let us assume that SN 1054 exploded on April, as seems to be indicated at least by the Arabic source (Brecher et al. 1978; Guidoboni et al. 1994) as well as by the most recent translation of the *Song huiyao* (*"Composition of Essential Documents of the Song Dynasty"*), which records the date of first sighting as 27 April 1054 (Pankenier 2006). Accordingly, the supernova must have been visible in China during the solar eclipse of May 10th 1054. This can be also deduced from a Liao Kingdom chronicle (though this source also presents some problems – see, e.g. Xu et al. 2000). Following standard Chinese astrology, the omen was clear: the Sun represents the Emperor (actually, the Emperor was the Sun) and the eclipse is a danger to the Emperor's life. However, the simultaneous presence of the "guest star" indicates the loss of Heavenly support (see, e.g., Sun Xiaochun 2001), and so the danger is unavoidable: the Emperor must leave or die. It is not surprising that such an omen could not be accepted without major political problems. On the other hand, it would have been difficult to justify a different omen from the presence of a "guest star" during a total solar eclipse: if this coincidence actually took place, then it would have been necessary to manage the situation somehow (see, e.g., Polcaro 2007). We stress that we are not claiming that the report from Yang Weide is "false": we are just suggesting that early observations of the "new star" during the solar eclipse might not have been included in the final official records, in order to "decouple" the solar eclipse from the "guest star". On the other hand, considering the precision of the reports by the Song Court's "Astronomical Bureau" official, we can be reasonably sure that on July 4th 1054 the star was "like Venus" (v $\cong$ -4.5) and that on April 1056 it had disappeared (i.e. v>5.5).

The actual light curve that can be deduced from the complete set of data concerning SN 1054 available at the present time is thus the one represented in Fig. 1:

As can be seen, the curve is perfectly compatible with the model of a type IIp Supernova, with a production of 0.07 solar masses of ^{56}Ni (see, e.g. Sollerman et al. 2001).

The Problem of the Medieval European Sources Concerning SN 1054

Guidoboni et al. (1992) and Collins et al. (1999), who have studied the three main references to SN 1054 (*De obitu Leonis* by Libuinus, the *Tractatus de ecclesia S.*

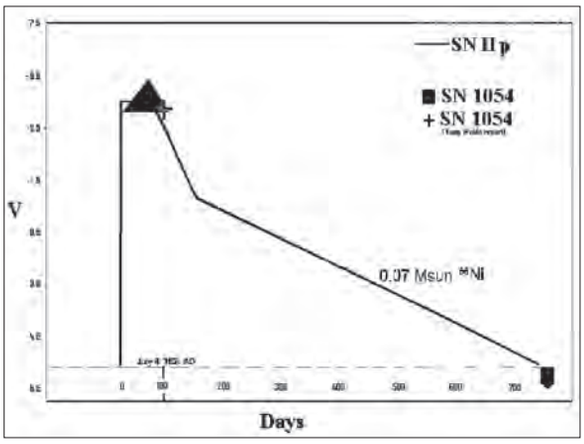

Fig. 1. Comparison between a Type IIp Supernova model and the available photometric data of SN 1054 deduced from the historical sources

Petri Aldenburgensi and the so called *Rampona Chronicle*), worked with an inappropriate method: they read each of those texts as if they belonged to the same vague 'genre' of historical works. This assumption can be countered, very briefly, as follows.

1. *De obitu Leonis* is a *libellus* – a "standard" genre of text created in order to support a request for canonization – for Pope Leo IX. The episode of "the innumerable brilliant lamps" is a recurring theme (*topos*) of the genre (*kratophania*) yet it does not appear in the most ancient (12th-century) and only preserved (in the Biblioteca Medicea Laurenziana, Florence) manuscript of this text. Thus we conclude that *De obitu Leonis* by Libuinus does not represent a record of a real celestial phenomenon.

2. *Ttractatus de ecclesia S. Petri Aldenburgensi* – if it is not an antiquarian forgery – belongs to the genre of the "legend of the foundation" of a church and it is not hard to demonstrate that Saint Leo IX (the pope) played a central role as "virtual" and much needed founder of the church of St. Peter. This text is not a 'history' of facts but a list of miracles.

3. The only certain reference to SN 1054 can be found in the so-called *Rampona chronicle* (which is part of a set of texts) and the recently proposed interpretation of the crucial passage (Collins et al. 1999) is sufficient, although not completely correct. In fact, the author of this late Italian town chronicle (of Bologna), Bartolomeo della Pugliola, wrote between 1395 and 1420, and so was only a contemporary witness of events that happened during that period; he "cut and pasted" news from earlier periods that he obtained from several different sources (Zabbia 1999). Incidentally, taking into account the sound proposal by Collins et al. (1999), the Latin expression "in circuitu prime lune" can be properly translated as simply "on the first day of the new moon".

Conclusion

It is a fact that SN 1006 was brighter than SN 1054: the first one was a Type Ia supernova while the second one was an intrinsically less luminous Type IIp and they were both at a similar distance (2.18 kpc and 1.83 kpc respectively).

However, this fact alone does not explain the difference in the number of historical sources concerning SN 1006 (19 independent sources found all over the world) and SN 1054 (only 7 or 8).

We suggest that the main explanation is in their position in the sky as well as the explosion dates.

Both supernovae exploded in April, but SN 1006 (R.A 15h 02m 48.4s) did so when it was nearly in opposition to the Sun and was thus immediately recognized everywhere as a very impressive star (although it was often called "a comet" for political or cultural reasons).

SN 1054 (R.A. 05h 34m 31.97s), on the other hand, exploded when it was nearly in conjunction with the Sun. Thus it took some time before it was clearly seen and recognized as "a star" (apart from in China, where it should have be seen during the solar eclipse of May 10th 1054). When SN 1054 finally became visible at night, it was already three months old, and thus much less luminous and impressive for people with a scarce sky knowledge (such as the Europeans) as well as for people with very strong political reasons for ignoring it as long as possible (such as the Chinese).

Further study of the 11th-century supernovae needs to be undertaken, both from the historical and the astrophysical point of view.

References

BRECHER, K., LIEBER, E. and LIEBER, A. E., 1978. A Near-Eastern sighting of the supernova explosion of 1054**,** *Nature,* 273, 728.

CLARK, D. H. and STEPHENSON, F.R., 1977. *The Historical Supernovae.* Oxford: Pergamon Press, 1977.

COLLINS, G. W., CLASPY, W. P. , MARTIN, J. C., 1999. A Reinterpretation of Historical References to the Supernova of A.D. 1054. *Publ. Astron. Soc. Pacific*, 111, 871.

DUYVENDAK, J. J. L., 1942. Further Data Bearing on the Identification of the Crab Nebula with the Supernova of 1054 A.D. Part I. The Ancient Oriental Chronicles**.** *Publ. Astron. Soc. Pacific,* 54, 91.

GHIGNOLI, A., POLCARO, V. F., 2007. Eleventh Century Astronomical Events as Recorded in Contemporary European Sources. In: I. LIRITZIS, ed. *Mediterranean Archaeology and Archaeometry,* 6 (3 - special issue), 61-66.

GUIDOBONI, E., MARMO, C., POLCARO, V. F., 1992. La Supernova del 1054 nelle fonti europee. *Le Scienze*, 292, 24.

GUIDOBONI, E., MARMO, C., POLCARO, V. F. 1994. Do we need to re-date the birth of the Crab Nebula? *Mem. SAIt*, 65, 623.

HUBBLE, E., 1928. Novae or Temporary Stars. *Publ. Astron. Soc. Pacific Leaflet,* 1, 14.
MAYALL, N.U., OORT, J.H., 1942 Further Data Bearing on the Identification of the Crab Nebula with the Supernova of 1054 A.D. Part II. The Astronomical Aspects. *Publ. Astron. Soc. Pacific,* 54, 95.
MCCORMICK, M., 1975. *Les annales du haut moyen âge.* Turnhout: Brepols.
PANKENIER, D. A., 2006. Notes on translations of the East Asian records relating to the supernova of AD 1054. *Journal of Astronomical History and Heritage*, 9(1), 77
POLCARO, V.F. MARTOCCHIA, A., 2006. Supernovae astrophysics from Middle Age documents. In: E. J. A. MEURS, G. FABBIANO, eds. *Proceedings of the 230th Symposium of the International Astronomical Union "Populations of High Energy Sources in Galaxies"*. Dublin, Ireland 15-19 August 2005. Cambridge: Cambridge University Press, 264-268.
POLCARO, V F., 2007. The astronomical bureau during the Song dynasty. In: M.P. ZEDDA and J. A. BELMONTE, eds. *Lights and Shadows in Cultural Astronomy.* Isili, Sardinia: Associazione Archeofila Sarda.
POULLE, E., 1981. *Les sources astronomiques (textes, tables, instruments)*. Turnhout: Brepols.
SOLLERMAN, J., KOZMA, C., LUNDQVIST, P., 2001. Why did Supernova 1054 shine at late times? *A&A,* 366, 197.
SUN XIAOCHUN, 2001. La cartografia celeste In: *Storia della Scienza,* II. Rome: IEI 155.
SWARTZ, D. A., WHEELER, J., C., HARKNESS, R.P., 1991. Model light curves of linear Type II supernovae. *ApJ*, 374, 266.
UTROBIN, V. P., 1978. Supernova models with slow energy pumping and galactic supernova remnants. *Ap&SS*, 55, 441.
VAN HOUTS, E., 1995. *Local and Regional Chronicles.* Turnhout: Brepols.
XU, Z., PANKENIER, D.W., JIANG, Y., 2000. *East Asian Archaoeastronomy.* Amsterdam: Gordon and Breach Science Publishers.
ZABBIA, M., 1999. *I notai e la cronachistica cittadina italiana nel Trecento.* Roma: Istituto Storico Italiano per il Medio Evo.

Received: 2 November 2007; Revised: 20 October 2008

XI A. SUPERNOVOS – KITAS BŪDAS SKAITYTI VIDURAMŽIŲ RAŠYTINIUS ŠALTINIUS?

Antonella Ghignoli, Andrea Martocchia, Vito Francesco Polcaro

Santrauka

Skaityti viduramžių rašytinius šaltinius yra gana sudėtinga. Čia negalime vadovautis paprastu stereotipišku „viduramžių mentaliteto“ supratimu, ypač kai tuose tekstuose reikia rasti astronominę informaciją, kurią būtina palyginti tiek su stebimosios, tiek ir su teorinės šiuolaikinės „objektyviosios“ astronomijos žiniomis. Šis straipsnis iš naujo kelia klausimą dėl viduramžių „vakarietiškų“ šaltinių apie XI a. supernovų SN 1006 ir SN 1054 tyrimus. Minėti reiškiniai yra svarbūs šiuolaikinei astrofizikai, bet senoviniuose rašytiniuose Rytų šaltiniuose apie juos pateikiami neapibrėžti ir abejotini tvirtinimai (Polcaro and Martocchia 2006). Į iškylančius klausimus apie SN 1054 supernovos pasirodymą atsakymų ieškoma pasitelkus vadinamąją „Ramponos kroniką“ ir „Tractatus de ecclesia S. Petri Aldenburgensis“ (naujai apmąstant šio teksto kilmę ir istoriją) bei įžymųjį „Libuinus'o tekstą“ apie popiežiaus Leo IX mirtį: vienintelis šio teksto senovinis rankraštis tėra išlikęs ir saugomas Florencijoje (Biblioteca Medicea Laurenziana, ms. Conventi soppressi (Vallombrosa) 331; sec. XII). Šie atpasakojamieji šaltiniai aptariami platesniuose teorinių klausimų rėmuose, taikant filologinės kritikos ir istorinės astronomijos metodus.

Prieinama išvada, kad nė vienas iš tirtų šaltinių negali pateikti naudingų astrofiziniams tyrimams kiekybinių duomenų. Apie supernovą SN 1054 esama gana mažai istorinių šaltinių palyginti su SN 1006, tai iš dalies gali būti aiškinama pastangų tiriant Vakarų rašytinius šaltinius stoka bei patrauklios, bet istoriškai nemotyvuotos „Romos katalikų bažnyčios cenzūros“ teorijos pasekmėmis, kaip ir tuo faktu, jog SN 1006 buvo tikrai ryškesnė negu SN 1054. Mūsų manymu, pagrindinė priežastis, nulėmusi skirtingą dėmesį abiem supernovoms, slypi skirtingose jų padėtyse dangaus skliaute ir sprogimų datose.

Abi supernovos sužibo balandžio mėnesį, bet SN 1006 (R.A. 15h 02m 48.4s) sprogo būdama beveik opozicijoje saulei, taigi iškart galėjo būti visur atpažinta kaip labai įspūdinga žvaigždė (nors dėl politinių ar kultūrinių priežasčių dažnai buvo įvardijama kaip „kometa“). Priešingai, SN 1054 (R.A. 05h 34m 31.97s) sprogo, kai jos padėtis beveik sutapo su saulės padėtimi. Taigi turėjo praeiti šiek tiek laiko, kol ją galima buvo aiškiai pamatyti ir atpažinti kaip „žvaigždę“ (išskyrus Liao karalystę, kur ji buvo matoma jau 1054 m. gegužės 10 d. – saulės užtemimo metu). Kai SN 1054 tapo matoma naktimis, jau buvo praėję trys mėnesiai, ir ji turėjo būti ne tokia ryški ir įspūdinga.

Vertė Jonas Marozas

THE DATE OF PURIM AND CALENDARS IN THE BOOK OF ESTHER

HELEN JACOBUS

Abstract

The paper suggests that The Book of Esther contains astronomical and chronological information associated with the reign of Artaxerxes II. It further investigates a play on dates concerning an intercalary 12th Hebrew month and the eve of Passover, and possible mathematical references to Ancient Near Eastern and Jewish calendars.

Key words: Esther, calendars, astronomy, Artaxerxes, Bible, Adar, Jewish, Babylonian.

Introduction

The Masoretic Text (the canonised Hebrew Bible: abbreviation: MT) of the Book of Esther is, according to some opinions, dated to between the early Hellenistic and late Persian period, in the 5th century BCE, and between 167 BCE to 135 BCE for its final edit (Moore 1992; Clines 1984; Frohlich 1996). One of the characteristics of the Book of Esther is that there is a very clear chronology and an emphasis on the use of dates. I suggest that there is a reference to calendars which the reader is being invited to unravel.

The Esther Story

The Book opens with the information that King Ahasureus celebrated his kingship in the third year of his reign with a 180-day celebration and feast for all the noblemen of his 127 provinces. After that period he held another banquet for all the people of his citadel, Shushan (Susa) **(**Esth 1: 2-5). On the 7th day, the king summoned his queen, Vashti, to appear before the people and the noblemen wearing her crown, in order to display her beauty. Vashti refused, and the king asked his astrologers the "wise men, knowers of the times" (Esth 1:13) for their advice. They told him that he had to issue an edict throughout his all satrapies that all wives must obey their husbands, and to conduct a search for a beautiful young virgin to be queen instead of Vashti (Esth 1:16-2:4). This was done, and after an empire-wide beauty contest, Esther, the niece of Mordechai, a Jewish subject, was taken to the king. He made her his queen, but Mordechai instructed Esther to keep her Jewish identity secret. The king promoted one of his nobles, Haman, above all others. Haman ruled that all the royal officials should kneel down to him and pay him honour, but Mordechai refused. Haman planned to wipe out all the Jews throughout the Persian empire in response to Mordechai's disrespect towards him (Esth 3:1-6). In the 12th year of the reign of the king, lots, called *pur*, were cast before Haman to select a date when the extermination should take place. The lots were cast in the first month, Nisan, "from day to day and from month [to month] until the 12th month, Adar" (Esth 3:7). "On the 13th day of the first month" an edict was despatched throughout the 127 provinces that "on one day, on the 13th day of the 12th month, which is the month of Adar," all the Jews were to be annihilated (Esth 3: 12-13). Esther, her maids, Mordechai and the Jews of Shushan fasted and prayed for three days.

Esther then had an audience with the king in which she requested that he and Haman attend a banquet that she'd prepared. At that feast she requested that she and her people be spared. As the king had no idea that Esther was Jewish and therefore that she and her people had been the objects of his edict to slaughter the Jews, Haman was hanged (Esth 7:1-10). On the 23rd day of the 3rd month, Sivan, a second command in the name of the king, this time written by Esther, went out to all the 127 provinces giving the Jews permission to defend themselves on the "13th day of the 12th month, Adar," when the first order would come into force, as no edict from the king ever could be revoked (Esth 8: 7,9,12).

In chapter 9, the final chapter, we read that, "On the 12th month which is Adar on the 13th day of it," the day of destruction instigated by Haman, battle commenced (Esth 9: 1-12). Then, after the Jews killed a great number of their enemies in the Persian empire and in Shushan, Esther asked King Ahasuerus to grant permission to the Jews in Shushan only to carry out the second edict "tomorrow," (Hebrew: *machar*) as well. Also, for Haman's 10 sons to be hanged on the same day (Esth 9:12-13). The Jews of Shushan then gathered themselves on the "14th day of the month of Adar" and

killed 300 men (Esth 9:15) while the Jews in the provinces "stood for their lives, had rest from their enemies and slew 75,000 men" (Esth 9:16). On the "13th day of the month of Adar" the Jews in the provinces had rest and "on the 14th of it they made a day of drinking and celebration" (Esth 9:17). And the Jews in Shushan assembled on "the 13th of it," and "on the 14th of it" they rested, and "on the 15th of it" they made a day of drinking and celebration (Esth 9:18).

Textual ambiguities

In Hebrew, *machar* meaning "tomorrow" or "the next day" also means "the time to come," (Brown et al 2001), as it does in English, for example, Isa 22:13: "Let us eat and drink for tomorrow we die." There is, thus, an ambiguity in the text as it is possible that this extra day ("tomorrow") (Esth 9:13) for the Jews of Shushan was in the following month, and that "the 12th month," was to be intercalated. In chapter 3, the *pur* was cast before Haman throughout the 12th year of the king's reign, "from month to month from Nisan to the 12th month, Adar" (Esth 3:7). Therefore, the command to annihilate the Jews issued on the 13th day of the first month (Esth 3:12), must have taken place in the 13th year of the king's reign. If the day of reckoning, at Esther's request in chapter 9, was the 13th day of the 13th month in the 13th year of the king's reign, the cursed date divined by Haman's *pur* in chapter 3, the 13th of the 12th month, Adar (Esth 3:13), was transformed into a lucky date: a line-up of all the 13s, resulting in political and military success (Esth 9: 17, 18).

There are different ways of reading the text. The Jews of Shushan are described as assembling and slaying 300 men on the 14th of Adar (Esth 9: 15), which is assumed to be their extra day in Adar, although it has no month number (while everyone else could only fight on the 13 th of Adar, which is Month 12). The Sushan Jews also assembed on the 13th "of it" (Esth 9:18), a date with neither month name nor number. However, the assembly on the 13th "of it," may be the extra day: that is, the 13th of the second Adar (Adar II). If the Jews in the provinces assembled and slayed on the 13th of the 12th month, Adar, (Esth 9:1), yet also rested on the 13th of Adar, without a month number (Esth 9:17), that would be Adar II. In that case, only the Jews of Shushan were fighting on the 13th of Adar II. The following day, the 14th of Adar II, the Jews of Shushan would be resting after the battle, while the Jews in the provinces, who did not have an intercalary Adar, were preparing for Passover on Nisan 14, Passover eve. In accordance with the Talmud (Megilla 6:2), Purim, the festival which celebrates this book on Adar 14 (Esth 9:21) is, in an intercalated year, celebrated in Adar II. This suggests that the alternative reading may have some foundation.

Mythology

According to Julius Lewy (1939), Artaxerexes II is the strongest candidate for the character of Ahasuerus. He argues that Esth 3-9 is based on the threat felt by the Babylonian worshippers of Marduk, the literal meaning of the name "Mordechai," by the introduction of Mithras and Anahita into the Zoroastrian pantheon of deities during the reign of Artaxerxes II. Marduk is associated with Jupiter (Van Der Waerden 1949). Jupiter translated into Hebrew, is *tsedek*, meaning the Righteous One. David Clines (1992) dismisses any linkage between Mordechai and Marduk, though Paton (1976) noted: "These similarities of names are certainly striking and can hardly be accidental." Talmudic Jewish literature connects Esther to the planet Venus (Megilla 13a). In the Septuagint (the Greek translation of the Hebrew Bible, abbreviation: LXX) Esth 2: 7 reads: "Her name was called after the bright star in Greek, Astêra."

Archaeoastronomy

Co-incidentally, in the Babylonian Astronomical Diaries, a fragment of a short diary assigned a 13th month, [an intercalary Month 12] in year 13 of a "King Artaxerxes." Abraham Sachs (Sachs et al 1988) stated that he "tentatively assigned it [the fragment] to Artaxerxes II [ruled - 404 to -358]" on the basis that it indicated that Month 12 had 29 days. "According to Parker Dubberstein this fits only Artaxerxes II… Other evidence is the full appearance of Saturn in year 13 of Artaxerxes II. No such appearances are available in year 13 of Artaxerxes III [-359 to -338] and year 13 of Artaxerxes I [-464-424]."

Computing for 13 Adar II in the 13th year of the reign of Artaxerxes II: March 12, –391 Julian calendar [13 Adar II 3369]), offers arguable astrological testimony in support of a celestial configuration that could have contributed to the symbolism of the characters in the story (although, all such interpretation is by its nature subjective, and non-scientific). Venus was the evening star, setting when Jupiter was rising just ahead of the full moon in Virgo (sun in Pisces). [1] The full Saturn

[1] On March 12 -391 Julian calendar: computed for 6pm (for Babylon) as the day begins at sunset. Purim falls on 14th Adar which is mid-month (February-March). The full moon: 20º Virgo, sun: 17º Pisces, Venus 24º Aries (37º behind the sun), Jupiter: 12º Virgo. At sunset, the date changed to Adar 14, Purim.

would have been seen before sunrise, when the moon and Jupiter were setting. At Purim, the full moon is always in Virgo, the zodiac sign possibly represented by Queen Esther, the King's favourite virgin (Esth 2: 17). (The term *betulah* meaning virgin, and Virgo, also occurs in Esth 2:2, 3, 19).

The question as to whether a month could be intercalated for divination purposes to avoid a bad omen or prediction, turns out to have been a well-attested practice, recorded in earlier texts from Babylon. A.L. Oppenheim (1974) describes the craft of intercalation to avoid any malefic astronomical portents (Swerdlow 1998; Brown 2000; Williams 2002). Brown also argues that the Old Babylonian record of intercalary months suggests that some of the months were added for concerns other than keeping the moon on track with the sun. Possibly, he suggests, "royal whim." He observes that there is also evidence to suggest that intercalation could take place without the general population using it, therefore, possibly, not even knowing about it.

In another text, a report sent by a Balasi to the Assyrian King, there is a request for an intercalation, in part, because not to do so would be unlucky: "Let them intercalate a month; all the stars of the sky have fallen behind. Adar must not pass unfavourably; let them intercalate!" (Hunger 1992; Williams 2002). In other words, a 13th month (the second Adar) could be seen as lucky by itself, or more likely, the king was persuaded to avert a prediction of evil, which he would be told would occur if the calendar was not kept in check.

According to M.E. Cohen (1993) during the Achaemenid period, directives for intercalation came from priestly officials, whereas during the Babylonian period they came from the king. However, in Esther, reference is specifically made to the king's astronomer-astrologers ("wise men, knowers of the times," Esth 1:13). It is an open question, according to our theory, whether Esther requested an intercalary month, according to the Babylonian model, or if she knew that Adar was to be intercalated.

The logical implication is that Ahasuerus may have been agreeing to Esther's request for an intercalary month (the royal whim, for him, the line-up of lucky 13s for her) and that that would have been what the astronomer-astrologers, or the priests would have suggested he should do for good calendrical reasons, so that Adar did not, indeed, pass unfavourably. Furthermore, if intercalation could occur without people knowing about it, it would be possible that the Jews in Shushan could fight on the 14th of a month with no name (Esth 9: 18), aware of the intercalation, while Jews in the rest of the country were preparing for Passover, unaware of it. Such a scenario is in keeping with the many farce elements in the narrative.

The Achaemenid kings and intercalation

An examination of the intercalation tables compiled by Britton (2002, 2007) reveals that the 13th year of the reigns of all the Achaemenid kings from the late 6th century BCE after Cambyses II had an intercalated 12th month (XII_2). In the chart below, the 13th year from the accession of the kings from Darius to Artaxerxes III, who ruled for longer than 13 years, has been calculated from Britton's data. The fourth column shows that all of them had an intercalary 12th month in that year.

King	Accession Year	13th Year	Intercalary month
Darius I	-521	-508	XII_2
Xerxes	-486	-473	XII_2
Artaxerxes I	-464	-451	XII_2
Darius II	-423	-410	XII_2
Artaxerxes II	-404	-391	XII_2
Artaxerxes III	-358	-345	XII_2

Britton shows that the 19-year intercalation cycle in which seven years are intercalated every two or three years, began to be standardised in the 6th century BCE. From Xerxes' reign, the19-year cycle always began with an intercalated sixth month, a second Ululu (Hebrew month: Elul), a practice which continued into the Seleucid era. The exception was during the reign of Artaxerxes I, during whose rule no second Ululu appeared at all (in his reign the first years of the 19-year cycle had an intercalary Adar, instead). This was possibly because, Britton suggests, Artaxerxes I's predecessor (Xerxes I) was murdered during an intercalary Ululu.[2] That temporary calendar change echoes the idea that the intercalary month may have carried superstitious associations.

Britton's arrangement of the 19-year cycle is as follows:

1,** 2, 3,* 4, 5, 6,* 7, 8, 9,* 10, 11,* 12, 13, 14,* 15, 16, 17,* 18, 19

** Second Ululu (except during reign of Artaxerxes I)

* Second Adar

[2] Xerxes was murdered between 4-8 August –465 (Lewis 1992).

Of interest, is the fact that Otto Neugebauer (1955) placed the second Ululu in year 18 of the cycle (not at the beginning of the 19-year cycle, as does Britton), so, according to Neugebauer, the seven intercalary years, had a different order:

1,* 2, 3, 4,* 5, 6, 7,* 8, 9,*10, 11, 12,* 13, 14, 15,* 16, 17, 18,** 19

Neither arrangement has an intercalary 13th month. Yet, can it be chance that Darius I, Xerxes, Artaxerxes I, Darius II, Artaxerxes II and Artaxerxes III all had a 13th month in the 13th year of their reigns? It could be that the accession list was so-arranged in order for those regnal years to coincide with an intercalary Adar.

Esther's calendars

Finally, we have taken the number 127, the number of satraps in the empire,[3] and found that key dates are joined together by spaces of 127 days, if we use different calendars and intercalations. The calendars are: 1) the 360-day calendar[4] with an intercalary Ululu/Elul; 2) the 360-day calendar without an intercalation; 3) the 354-day calendar with an intercalary Adar; 4) the 354-day calendar without an intercalation. The dates 127 days apart also reflect the way different Jewish groups in late antiquity counted the days in the Jewish festival calendar (Talmon 2001), as well as the different kinds of calendars themselves. The biblical festivals I suggest, are: the 1st, 15th and 22nd day of the seventh month, Tishri – these are Rosh Hashanah, Tabernacles and the 8th day of Tabernacles (the Rejoicing of the Law) – and the different dates of the biblical festival of First Fruits, or Weeks, in the third month, Sivan (Talmon, ibid).[5] As the final editing of the Book of Esther is believed to have taken place in the second century BCE, it is possible that Esther could play with the variety of calendars that were known in the Ancient Near East and in Judasim, as well as reference the differences in calendar-keeping among the Jewish groups.

The suggested calendars in the Book of Esther, then, are as follows:

1.Sivan 23 to Tishri 1 using a **second Ululu/ Elul in the 360-day calendar**:

Calculation: 7 days (remainder of Sivan) + 30 days (Tammuz) + 30 days (Av) + 30 days (Ululu/ $Elul_1$) + 30 days (Ululu/$Elul_2$) = 127 days

2. Sivan 15 to Tishri 22 in the **360-day calendar**:

That is, 15 days (remainder of Sivan) + 30 days (Tammuz) + 30 days (Av) + 30 days (Ululu/Elul) + 22 days (in Tishri) = 127

3. Adar I 14 to Sivan 23 using an **intercalary Adar in the 354-day calendar**:

That is, 16 days (remainder of days in Adar I) + 29 days (Adar II) + 30 days (Nisan) + 29 days (Iyyar) + 23 days (in Sivan) = 127 days.

4. Sivan 6 to Tishri 15 in the **354-day calendar**:

That is, 24 days (remainder of days in Sivan) + 29 days (Tammuz) + 30 days (Av) + 29 days (Elul) + 15 days (in Tishri) = 127 days.

References and Select Bibliography

BRACK-BERNSEN, L., 2005. The 'days in excess' from MUL.APIN: On the "first intercalation" and "water clock" schemes from MUL.APIN. Centaurus, 47(1), 1-29.

BRACK-BERNSEN, L., 2007. The 360-Day Year in Mesopotamia. In: J. M. STEELE, ed. *Calendars and Years: Astronomy and Time in the Ancient Near East* . Oxford: Oxbow Books, 83-100.

BRITTON, J., WALKER, C., 1996. Astronomy and Astrology in Mesopotamia. In: C.Walker, ed. *Astronomy Before the Telescope.* New York: St Martin's Press, 46.

BRITTON, J., 2002. Treatments of Annual Phenomena in Cuneiform Sources. In: J. M. STEELE and A. IMHAUSEN, eds. *Under One Sky: Astronomy and Mathematics in the Ancient Near East.*, Munster: Ugarit-Verlag, 33, 36.

BRITTON, J., 2007. Calendars, Intercalations and Year-Lengths in Mesopotamian Astronomy. In: J. M. STEELE, ed. *Calendars and Years: Astronomy and Time in the Ancient Near East*. Oxford: Oxbow Books, 122-123.

BROWN, D., 2000. *Mesopotamian Planetary Astronomy-Astrology.* Groningen: Styx Publications, 121-122, 195, 196.

BROWN, F., DRIVER, S.R., BRIGGS, C.A., 2001. *The Brown-Driver-Briggs Hebrew and English Lexicon.* Peabody MA: Hendrickson, 563.

CLINES, D. J. A., 1984. *The Esther Scroll: The Story of the Story*. JSOT Supplement Series 30. Sheffield, 39-63.

[3] Esth 1.1; 8:9; 9:30; and LXX: Esth Add: 13:1; 16:1.

[4] The 360-day year, known from the MUL.APIN was used an ideal, administrative year and for astronomical calculations from the 3rd millennium BCE and was known in late antiquity. It had 12 months of 30 days each, and was the basis of our 360° circle and the zodiac wheel (Brack-Bernsen 2005; Britton 2007; Britton and Walker 1996). The question of its intercalation is a matter of scholarly discussion and debate, not analysed here. Our focus has been on calendars 3) and 4).

[5] The date for the festival of First Fruits in the 364-day fixed calendar in the Dead Sea Scrolls is Sivan 15. In the Pharisees' 354-day luni-solar calendar it is Sivan 6. The different dates are, in part, due to different interpretations of the meaning of the phrase "the day after the Sabbath" (*mi-machorat haShabbat*) in Leviticus 23:15-16.

CLINES, D J A., 1992. Mordechai. In: D. N. FREEDMAN, ed. *Anchor Bible Dictionary,* Vol. 4, New York: Doubleday, 903.

COHEN, M. E., 1993. *The Cultic Calendars of the Ancient Near East*, Bethesda, NY: CDL Press, 6.

FROHLICH, I., 1996. *Time and Times and a Half: Historical Consciousness in the Jewish Literature of the Persian and Hellenistic Eras.* Edinburgh: T & T Clark International, 144-145.

GREENFIELD, J. C., NAVEH J., 1984. Hebrew and Aramaic in the Persian Period. In: W.D.DAVIES and L. FINKELSTEIN, ed. *The Cambridge History of Judaism.* Vol 1: Introduction; The Persian Period. Cambridge: Cambridge University Press, 119-121 (115-129).

HUNGER, H., 1992. *Astrological Reports to Assyrian Kings,* Helsinki: Helsinki University Press, 57, lines 8-10.

LEWIS, D. M., 1992. Chronological Table. In: D.M. LEWIS, J.BOARDMAN, et al, eds. *The Cambridge Ancient History, 2nd Edition, Volume V: Fifth Century B.C.* Cambridge: Cambridge University Press, 13, 506-513.

LEWY, J., 1939**.** The Feast of the 14th Day of Adar. Hebrew Union College Annual, 14, 127-151.

MOORE, C. A., 1992. Esther. In: D. N. FREEDMAN, ed. *Anchor Bible* D*ictionary*, Vol. 2, New York: Doubleday, 640-641.

NEUGEBAUER, O., ed., 1955, reprint 1982, *Astronomical Cuneiform Texts.* New York: Springer-Verlag, 33.

OPPENHEIM, A. L., 1974. A Babylonian Diviner's Manual. *Journal of Near Eastern Studies*, 33(2), 197-220.

PATON, L.B., 1976 (reprint). *The Book of Esther* (S. R.DRIVER, A.PLUMMER, C. A. BRIGGS, eds. International Critical Commentary Series). Edinburgh: T & T Clark International, 88-94 (89).

REGEV, E., 2006. The Sadduccees, the Pharisees, and the Sacred: Meaning and Ideology in the Halakhic Controversies between the Sadduccees and Pharisees 2006. *Review of Rabbinic Judaism,* 9, 126-140.

REIDER, J., 1949. A New Ishtar Epithet in the Bible. *Journal of Near Eastern Studies*, 8(2), 105-107.

SACHS, A. J., HERMANN H., 1988. *Astronomical Diaries and Related Texts from Babylonia*. Vol. I. Vienna: Verlag der Osterreichische Akademie der Wissenschaften, 69.

SUITER, D. E., 1992. Artaxerxes. In: D.N. FREEDMAN, ed. *Anchor Bible Dictionary.* Vol. 1. New York: Doubleday, 463-464.

SWERDLOW, N.M., 1998. *The Babylonian Theory of the Planets.* Princeton: Princeton University Press, 8.

TALMON, S., 2001. Introduction. In: S.TALMON, J.BENDOV, U.GLESSMER, eds. *Discoveries in the Judaean Desert XXI: Qumran Cave IV (XVI): Calendrical Texts*. Oxford: Clarendon Press, 5-6.

VAN DER WAERDEN, B.L., 1949. Babylonian Astronomy, II. The Thirty-Six Stars. *Journal of Near Eastern Studies*, 8, 6-36 (12).

WILLIAMS, C., 2002. Signs from the Sky, Signs from the Earth: The Diviner's Manual Revisited. In: J. M. STEELE and A.IMHAUSEN, eds. *Under One Sky: Astronomy and Mathematics in the Ancient Near East*. Munster: Ugarit-Verlag, 484.

Online calendar converter programme http://www.fourmilab.ch/documents/calendar/
(uses minus signs for BCE) and the Swiss Ephemeris online zodiac programme http://www.astro.com/swisseph/swepha_e.htm . For -391 (392 BCE): (http://www.astro.com/swisseph/ae/m0300/ae_m0391.pdf and go to March).

Received: 25 January 2008; Revised: 26 November 2008

PURIM ŠVENTĖS DATA IR KALENDORIAI ESTEROS KNYGOJE

Helen Jacobus

Santrauka

Straipsnyje keliama prielaida, kad Esteros knygoje slypi astronominė ir chronologinė informacija, susijusi su persų karaliaus Artakserkso II viešpatavimu. Nagrinėjamas hebrajų kalendoriaus 12-ojo mėnesio interkaliacijos ir žydų Velykų išvakarių klausimas bei galimos Esteros knygoje aptinkamų chronologinių žinių sąsajos su Senovės Artimųjų Rytų ir žydų kalendoriais.

Vertė Jonas Vaiškūnas

L'ABBÉ JEAN LEBEUF, (1687-1760), A FORGOTTEN PRECURSOR OF ARCHAEOASTRONOMY AND ETHNOASTRONOMY

ARNOLD LEBEUF

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Abstract

In the eighteenth century, the Abbé Lebeuf was a reknowned historian, a folklorist, a musicologist, and an archaeologist. He published several books and many articles in the *Mercure de France*. He was still famous in the 19th century but is now almost forgotten. His work contains a great many notes, reflections and other pieces of information of interest to those studying astronomy in culture. I present here a short selection of such fragments.

Key words: history, astronomy, folklore, Middle Ages, archaeology, nepotism.

A Short Introduction

Those of our friends and colleagues who were present at the last joint SEAC-Oxford conference at La Laguna in the Canaries in 1999 may remember my mentioning the Abbé Lebeuf during my review on calendars. I recalled Lebeuf describing how a statue marked the spot where some treasure was buried by casting a shadow at sunrise on the date mentioned on its base. And the way a gentleman chose the date of St Michael for a duel with swords to resolve a conflict with the King of Cyprus. (St Michael, carrying the scales of justice and the sword of punishment at the September equinox, when day and night are in good balance, is of course the herald of divine justice in the calendar: the Saint knocks down evil Lucifer from heaven.) Another fragment contained a discussion about the orientations of tombs as a means of establishing the nation that dug them.

Some colleagues suspected it was all a figment of my imagination and that the Abbé Lebeuf had never existed. Others thought it was just a crazy joke. But the Abbé Lebeuf did really exist: it is just that the memory of his works faded away and he is now almost forgotten. Once I was looking for one of his books in the University library in Warsaw. I filled in the order form and handed it to the lady at the desk. She saw the reader's name, mine, then looked at the author's name and the publication date, 1739, then looked back at me suspiciously. When she brought the volume it was an old book covered in leather, in a perfect state of conservation as if it had just been delivered from the printers. I took it to my table and, after a minute, returned to the desk and asked the lady to lend me a knife to separate the pages. The book had been waiting for 260 years untouched, waiting for another Lebeuf to appear and open it. Then I decided something must be done to save the old man from a shameful oblivion.

A Succinct Biography

Jean Lebeuf was born in Auxerres on the 6th of March 1687. Of the fortune of their ancestors his parents had only saved honor and honesty, they had two sons. Jean who was the older was soon noticed for his grave and serious interests, and his extraordinary love for study. At the age of seven, he started his humanities at the Jesuit's college and took the clerical dress. The church was poor and still using old books of the XIIIth and XIVth centuries, in which Lebeuf learned to decipher gothic scripts and old style musical notations. This is here we find the origin of his passion for ancient manuscripts and music.

Overpowered by the desire to proceed in science, he wished to go and complete his instruction in Paris. But the extreme mediocrity of his father's fortune could not allow him for such a sacrifice. A generous uncle (who was then the secretary of the King) offered to help him. He studied theology, latin, greek, hebrew and spent all his free time at libraries. He made such a progress in paleography, a new science then, that he soon was able to determinate with certainty the age of a manuscript at first glance.

He was first also to establish the age of architectural monuments by the style of their construction, the design and proportions of their vaults, one of the first as well to investigate archaeological discoveries and compare them to historical evidences. He was showing interest for the history of ideas, customs, laws, and

all sorts of events that could affect the development of European societies and of France in particular since the fall of the roman empire. He became one of the prime scholars in the study of Middle Ages, but his simple and modest nature seemed to ignore oneself.

He wanted to see by himself all the famous places of France were battles or other events had taken place, Ancient monuments, remnants of antique camps, all the roman roads, and all that could help, through direct observation, the understanding of written relations and documents. Every year he went on the roads for a month or two. I collected, from oral traditions some curious information about the manners of that singular tourist who did not care for comfort. He almost always went walking. Some pages of books and sheets of paper describing something he wanted to verify on the spot were his all and only luggage. He took hospitality at parsonages and monasteries went along old paths and roman ways, counting his own steps to verify the maps. He was not afraid of thirty or forty miles to precise 'de visu' some historical point, and when at last he came to the monument, the first thing he did was to measure it, make a plan, draw the interesting details and then asked all around the neighborhood about local traditions, as well the popular ones as the scholarly ones. The smallest incidents helped him to fix a date, precise the location of a battlefield, discover a ruined city or a forgotten castle and solve many difficult problems of geography and archaeology. Archaeology of the middle ages was then a completely new science, a despised period considered as barbaric and not worth interest. Lebeuf had presented the project of writing a treatise on archaeological chronology based on all the knowledge he had acquired, but his health failed then, he was going to be nominated Director of the Royal Institute of Arts and Literature when he died at the age of 73.

The preceding lines are not, of course, of my own invention, but are translated fragments taken both from the biographical notes published in 1760 at the Academy after the Abbé Lebeuf's death and from a biographical notice by Maximilien Quantin which I chose in order to portray this forgotten author as succinctly as possible. We could have added many more tasty episodes in the life of this impoverished savant and inquisitive traveller. He published an impressive number of books and articles on very different subjects such as history, archaeology, iconography, music and folklore, not to mention other topics including some scholarly letters about the excellence of Burgundy wines. He was famous in the 18th and 19th centuries but, strangely, disappeared completely from encyclopedias during the second half of the twentieth century. For the purposes of this conference I have made a short selection of texts that may, I hope, be of some interest for our genial company of scholars in the field of Astronomy in Culture.

A Tiny Collection Of Texts

(I had to cut drastically my original selection. The interested reader will find further references in the bibliography.)

An astronomical allegory concerning the state of the sciences

In 1734, Lebeuf starts his *Critical Discourse about the State of the Sciences in the French Monarchy under Charles the Great* with these words: "Sciences as well as empires have their revolutions: for a time they flourish, and then they only persist and decay; at times they wake up and stand again with some honour; Sometimes they fall forever. They are like the Sun with its Solstices and periods; They like to wander and pass from one climate to the other; Often, after illuminating some country, they dive into the abyss and go off to enlighten some new people or nation.... What can be the cause of such revolutions? Is it the influence of the stars? the temperature of the air? or the quality of the spirits that animate our bodies and change according to the climate and changing aspects of the Sun? ... The sciences are tied to the predilections of the nations that cultivate them, but the prevailing fashions and tastes give them quality, value and excellence; And these tastes always reflects the proper genius of the nation. The genius complies with the maxims and the maxims change according to the circumstances of time and location. By the way, and this is a key point, these exquisite tastes, this great and sublime genius, so necessary to the perfection of the sciences, is a gift which the sky rarely pours on the earth, and is then given only to a small number of privileged men" (1734b, p.1291-1306). This illustrates nicely, I think, the use of astronomical metaphors in literature, but it also establishes in just a few words the priest's opinion about the influence of stars: evidently he rejects astrological explanations.

The directions of the world: landscape orientation

Lebeuf walked through the land measuring it by counting his own steps. It is interesting to discover that he seems to have preferred territorial diagonals to orthogonals: "I first had limited myself to the bounds of the diocese of Paris which is about 18 to 20 miles from the Summer Sunrise to the Winter Sunset, and of 12 to 14 miles from the Winter Rise to the Summer Set" (1754-1758, avertissement). He uses this method of orientation in

several places, for example: "Villeneuve-la-Dondagne, situated two leagues from Sens in the direction of the winter sunset" (1848, I, p.X). We see, then, that the directions used by Lebeuf for orientations are those most appreciated by modern archaeoastronomers, making him an early colleague. But he also uses other, more complex solar references for map orientations. In a letter to President Bouhier dated 14th February 1732, he specifies the location of a village named Chenove thus: "It will probably be that one of the dioceses of Challon [that is] five leagues from Bussy by the four o'clock sun"(1885)

The orientation of churches and the beauty of illumination

In his long dissertation about the orientation of graves, Lebeuf mentions that corpses were laid out facing the sunrise, or Orient, waiting for the Saviour, but he also states that graves in churchyards were often simply oriented parallel to the church. He adds that these monuments are also turned eastwards in order to await the morning illumination. He writes that in the sixth century, at the time of Childebert: "Fortunat ... speaks of the marble columns which ornate the church and of its glass windows, and all the chevet turned to the Orient, in such a way that the morning dawn suddenly illuminated the vault and then the floor" (1739-1743). But he also makes clear in several places that what is generally called the Orient is in fact an arc extending between the directions of sunrise at the summer and winter solstices.

Some lunar traditions and problems

Lebeuf discusses several expressions found in old medieval calendars that had already become little understood in the eighteenth century. There are many mentions of lunar counts and the computus. In one place he clarifies the custom of giving solar month names to the lunations and explains what those names mean exactly: "Each lunation, each moon, each lunar month should be given the name of the month in which it finishes, and thus, a moon finishing in January must be called the January moon" (1728, p.269-273). After that he discusses the relationship between the solar year and the lunar cycle, and comments upon embolismic years and the rules of intercalation, before returning to the question of naming the moons: "It could seem strange to some people to hear it said that, in such a year, Easter has been celebrated in the May moon. This language is consistent with common notions, primarily those of countryside people who are well accustomed to seeing that the moon of April finishes in May, and they call it the Ruddy moon" (1728, p.271)… He then adds: "'Embolismalis nullius dicitur esse', that is to say that the embolismic moon, which is intercalated, does not take the name of any of the months" (1728, p.274).

A later passage is of particular value, for it documents a little-known lunar cycle of eleven years: "We must, probably, look back at least to the 12th or 13th centuries, when we were accustomed to write this sort of verse in the margins of calendars and even in the text itself. The two famous words Ogdoas and Endecas share the lunar cycle of 19 years, that is to say that Ogdoas signifies the eight-year period and Endecas the eleven-year period" (1728, p. 272-273).

Lebeuf also comments upon the meaning of the expression 'the jump of the moon'. "The bishop of Mende offers a bit later the true explanation of what is called the jump of the moon, which is the excess of one day that must be cut off at the end of every 19-year cycle in order to correct the fact that after 14 of those cycles[1], without it, we would obtain a new moon when there should be a full moon. The celebrated day of this jump is on July 31 according to Duran: 'Luna facit saltum Quintilis luce suprema'. This does not mean (he writes with humour) that the moon jumps better that day than another, 'non quod luna magis saltat illa die quam alia', but arises because the month of July is the last of the lunar months which count 30 days in the Epact year… He claims that, according to him, the jump of the moon does not mean a violent jump of the moon up and down, as some could imagine (such a jump could be harmful to many people), but that it simply means the omission of one day in the cycle" (1728, p.283-284).

Another little-known cycle is mentioned in the dissertation about the sciences in France: "In the year 1064 they had the opportunity to observe the great year, that is to say that one that completed for the second time the great cycle of Dennis the Short (twenty-eight cycles of nineteen years, or 532 years in total). As this large cycle includes all the possible variations of the feast of Easter, a new one was initiated in 1065 starting with year number one" (1741, p. 89-90). But the Abbé mentions the danger of giving importance to such correspondences: "Humbert of Romans, General of the [Dominican] order, knew about the abuse some people made of this art of computation, when he insisted on arguing in one of his sermons against the sentiments and beliefs held by some pagan philosophers that the whole universal machinery would perform a complete cycle in such a way that all things would reappear another time" (1741, p.93-94).

[1] 'Years' in the text, but this is evidently a mistake, probably by the printer.

Celestial phenomena: comets

In the course of denouncing superstitions, Jean Lebeuf quotes some very precious historical fragments from ancient times. Thus, in the 9th century, "When the Emperor [Louis le Debonnaire, son of Charles the Great, in 837] saw this comet [in Aix la Chapelle during the Easter celebration], being cautious of this sort of sign, he stopped suddenly, and before going to bed, he had a certain man of his court called, together with myself, whom he considered to be very instructed in the knowledge of astronomy, and he asked our advice. I begged him to give me time to observe this comet in order to study the truth, and I would give him a very precise report in the morning. The Emperor believed (rightly) that I was tricking him, both to gain time and to delay the moment of telling him some bad news. 'Go', he said, 'to the next room and then tell us what you think of it. I am sure I did not see this star yesterday evening, and you yourself did not notice anything. For me, I see clearly that it is one of those comets about which we have been speaking these last few days. Tell me what you think it is foretelling.' I gave him some sentences on the subject and then stopped. 'There is something', he said, 'you want to keep secret'. This was because it is told that this sort of phenomenon announces a political change and the death of the prince. I quoted the passage of the prophet where it is said: 'Do not fear the signs in the sky as do other nations'. Immediately, and without any preparation, as if by the effect of his own virtue, he said: 'We should only fear Him who created both us and that star; we can never admire Him enough nor praise His clemency as he sends these signs only to wake us up from the sleep in which we are, we impenitent sinners. The marvel tells me in particular and the others in general: let us hurry to improve ourselves and do better than in the past, in fear that the Lord, after having offered us penitence, would find us unworthy of His mercy.' After these words, he took a few swigs of wine, and ordered all to do the same. We were told later that he had spent all the night in prayers" (1726b, p.2429-2430).

Celestial phenomena: aurora borealis

"I shall not conceal from you, Sir, that my aim was to tell you a few words about something still existing which the people call the Septentrional light because it moves in the direction of the North. Here, these lights only display themselves in the middle of the air at about the time of Advent…. I will tell you in general that this light has nothing to do with astronomy…" (1726b, p.2431-2432).

The Abbé was wrong about this, as we now know. But he quotes early medieval references to the observation of these lights, which will certainly be of interest for our modern historians.

"It is very difficult to believe that Mr Maraldi wrote that a thousand years had passed without the mention of this phenomenon; that is from the years 584, 585, 586 and 587 until 1154 and beyond. Indeed, if we take the trouble of consulting the authors of ancient chronicles… Hughes of Flavigny is certainly worthy of attention since this author, a very clever one for that epoch, was living when this light appeared, and he saw it, tried to understand it, and made some prognostics for the future. He refers to a similar light which had appeared a short time before the bloody battle fought in our part of the world, commonly called the battle of Fontenay, on Saturday June 25th in the year 841" (1724, p.2349). This letter gives other dates and medieval references to the observation of the northern lights. It is followed by two other letters by Monsieur Meynier (1726b, p.2436-2443) and by Monsieur Capperon about the northern lights seen over La Ville d'Eu on October 19th, 1726 (1726b, p.2443-2449). Astrophysicists studying solar activity would doubtless like to study these sources further.

A folklorist

The most interesting of the Abbé's discussions are certainly those on old calendars, popular credulity and lunar cycles. In the Mercure de France of January 1734 we find an interesting letter about the popular traditions concerning the occurrence of the feast of Easter when it falls on the 25th of April its latest possible date: "Sir, you are probably informed of the traditions running among the people concerning the occurrence of the feast of Easter on the 25th of April, such as will be the case in the next year, 1734. The result of this occurrence is that the celebration of Corpus Christi then takes place on June 24th, the day of the Nativity of St John the Baptist; and it is because of this conjunction that a certain proverb came into existence concerning the End of the World. In order to demonstrate this illusion, it seems to me enough to recall its origin or rather its late appearance. Everyone knows that the solemnity of Corpus Christi was only established as late as in the XIIIth century..." (1734a).

Another popular tradition discussed by the Abbé, is that concerning a miraculous grave that fills with water at full moon. Here again, he prefers not to mount a full-frontal attack on the faith of simple people, but instead proposes and lets his readers consider a rational reason for the miracle: "I have often felt like talking to you about a type of Phenomenon that might somehow

be relevant to miracles because it concerns a saintly object. In Arles in Provence, at a place called the Champs Elysées, there is a church by the name of St Honorat which is the ancient cemetery church of that city, served today by the Order of the Minims. Under this church is a crypt in which there are seven marble graves disposed at random, most of them empty. They are said to belong to the bishop saints of Arles – Concordius, Hilary, Eone, Virgilius, and Rolland – to St Genes the notary, and to a Saint of Arles named Dorothea. Some people have mentioned that, according to a passing scholar, the grave of St Concordius who died in the IVth century, which is placed on top of the grave of the Bishop Saint Rolland, fills up with water when the moon is full… I do not doubt that our gentlemen the physicists will desire to be better informed of the reality of that before starting to think about the problem. At present, I cannot provide any more evidence than the testimony of Mr. Chatelain in his catalogue of martyrs dating to January 16th. It is in his note about St Honorat that the fact is mentioned. I think it will be very difficult to explain the cause and suppose that it could be classified in the same group as the miracle of St Gratien's hazelnut tree, which is also very astonishing. This is unless the proximity of the city of Arles to the sea lead us to imagine some canal that would connect to the upper grave exclusively and to no other" (1727, p.927).

Here again, Lebeuf finds a rational explanation for the miracle, but presents it lightly, by a simple suggestion, without directly challenging the popular belief. As he puts it elsewhere: "Is it possible to disabuse the folk from such thoughts? Not if the kings themselves and even emperors were so upset that it was difficult to calm them at the appearance of comets or any other sign, which led them to fear the worst effects" (1726b, p.2427-2428).

I hope these few notes will encourage my friends and colleagues to search for more.

A Very Limited List of References

In what follows I present a short and subjective choice of articles concerning astronomy, calendars, calendrical feasts, and celestial and atmospheric phenomena by the Abbé Lebeuf.

1724. Lettre sur la lumière septentrionale. *Mercure de France*, Novembre, 2346. (Les remarques de M. Maraldi au sujet de cette lettre sont dans le journal des Savans, 1725, 255).

1725. Lettre au sujet de l'explication donnée, depuis peu, d'un terme de la basse latinité, ou il est parlé d'Abbas Cornardorum, de l'abbé des fous et de leur fête. *Mercure de France*, Juillet, 1593.

1726a. Remarques sur les anciennes réjouissances devant les fêtes de Noel, à l'occasion du mot 'defructus', et sur les abus de la Fête des Fous. *Mercure de France*, Fèvrier, 218.

1726b. Lettre sur la lumière boréale, à l'occasion de celle qui a paru au mois d'octobre 1726. *Mercure de France*, Novembre, 4220.

1726c. Lettre sur un calendrier écclesiastique pour un nouveau bréviaire, ou l'on propose des régles sur cette matière. *Continuation des mémoires de litt érature receuillies par le P. Desmolets*, Tome I, part 1, 320.

1727. Lettre sur les fêtages d'Angers, les defructu; sur un tombeau qui se remplit d'eau selon le cours de la lune, superstitions de figures, de pieds attachés aux arbres. *Mercure de France*, Mai, tome III, 921-927.

1728. Observations sur les lunaisons: si elles doivent porter le nom des mois; sur l'embolisme, sur le saut de la lune, l'annonce de la fête de Pâques, les cycles, tables pascales, vers des anciens calendriers. *Mercure de France*, Février, tome I, 269 – 293.

1732. Lettres sur les préservatifs contre le tonnerre et contre les maladies du corps humain. *Mercure de France*, Mai, 903.

1734a. Mémoire touchant les traditions populaires au sujet de l'occurence de la fête de Pâques au 25 Avril. *Mercure de France*, Mars, tome I, 485 – 493.

1734b. Discours sur l'état des sciences dans l'étendue de la monarchie francaise sous Charlemagne". Cette pièce est la première qui ait remporté le prix de l'Academie des Inscriptions et belles lettres; elle se trouve tout entière dans les *Mercures de France* de Juin et Juillet 1734, Paris, Louis Guerin, in-12. tome II, 1291 – 1306. On en lit l'extrait dans le *Journal des Savants* de Décembre, 2178, édit.in-12. On y loue les recherches et la solidité des remarques dont cette dissertation est remplie.

1738a. Dissertation sur l' état des sciences dans les Gaules depuis la mort de Charlemagne jusqu'à celle du roi Robert. In: *Receuil de divers écrits pour servir d' éclaircissements à l'histoire de France et de supplément à la notice des Gaules*. In 12, 2 vol. Paris: Jacques Barois fils.

1738b. Extrait de la lettre au sujet des pierres de foudre tombées en Artois au mois de Juin 1738. *Mercure de France*, Septembre, tome III, 1986 – 1987.

1739-1743. Traité sur les anciennes sépultures, in tome II, (1742), des *Dissertation sur l'Histoire Ecclésiastique et Civile de Paris, suivie de plusieurs éclaircissements sur l'histoire de France*, Paris : *Lambert et Durand.*

1741. Dissertation sur l'etat des sciences en France depuis la mort du dit roi Robert jusqu'a celle de Philippe le Bel. In: *Dissertations sur l'histoire ecclesiastique civile de Paris, suivie de plusieur eclaircissements sur l'histoire de France.* In 12, t.2. Paris: Lambert et Durand.

1748. Observations critiques sur le calendrier historique et ecclesiastique de M. Lefevre. *Mercure de France*, Avril, 255-260.

1750. Reponse sur la date 'Dominica isti sunt dies'. *Mercure de France*, Octobre, 275.

1751a. Lettre sur les jubes. *Mercure de France*, Mars, 208.

1751b. Lettre sur la date du Jeudi Magnificat, ou premier Jeudi de Caresme. *Mercure de France*, Mai, 372.

1751.c. Observations sur l'origine des samedis gras. *Mercure de France*, Juillet, 34.

1752. Sur le Roi des Ribauds et „Sur les feux de Saint Jean". *Mercure de France*, Novembre, 228.

1754-1758. *Histoire de la Ville et de tout le diocese de Paris.* 15 volumes, Paris: Chez Prault Pere.

1755. Lettre sur les chiffres arabes et leur ancienne figure. *Mercure de France*, Juillet, 38.

1848-1855. *Mémoires concernant l'histoire civile et ecclésiastique d'Auxerre et de son ancien diocese.* Rééd. Challe et Quantin, Auxerre, Vol. 1-4, (reedition).

1867. *Lettres de l'Abbé Lebeuf*, publiées par la société des sciences de l'Yonne, sous la direction de MM. Quantin et Cherest, Auxerres, 1866-1867.

1885. *Correspondance de l'Abbé Lebeuf et du President Bouhier.* Auxerres.

Received: 29 October 2007; Revised: 5 September 2008

ABATAS ŽANAS LEBIOFAS (1687–1760) – UŽMIRŠTAS ARCHEOASTRONOMIJOS IR ETNOASTRONOMIJOS MOKSLŲ PIRMTAKAS

Arnold Lebeuf

Santrauka

Žanas Lebiofas (Jean Lebeuf) gimė Osere 1687 m. kovo 6 d. Būdamas septynerių jis pradėjo studijuoti humanitarinius mokslus Jėzuitų kolegijoje ir tapo klieriku. Jis studijavo teologiją, lotynų, graikų, hebrajų kalbas, visą savo laisvą laiką leido bibliotekose ir tapo puikiu paleografijos ekspertu.

Jis pirmasis ėmėsi nustatinėti architektūros paminklų amžių pagal jų konstrukcijos stilių, vienas iš pirmųjų ėmė gretinti archeologinę medžiagą su istoriniais faktais. Domėjosi idėjų istorija, papročiais, teise ir visų rūšių reiškiniais, kurie galėjo paveikti Europos visuomenę ir konkrečiai Prancūziją po Romos imperijos žlugimo. Jis buvo vienas iš pirmaujančių mokslininkų viduramžių studijų srityje.

Ž. Lebiofas pristatė mokslo veikalo projektą, skirtą archeologinio datavimo klausimams, kuris rėmėsi visomis jo sukauptomis žiniomis. Tačiau staiga pablogėjus sveikatai mirė, būdamas 73 metų, nespėjęs tapti Karališkojo menų ir literatūros instituto direktoriumi, kuriuo buvo rengiamasi jį paskirti.

Ž. Lebiofas paskelbė įspūdingą skaičių knygų ir straipsnių labai įvairiomis temomis: istorijos, archeologijos, muzikos, tautosakos, etnologijos ir kt. Jis buvo gerai žinomas XVII–XIX a., bet keistai dingo iš enciklopedijų XX a. antrojoje pusėje. Straipsnio pabaigoje pateikiama rinktinė su kultūros astronomijos tematika susijusių Ž.Lebiofo straipsnių bibliografija.

Vertė Jonas Vaiškūnas

V. REFLECTIONS OF ASTRONOMICAL AND COSMOLOGICAL KNOWLEDGE IN MONUMENTS, LANDSCAPES AND ARCHITECTURE

ORIENTATIONS AT THE MINOAN PEAK SANCTUARY ON PHILIOREMOS NEAR GONIES (MALEVIZIOU), CRETE

GÖRAN HENRIKSSON, MARY BLOMBERG

Abstract

As part of the Uppsala University archaeoastronomical project to study the Minoan calendar, we have investigated representative examples of their buildings and found on Philioremos the third example of a peak sanctuary related to sunrise at the summer solstice. This is the nineteenth example of an important Minoan building exactly related to a major yearly event of the lunisolar calendar that was remembered in archaic Greek literature. An important achievement of our project is the discovery of cooperation among Minoans at different sites to mark major celestial events and of well-developed methods for maintaining a seasonally correct lunisolar calendar that began in connection with the autumn equinox.

Key words: Aegean Bronze Age, ancient calendars, Bronze Age Crete, Gonies, Minoan culture, orientations, peak sanctuaries.

Introduction

The initial aim of our project was to investigate the orientations of representative examples of important Minoan buildings: the large palaces, the villas, and the peak sanctuaries. We later decided to include all four of the palaces and all of the peak sanctuaries with walls well enough preserved for their orientations to be measured, as there are only four such palaces and seven such peak sanctuaries (Fig. 1). We were especially eager to include all of the peak sanctuaries, as they are ideally placed for the study of the celestial bodies and we saw a use for the small terracotta objects found around them as aids in this study (Blomberg P. 2000, 2006).

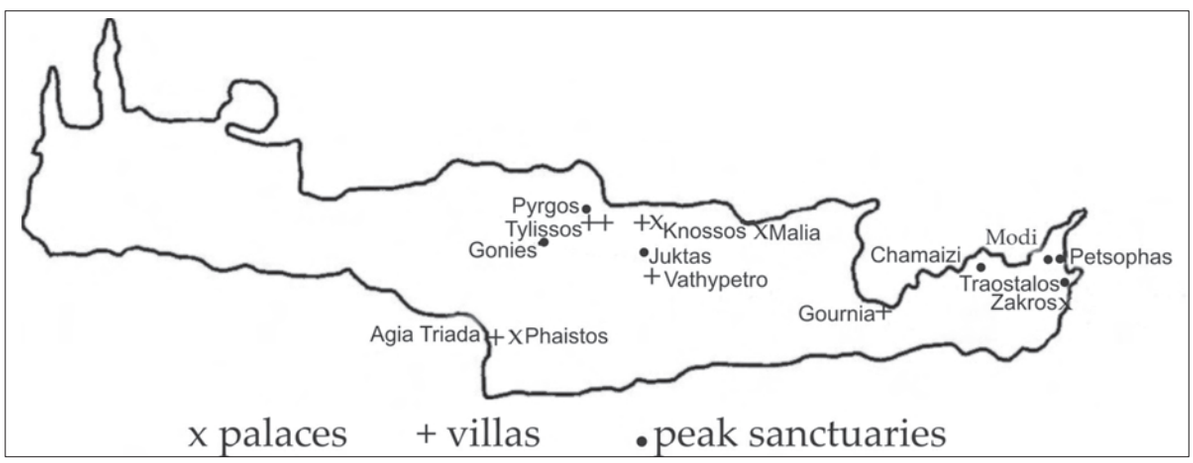

Fig. 1. Minoan sites in the Uppsala University archaeoastronomical project.

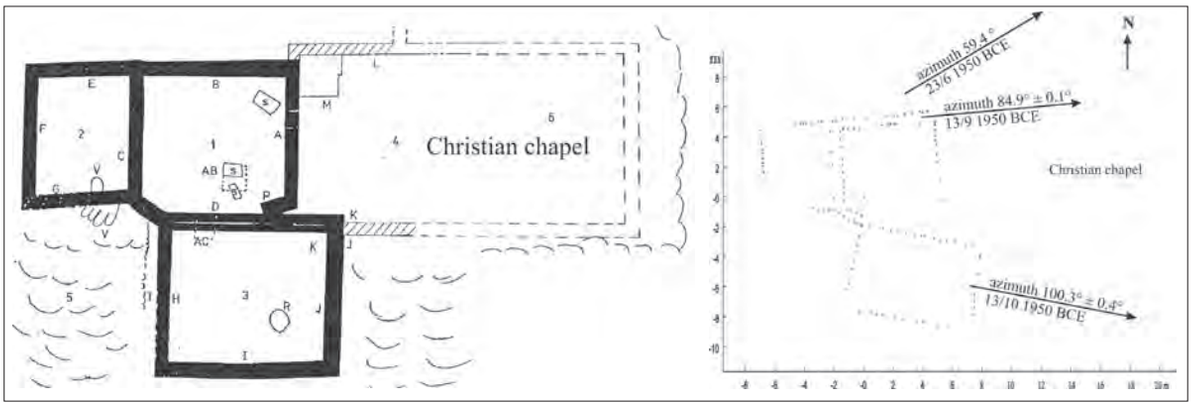

Fig. 2. Peak sanctuary near Gonies. Left: Rutkowski's plan. Right: our measured points and orientations. Sunrise at the summer solstice in 1950 BCE had azimuth 59.4°.

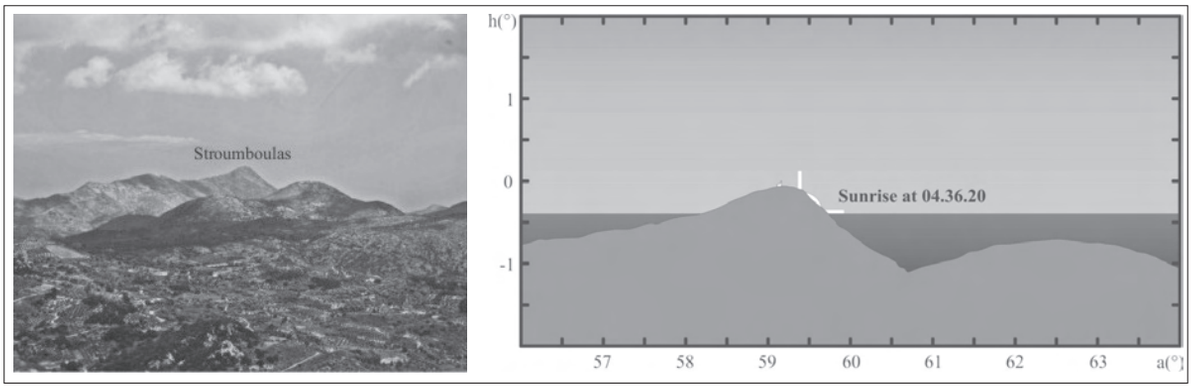

Fig. 3. The peak Stroumboulas opposite the sanctuary on Philioremos. Left: photo courtesy of John G. Younger. Right: calculation of sunrise on the summer solstice as it would have been observed from the peak sanctuary, 23 June 1950 BCE, local mean time 04.36.20.

Methodology

Our initial study indicated orientations to major events in the calendar year and we wanted to collect and study these. We use classical archaeoastronomical methods in our investigations (Schlosser and Cierny 1997; Blomberg and Henriksson 2001a): i.e., we measure the orientations of walls and landscape horizons using a total station, we evaluate the measurements by appropriate mathematical calculations and then, using our own computer programs, we compare the results with the positions of the celestial bodies as they were in the Middle Bronze Age, which is the date of most of the buildings. This was from about 2000 to 1650 BCE in the Aegean (Manning 1999, p.339).

The Peak Sanctuary

The site. The sanctuary building is located on the peak of Philioremos (c. 800 m) near the small village of Gonies in north central Crete (Fig. 1). The excavator K. Davaras (1972) dated it to the Middle Minoan I period, ca 2000-1800 BCE. We have no quarrel with the traditional term *peak sanctuary* for these places, as the study of the celestial bodies most likely had a religious dimension for the Minoans. There is now a Christian chapel at the eastern edge of the site.

The plan. The rooms are not rectangular, a fact noted by archaeologists, but it is not reflected in the only published plan (Rutkowski 1986, p.82). There is no evidence today of any rooms east of the three westernmost ones. The points that we measured on the foundation stones give a more correct view of the original layout of the building (Fig. 2).

The relationships to celestial bodies. From near the building, sunrise on the summer solstice would have been observed to occur behind the conical peak of Stroumboulas, which also is about 800 m high and also has a Christian chapel (Fig. 3).

This peak is very prominent on the northern coast of Crete, and there may have been a Minoan peak sanctuary on it also, to judge from the remaining remnants of walls.

If we compare sunrise at the summer solstice with sunrise at the three other major calendar times of the year, the autumn and spring equinox and the winter solstice, we can see the differences. No parts of the building

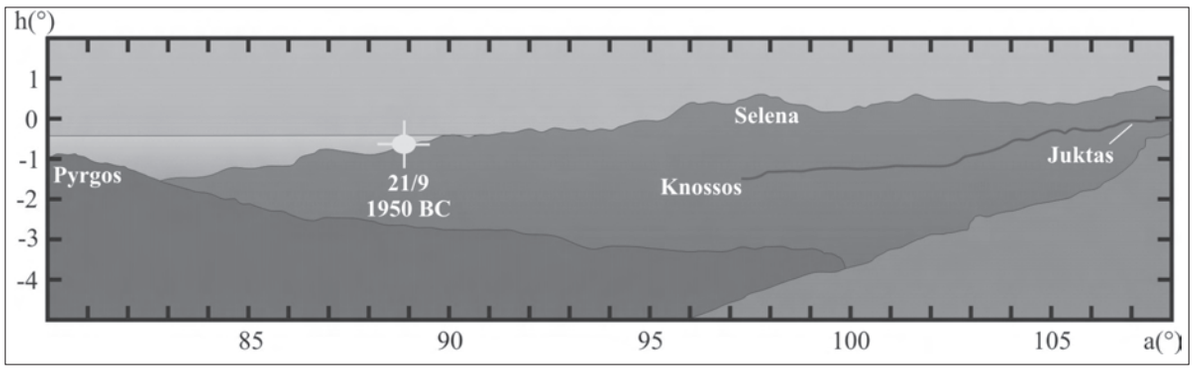

Fig. 4. Sunrise at the autumn equinox in 1950 BCE as it would have been observed from the peak sanctuary. The spring equinox occurs in the same place.

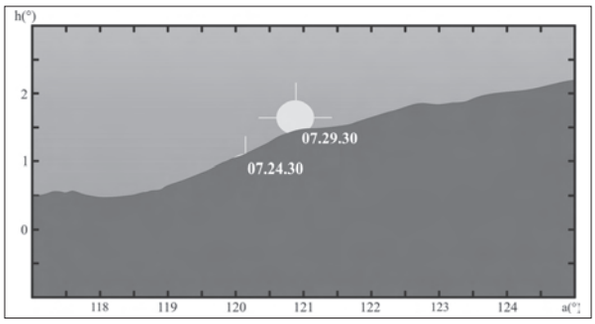

Fig. 5. Sunrise at the winter solstice in 1950 BCE as it would have been observed from the peak sanctuary.

are oriented to where these events occur nor are there any distinctive natural features that mark them (Figs. 4 and 5).

The seemingly indifferent orientations of the north wall and the axis of symmetry of the southernmost room of the sanctuary building may, in fact, have been important in the lunisolar calendar that we have argued was used by the Minoans. The northern wall is oriented to sunrise eight days before the autumn equinox and the axis of symmetry of the southern room is oriented to sunrise twenty-two days after the autumn equinox. These two orientations would have permitted determination in the following way of the years in which the new crescent moon would have appeared on the very day of the autumn equinox and on the earliest possible day of the second month of the year:

1. When the sun rises along the long northern wall and the waning half moon is visible, the next new moon will take place on the day of the autumn equinox, which will therefore be the first day of that Minoan year. This happened, for instance, in the year 1943 BCE. It is probable that years in which the new crescent moon appeared on the very day of the autumn equinox were especially significant for the Minoans.

2. When the sun rises along the axis of symmetry of the southern room and the waning half moon is visible, the next new moon will take place on the first day of the second month of the year. This also happened in the year 1943 BCE.

These two events will occur in the same year every eighth and nineteenth year. Therefore they indicate the beginning of the eight- and nineteen-year cycles with the new crescent moon on the autumn equinox. These two orientations can thus explain the unusual plan of the sanctuary building.

Discussion

Why the summer solstice? When we asked ourselves why the summer solstice was targeted from the building on Philioremos and not the autumn equinox that was the beginning of the Minoan year, we found that the answer lies in the broader context of the results of our project.

Minoan relationships to major celestial events. In our study of the orientations of the walls of our sites with respect to the horizons opposite, we found many that focused quite exactly on the major times of a calendar year: sunrise and sunset at the solstices and the equinoxes, moonrise and moonset at the major standstills, and also the heliacal risings and settings of the brightest stars to mark significant points of the year. A lunisolar calendar of this type was used later by the Greeks and also had many common features with that of the Babylonians who were contemporary with the Minoans (Cohen 1993). As our research favoured the existence of a lunisolar calendar, the cultural affinities for such a calendar in the eastern Mediterranean supported us in our conclusions (Blomberg and Henriksson, 1996).

Our investigations indicated that orientations were not the only means by which Minoans related their buildings to the celestial bodies**.** They also chose sites where, from the near vicinity of a building, a major event in the calendar would be observed to occur be-

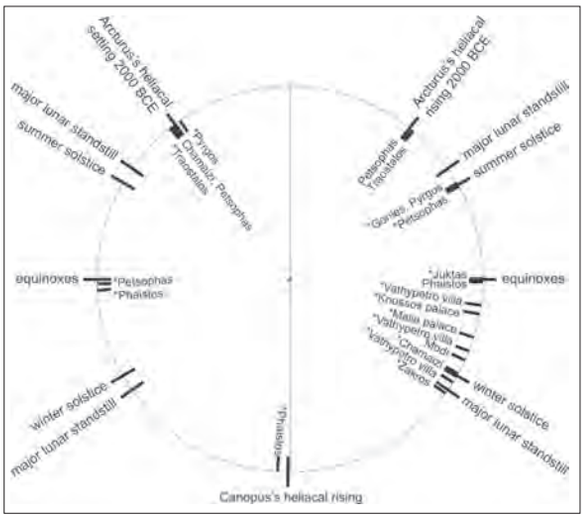

Fig. 6. The Minoan buildings in the Uppsala project. An asterisk indicates a foresight.

hind an impressive natural feature, as in the case of the building on Philioremos. We discovered a number of such examples that mark calendar events in this way for the Minoans.

Our project includes twenty buildings from fifteen sites. We have been able to argue on the basis of their orientations that three were Mycenaean and not Minoan (the small shrines at Malia, Vathypetro, and Agia Triada), and therefore they are not included here. In the case of the seventeen relevant here, we have completed our study of twelve of them (Fig. 6). We found at ten of these one or more relationships to a major calendar event of the year, nineteen in all: four to sunrise at the equinoxes, two to sunset at the equinoxes, three to sunrise at the summer solstice, two to sunrise at the winter solstice, one to the rising full moon at the southern major standstill, two to the heliacal rising of Arcturus, four to its heliacal setting, and one to the heliacal rising of Canopus. The framing of our constellation Orion by the doorway into the Central Palace Sanctuary at Knossos in the days around the autumn equinox should also be mentioned (for earlier studies see Blomberg and Henriksson 2000, 2001b, 2002, 2003, 2005b, 2007a, 2007b; Henriksson and Blomberg 1996, 1997-1998).

The nineteen major times of the calendar measured from our data at ten of the twelve sites is a fair quantitative assessment of their value for the Minoans (Ruggles 1999, p.148). The reason why the azimuths of the relationships in Fig. 6 do not coincide with those of the astronomical events is due to the mountainous character of the horizon in Crete. The azimuths are as measured from the sites.

The Minoans only rarely focused on sunsets and, in the two cases where they did so, it seems to have been for a special reason. We have explained this as being due to the importance of being able to identify the autumn equinox, as it determined the beginning of the Minoan year. At both Petsophas and Phaistos, sunrise was at a distant horizon and would often have been obscured by heavy mist. Thus establishing a relationship to sunset at the equinoxes at such places increased the chances of knowing when the autumn equinox would occur.

The focus on an event could be marked by a natural or a manmade foresight, by the orientation of a wall, and even by a foresight and an orientation. The relationships are always clear. It seems that the Minoans sought places where natural foresights could mark the major celestial events. Three of the four palaces and four of the seven peak sanctuaries have such a foresight. Three of the remaining five monuments had manmade foresights. Some sites have more than one foresight (Fig. 6). Of course some manmade foresights may not have survived. We have discovered other ways of relating buildings to major celestial events, by framing an event in a doorway, for example, and creating light and shadow effects to highlight the event (Blomberg et al. 2002, p.85).

Crete has many mountain peaks that would have been suitable for marking a celestial event. In an area of about 15 kilometres around Philioremos, there are more than 45 peaks higher than 600 meters. This indicates that there may well have been choice available to the Minoans in locating their peak sanctuaries in places that would provide natural foresights for the major celestial events, and consequently there was less need to rely on manmade foresights.

Culture-specific relationships to calendar events. In addition to the relationships to major calendar events, we have found what seem to us to be relationships to other celestial events that had special significance for the Minoans. This may be the case for three that we have found at the palace of Malia, the villa at Vathypetro, and the peak sanctuary on Modi (Blomberg and Henriksson 2005a, Henriksson and Blomberg in press). The axes of symmetry of the major cult area of the palace and of the villa are aligned to sunrise on the first day that could have begun the second month and thus also the sixth, in the lunisolar calendar that we propose for the Minoans. If the new crescent moon rose on that day, then it was the first day of the month. At Modi the axis of symmetry of the sanctuary is oriented to sunrise on the first day that could have begun the third month, and thus also the fifth, of the proposed Minoan calendar. The result from Modi, which seemed very unpromising to us at first, together with the two results from Malia and Vathypetro, provide us with one answer as to why the Minoans created different relationships to celestial events at different sites.

The Minoan calendar. We have argued that the Minoans had a lunisolar calendar that began at the new crescent moon following the autumn equinox. The major evidence comes from the palace at Knossos and the nearby peak sanctuary on Juktas. These were in all probability the most important buildings of their type in Minoan Crete. At each of these places not only was the morning of sunrise at the equinoxes clearly marked, but also the eleventh day after the autumn equinox, which made it easy to know when to intercalate a month in the calendar (Blomberg and Henriksson 2000, 2002).

We think that we now have evidence of a system by which the earliest possible first day of each month of the calendar could have been easily determined, a system deliberately designed to incorporate major cult places of the Minoan culture (Table 1). We think that there probably were also sites with celestial relationships that determined when the remaining months would begin, the eighth, ninth, eleventh and twelfth. We need only two places: X, oriented to sunrise on the earliest possible day of the eighth and twelfth months and Y, oriented to sunrise on the earliest possible day of the ninth and eleventh months. This is an intriguing hypothesis that we hope will be verified in our future work.

Table 1. Minoan sites with relationships to celestial events that determined the earliest 9beginning of each month

Site	Month
Petsophas, Phaistos, Knossos, Juktas	first month (autumn equinox)
Malia, Vathypetro	second month
Modi	third month
Chamaizi, Vathypetro	fourth month (winter solstice)
Modi	fifth month
Malia, Vathypetro	sixth month
Petsophas, Phaistos, Knossos, Juktas	seventh month (spring equinox)
X (not yet found)	eighth month
Y (not yet found)	ninth month
Gonies, Petsophas, Pyrgos	tenth month (summer solstice)
Y (not yet found)	eleventh month
X (not yet found)	twelfth month

Not all relationships to celestial phenomena were for the purpose of regulating the calendar. The relationships to the bright stars Arcturus, Canopus and the constellation Orion, may have been in order to pinpoint important times in the agricultural year, as they did in the historical period, according to Hesiod, and also times for the sailing season, as we have tried to show elsewhere (Blomberg and Henriksson 1999).

Acknowledgements

We are very grateful to John G. Younger for taking the photo of Stroumboulas from Philioremos. We would also like to thank the boards of the following foundations for making our research possible: the Swedish Council for Research in the Humanities and Social Sciences, the Gunvor and Josef Anér Foundation, the Axel and Margaret Ax:son Johnson Foundation, the Magn. Bergvall Foundation, and the Helge Ax:son Johnson Foundation. We are grateful as well to the Greek Archaeological Service for permission to study the sites and the staff of the Swedish Institute at Athens for practical assistance in many ways.

References

BLOMBERG, M. and HENRIKSSON, G., 1996. *Minos Enneoros*. Archaeoastronomical light on the priestly role of the king in Crete. In: P. HELLSTRÖM, P. and B. ALROTH, eds. *Religion and Power in the ancient Greek world.* Proceedings of the Uppsala symposium1993 (= BOREAS. Uppsala Studies in Ancient Mediterranean and Near Eastern Civilizations, 24). Uppsala, 27-39.

BLOMBERG, M. and HENRIKSSON, G., 1999. Evidence for the Minoan origins of stellar navigation in the Aegean. In: A. LE BEUF and M. ZIÓLKOWSKI, eds. *Actes de la V*ème *conférence de la SEAC, Gdańsk, 5-8 septembre 1997* (Światowit supplement series H: Anthropology II). Warsaw, 69-81.

BLOMBERG, M. and HENRIKSSON, G., 2000. Further evidence for the Minoan origins of the Greek calendars. In: A. KARETSOU et al., eds. Proceedings of the 8th Cretological congress, Heraklion (Crete), Greece, 9-14 September 1996. Heraklion, 109-128.

BLOMBERG, M. and HENRIKSSON, G., 2001a. Archaeoastronomy: new trends in the field, with methods and results from studies in Minoan Crete. *Journal of Radioanalytical and Nuclear Chemistry,* 247, 609-619.

BLOMBERG, M. and HENRIKSSON, G., 2001b. Differences in Minoan and Mycenaean orientations in Crete. In: C. RUGGLES, F. PRENDERGAST and T. RAY, eds. *Astronomy, Cosmology and Landscape*. Proceedings of the SEAC 98 meeting, Dublin, Ireland, September 1998. Bognor Regis: Ocarina Books, 72-91.

BLOMBERG, M. and HENRIKSSON, G., 2003. The Minoan peak sanctuary on Pyrgos and its context. In: M. BLOMBERG, P. BLOMBERG and G. HENRIKSSON eds. *Calendars, symbols, and orientations: legacies of astronomy in culture*. Proceedings of the 9th meeting of the European Society for Astronomy in Culture, 27-30 August 2001 (Uppsala Astronomical Observatory Report No. 59). Uppsala, 127-134.

BLOMBERG, M. and HENRIKSSON, G., 2005a. Some problems in Minoan archaeoastronomy. In: M. KOIVA, I. PUSTYLNIK and L. VESIK, eds. *Cosmic Catastrophies: a collection of articles* (Proceedings of the European Society for Astronomy in Culture (SEAC) 2002. Tartu, 15-22.

BLOMBERG, M. and HENRIKSSON, G., 2005b. Orientations of the late Bronze Age villa complex at Vathypetro in Crete. *Mediterranean archaeology & archaeometry* 5, 51-61.

BLOMBERG, M. and HENRIKSSON, G., 2007a. The function of the Minoan oval house at Chamaizi. In: E. PÁSZTOR, ed. *Archaeoastronomy in Archaeology and Ethnography* (Papers from the annual meeting of the SEAC (European society for Astronomy in Culture) held in Kecskemét in Hungary in 2004). British Archaeological Reports International Series, 1647, 15-18.

BLOMBERG, M. and HENRIKSSON, G., 2007b. Orientations of the Minoan palace at Phaistos in Crete. In: I. LIRITZIS, ed. *Ancient watching of cosmic space and observation of astronomical phenomena, 6-10 April, 2006, Rhodes, Greece* (Proceedings of the international conference on archaeoastronomy, SEAC 14th 2006). Mediterranean Archaeology and Archaeometry, 6, 185-192.

BLOMBERG, M., HENRIKSSON, G. and PAPATHANASSIOU, M., 2002. The calendaric relationship between the Minoan peak sanctuary on Juktas and the palace at Knossos. In: T. M. POTYOMKINA and V. N. OBRIDKO, eds. *Astronomy of ancient Societies:* Proceedings of the Conference "Astronomy of Ancient Civilization" of the European society for Astronomy (SEAC) associated with the Joint European and National Astronomical Meeting (JENAM) Moscow May 23-27. Moscow: Hayka, 81-92.

BLOMBERG, P., 2000. An Astronomical Interpretation of Finds from Minoan Crete. In: C. ESTABAN and J. A. BELMONTE, eds. *Astronomy and Cultural Diversity: Proceedings of the International Conference Oxford VI and SEAC 99*, La Laguna, 21-29 June 1999. Tenerife, 311-318.

BLOMBERG, P., 2006. A new interpretation of the figurines from Petsophas and Traostalos. In: E. TABAKAKI and A. KALOUTSAKIS, eds. *Proceedings of the 9th Cretological congress, Elounda (Crete), 1-7 October 2001*. vol. A4. Heraklion, 333-347.

COHEN, M., 1993. *The cultic calendars of the Ancient Near East*. Bethesda: CDL Press.

DAVARAS, K. 1972. Kriti: Modi. *Archaiologikon Deltion*, 27 (Chronika), 652.

HENRIKSSON, G. and BLOMBERG, M., 1996. Evidence for Minoan astronomical observations from the peak sanctuaries on Petsophas and Traostalos. *Opuscula Atheniensia* 21, 99-114.

HENRIKSSON, G. and BLOMBERG, M., 1997-1998. Petsophas and the summer solstice. *Opuscula Atheniensia* 22-23, 147-151.

HENRIKSSON, G. and BLOMBERG, M., 2000. New arguments for the Minoan origin of the stellar positions In Aratos' Phainomena. In: C. ESTEBAN AND J. A. BELMONTE, eds. *Astronomy and cultural diversity*. Proceedings of the International Conference "Oxford VI and SEAC 99", La Laguna, 21-29 June 1999. Tenerife, 303-310.

HENRIKSSON, G. and BLOMBERG, M., in press. Archaeoastronomical study of the Minoan site on Modi. Proceedings of the 10th International Cretological Congress, Khania (Kreta) 1-8 October 2006.

MANNING, S. W. 1999. *A test of time*. Oxford: Oxbow.

RUGGLES, C. 1999. *Astronomy in prehistoric Britain and Ireland*. New Haven and London: Yale University Press.

RUTKOWSKI, B. 1986. *The Cult Places of the Aegean*, New Haven and London: Yale University Press.

SCHLOSSER, W. and CIERNY, J. 1997. *Sterne und Steine : eine praktische Astronomie der Vorzeit*. Stuttgart: Theiss.

Received: 23 October 2007; Revised: 20 September 2008

MINO KULTŪROS VIRŠUKALNĖS ŠVENTYKLOS ORIENTACIJOS (GONIES PHILIOREMOS VIETOVĖ, KRETA)

Göran Henriksson, Mary Blomberg

Santrauka

Viršukalnės šventykla Philioremos vietovėje buvo tiriama pagal Upsalos universiteto archeoastronominį projektą (1 pav.). Paaiškėjo, kad šventyklos statinys nėra stačiakampis, kaip buvo vaizduojama anksčiau paskelbtame plane. Pagal mūsų atliktus matavimus buvo sudarytas originalus statinių planas (2 pav.).

Žiūrint iš šventyklos vasaros saulėgrįžos dieną galima matyti Saulę tekant iš už Stroumboulas kalno keteros. Nė viena šventyklos statinio dalis nėra orientuota lygiadienio arba žiemos saulėgrįžos saulėtekio kryptimi, taip pat nėra jokių išskirtinių natūralių reljefo ypatumų, galėjusių žymėti šias saulėtekio kryptis (4 ir 5 pav.).

Neįprastą statinio planinę struktūrą galima aiškinti tuo, kad šiaurinė jo siena yra orientuota į Saulės tekėjimo kryptį likus 8 dienoms iki rudens lygiadienio, ir pietinio kambario simetrijos ašis yra nukreipta kryptimi, kuria Saulė teka 22 dienas po rudens lygiadienio. Šios kryptys galėjo būti naudojamos metams, kuriais jaunas Mėnulis pasirodo pirmą pirmojo mėnesio dieną pagal minojiečių Saulės-Mėnulio kalendorių, nustatyti, taip pat pirmajai antrojo mėnesio dienai ir kartu 8-erių ir 19-os metų kalendorinių ciklų pradžiai nustatyti.

Kalendoriniams stebėjimams naudoti ne tik specialiai orientuoti statiniai, – ir pačių statinių statybos vietos buvo parenkamos taip, kad svarbių kalendorinių datų metu stebimas dangaus šviesulys projektuotųsi į išsiskiriančius horizonto darinius.

Beveik kiekvienoje tirtoje vietovėje mes aptikome statinių, orientuotų į vieną ar daugiau reikšmingų kalendorinių astronominių krypčių (6 pav.). Be šių krypčių, buvo aptiktos ir trys kitos labai svarbios minojiečiams orientacijos. Modi šventyklos, svarbios Malia rūmų kulto vietos bei Vathyperto vilos simetrijos ašis yra nukreipta į Saulės patekėjimą pirmąją keturių mėnesių periodo minojiečių kalendoriuje dieną. Šios orientacijos leidžia iškelti vieną prielaidą, kodėl minojiečiai skirtingus statinius siejo su skirtingais dangaus reiškiniais. Galbūt turime reikalą su specialia sistema, skirta anksčiausiai kiekvieno mėnesio kalendorinei dienai nustatyti, naudojant apgalvotai suplanuotą pagrindinių Mino kultūros kulto vietų tinklą (1 lentelė).

Vertė Jonas Vaiškūnas

READING, WRITING, AND RECORDING THE ARCHITECTURE: HOW ASTRONOMICAL CYCLES MAY BE REFLECTED IN THE ARCHITECTURAL CONSTRUCTION AT MESA VERDE NATIONAL PARK, COLORADO, USA

GREGORY E. MUNSON, BRYAN C. BATES, LARRY V. NORDBY

Abstract

When tree ring dates at Mesa Verde National Park were plotted as a function of time along the lunar standstill cycle, a correlation was evident, leading to the hypothesis that architectural features and construction phases were timed according to the lunar 18.6 year cycle. A detailed architectural analysis at Sun Temple and tree ring analysis support the sub-hypothesis that lunar maximums were observed over Sun Temple from the Painted Tower area of Cliff Palace. Tree ring dates at Balcony House and Square Tower House suggest a similar relationship between construction of specialized architecture such as kivas and the lunar maximum cycle.

Key words: archaeology, lunar maximum, architectural documentation, science, archaeoastronomy.

Introduction

While research of Ancestral Puebloan solar observations abound, studies related to lunar observation by the Ancestral Puebloans are relatively few. At Chaco Canyon Sofaer and Sinclair (1987) documented the northern lunar maximum and minumum on the "Sun Dagger" of Fajada Butte. Their results were challenged by Carlson (1987) and others, and later confirmed by Bates and Odell (1987). In the 1990's Malville, Sutcliff, and others documented Great Kiva alignments with the Northern Lunar maximum at Chimney Rock Archaeological Area, more than 100 km North of Chaco Canyon. Again in the early 1990's, research at Mesa Verde National Park, suggested ancestral observations of lunar alignment between Cliff Palace and Sun Temple (Malville 1993). Cliff Palace and Sun Temple, two sites about 0.35 kilometers apart but with a clear line of sight, allowed for Theodolite measurements and mathematical modeling, both supporting observation of the lunar maximum. Tree ring studies suggested an unknown socially driven reason for distinct discreet architectural construction cycles (Fairchild-Parks and Dean 1993; Windes 1995). Research related to the periodicity of construction may give us insight as to social/cultural phenomena as well as the development of science (particularly astronomy) by the Ancestral Puebloan people. Our objective is to assess whether or not the lunar standstill cycle influenced the placement of architectural features, structural form, construction cycles, and the location of ceremonial sites at Mesa Verde National Park between AD 1200 and 1300.

Architectural Documentation and Site Description

If the correlation of architectural construction and astronomical cycles are to be assessed, a rigorous and systematic documentation of the architecture is essential. The Architectural Documentation Program developed by Larry Nordby at Mesa Verde National Park had been used to look at households, residential units, and identify social and architectural units that were other than residential, as well as examine construction techniques through a series of models. Data collection involves a detailed system of intrasite proveniencing, data forms, scale drawings, and historical data such as photographs and reports. Altogether, this approach provides the framework for making conclusions about the construction of architecture (Nordby 2002). A major objective is to separate residential from non-residential or public architecture. It can be equally and universally applied to historic or pre-historic cultural sites throughout the world. In the summer of 2006, we applied the Architectural Documentation system to one of the most visited and least understood structures in Mesa Verde National Park, Sun Temple, which lacks evidence of traditionally defined household spaces and seems related to public or specialized architecture.

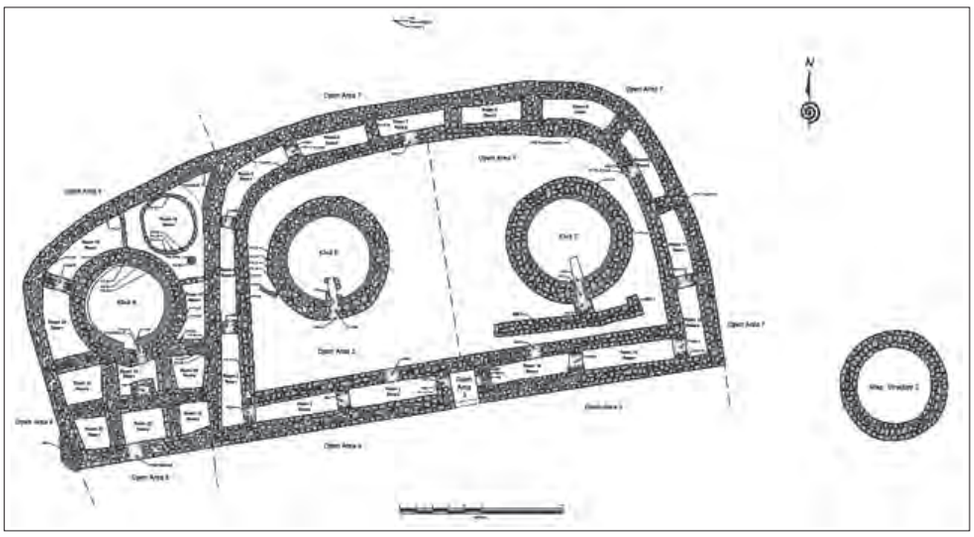

Fig. 1. Sun Temple plan map.

The overall layout of Sun Temple has a D-shaped configuration positioned around two central circular structures that appear to be towers, but are actually kivas (Fig. 1). Typical kivas are circular subterranean structures with features like banquettes, ventilator complexes, and crib roofing. Kivas are most commonly associated with ceremonial or ritual activities. An Annex was also constructed on the western portion of the site enclosing an additional circular kiva like structure.

The walls of Sun Temple are core and veneer construction built in three stages. First, build the outer veneer; secondly, build the inner veneer, and then fill the core. We evaluated each veneer abutment pattern **independently** in order to identify patterns that are not apparent if one only considers wall end abutments as a single entity. This approach provided us the room construction sequence for the D-shaped structure. Doorway placement was also helpful in this process and for evaluating the relationships between structures. The overall sequence is described in Figure 2.

In addition, there is a pecked basin that may have served as a construction datum, located to the north of the perimeter wall. This small basin seems related to the D-shaped and central towers or kivas at Sun Temple, although more work is needed to verify the actual function of the pecked basin.

Although a massive formal building, Sun Temple shows less complexity than smaller cliff dwelling rooms that have shapes and sizes that must be fitted into naturally occurring alcove spaces. Studying modal measurement values at this site would be a little less complicated, and then could be compared with other cliff dwellings and open sites. Comparisons could include Sand Canyon and Goodman Point Pueblos, as well as cliff dwellings, with the objective of studying geometry, mathematics, and building measurement systems. This applies to the characteristics of the buildings themselves as well as the overall layout. Development of a highly accurate plan map of Sun Temple is in progress and necessary before these studies can be performed.

Research Questions and Preliminary Results

Our brief investigation revealed a great deal about the architectural construction of Sun Temple. We had several general questions:

- Was Sun Temple completed by the Ancestral Puebloans, a follow-up to interpretations of Fewkes' work.
- Did the towers or Kivas B and C extend above the perimeter wall as Malville (1993) suggested?
- If the structure was completed and Kivas B and C could not be viewed above the perimeter wall from the Painted Tower area of Cliff Palace, what other data supports that Sun Temple was an astronomical observation marker or center?
- Finally, what was the role of the other buildings at Sun Temple, namely the other free-standing towers and the Annex?

Astronomy of Sun Temple

In 1991, J. McKim Malville proposed that Kivas B and C would form a marker for observation of winter solstice sunset and the southern maximum moonset from two separately marked observation points in Cliff Palace. The winter solstice sunset could be observed from a pecked basin on the Cliff Palace exit trail and the

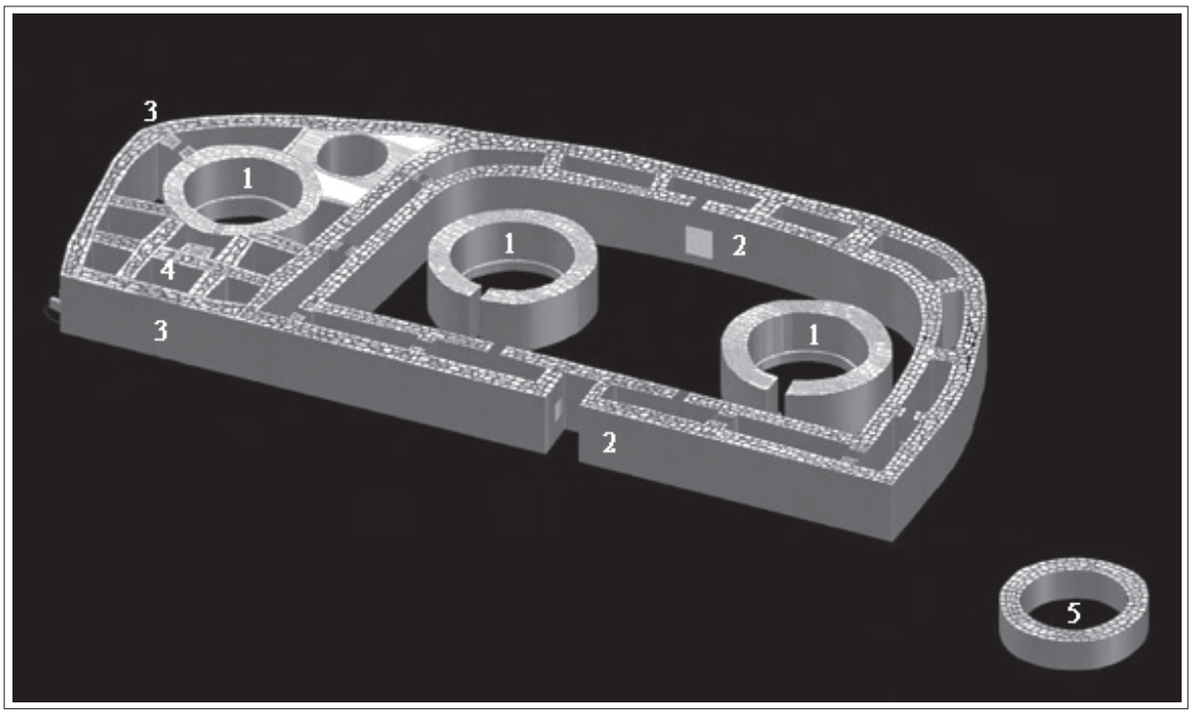

Fig. 2. Sun Temple architectural construction sequence.
1 – Kivas A, B, and C. Initially constructed as towers; 2 – Principal D perimeter wall, begining at north center and ending on the south wall; 3 – Annex perimeter wall; 4 – Annex subdivisions; 5 – Miscellaneous Structure 2, detached from main structure, sequencing indeterminate.

southern maximum moonset was best observed from an opening in the third story of the Painted Tower within Cliff Palace (Malville and Munson 1998).

These alignments would function if Kivas B and C in Sun Temple were towers that projected above the outside perimeter wall. In December of 1997, Munson observed the winter solstice sun setting over the center of Sun Temple from the pecked basin confirming Malville's first hypothesis. (Fig. 3). In June 2006, Bates and Munson observed the southern maximum full moon setting over the center of Sun Temple from the Painted Tower of Cliff Palace. Munson reconfirmed this alignment on June 2, 2007 (Fig. 4).

Fig. 3. Winter solstice sunset.

Architectural Conclusions

Using a grid construct and triangulation, we calculated an estimate of stone fall volume to determine if the current wall height was the same as the original wall height. Based on an 1891 photograph taken by Gustav Nordenskiold (Fig. 5), we believe that current wall top stones match those in the photo. Further, our calculation correlates with Fewkes' estimate of the volume of rock he removed from Sun Temple, which was then used to build administrative buildings on Chapin Mesa. With the presence of the stump, plus roots that extend through the walls, we believe that the current location of the stump is at the historic top of the origi-

Fig. 4. Southern maximum moonset.

Fig. 5. Sun Temple in 1891.

nal mound and wall tops, estimated at 3.0 meters. The amount of rubble surrounding the walls of Kivas B and C indicate they were no higher than approximately 2.5 meters. This analysis supports the conclusion that the towers or kivas did *not* extend above the D-shaped perimeter wall and thus were not visible from Cliff Palace once the surrounding wall was in place.

At this time we believe that construction at Sun Temple was completed by the Ancestral Puebloans based on openings that have been remodeled. Fewkes stabilized the structure in 1915 by adding a cap of reset building stone (Fewkes 1916). Although this cap was 40-60 cm thick, he did not significantly alter the overall layout or details. We currently believe that no portion of Sun Temple was roofed or was ever designed to be roofed. This is based on wall heights, the absence of roof beam sockets, and the need for light to penetrate rear rooms of the structure.

Cliff Palace/Painted Tower Architecture

Before we make any conclusions as to the astronomical uses of Sun Temple, we must address the architectural history of the Painted Tower area in Cliff Palace. Previously recorded features of the Painted Tower that support astronomical usage are the vent in the third story west wall and a well preserved pictograph also located in the third story that is reported to depict lunar cycles (Malville and Munson 1998) although there are alternative interpretations of this decoration. Historic photographs show the pictograph to be largely intact in 1896 while about 3/4 of the vent was reconstructed in 1934. It should be noted that through repeated Theodolite measurements, this opening is in the proper orientation to observe the southern maximum moonset over the central portion of Sun Temple.

In June of 2006, we located what appeared to be a small sealed opening in the southwest exterior corner of the Painted Tower near the base of the third story.

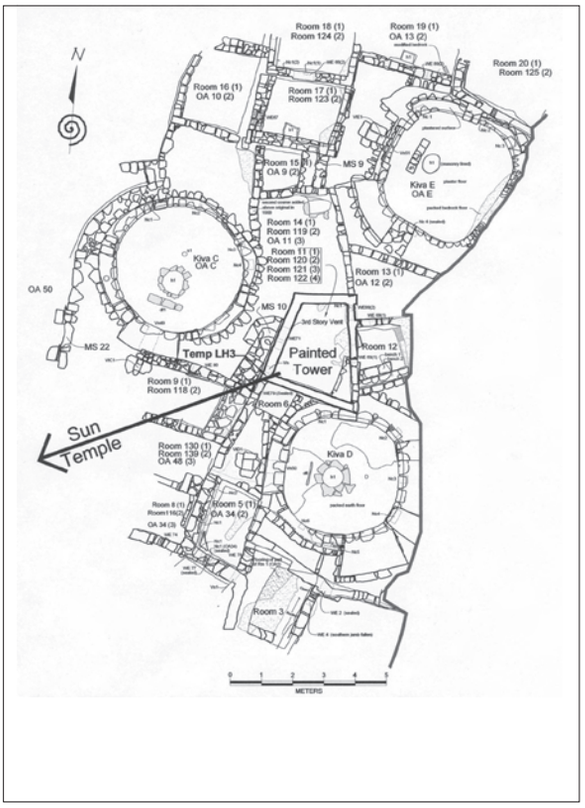

Fig. 6. Cliff Palace Painted Tower area.

The opening is circular with a diameter of 8 cm and angled through the wall. The opening was sealed by the Ancestral Puebloans with adobe from the interior, plastered over, and then decorated with the pictograph. When it was open, the angle and position of the opening may have provided an observer with a well framed and easy to use view of Sun Temple (Fig. 6). The exact alignment is difficult to assess as the feature is sealed.

Immediately to the south of the Painted Tower is Kiva D. In June of 2006 we noted that the southern maxima moon could be seen setting over the top of Sun Temple from the roof elevation of Kiva D.

These investigations suggest that Sun Temple could have been used as an astronomical marker for both winter solstice and southern maximum moonset as viewed from separate locations in Cliff Palace. Original features show orientation and views of Sun Temple applicable to the southern maximum moonset. Modifications to these features over time indicate a possible change in how this event was viewed and recorded. The southern lunar standstill events of 1279 AD to 1281AD could be observed setting over some portion of Sun Temple by a large population located at ground level from Kiva A to Kiva F and south of the Painted Tower in Cliff Palace. Persons with specialized or sacred knowledge may have been located in an elevated position, either on the roof top of Kiva D or in the third story of the Painted Tower. This may have provided

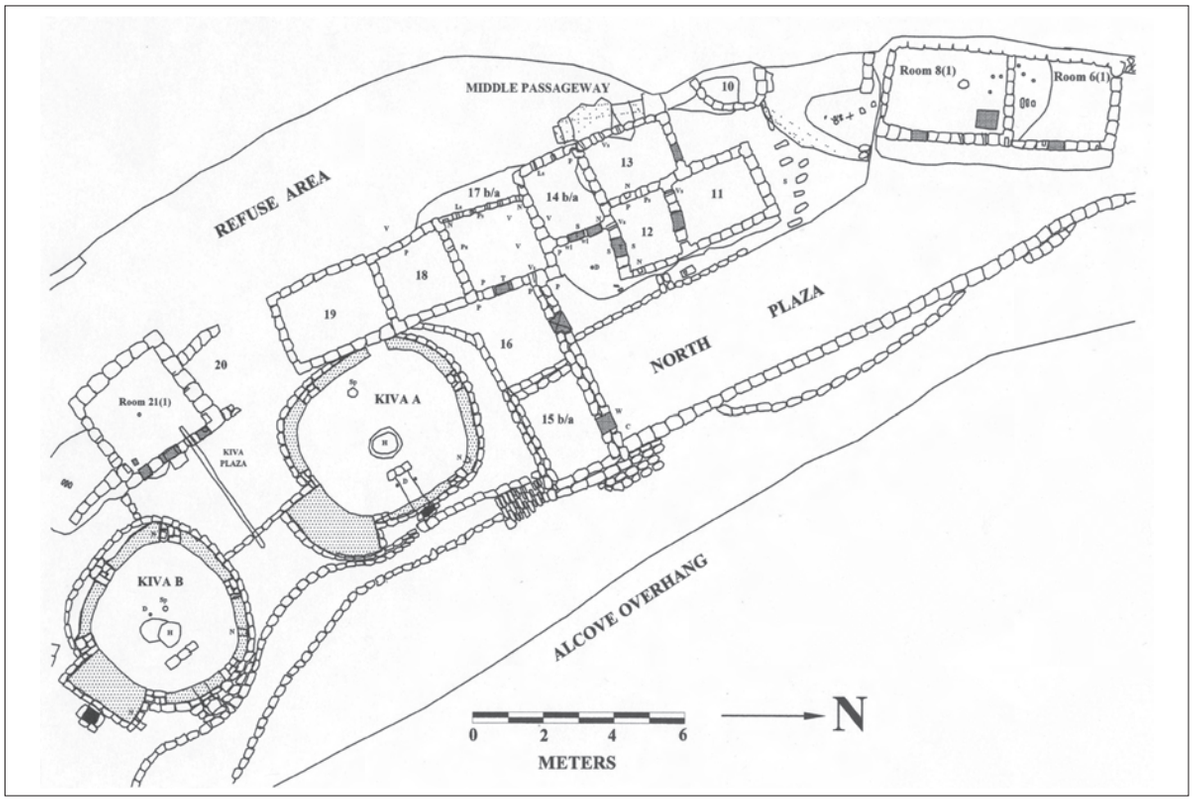

Fig. 7. Balcony House, plan map, central area.

timing for the 18.6 year lunar maximum cycle, a figure perhaps not too unlike a human generational reproductive cycle in the AD 1200's. This may have been used for the purpose of timing large public gatherings. References to this type of information are not currently found in puebloan ethnography as it may be secret or such practices were discontinued at the time of the Ancestral Puebloan migration around 1300 AD.

Dendrochronology Studies

The other major component to our research is analyzing the relationship of the lunar standstill cycle and architectural construction phases. Dendrochronology studies have shown an association of the lunar standstill cycle with architectural construction at the Chimney Rock Great House Pueblo (Malville 1999). Dendrochronology or tree ring dating is a process where structural wood samples are cross dated through time to provide room construction dates. Enough samples show periods or cycles of construction. Our use of dendrochronology is consistent with research protocol proposed by Bates and Bostwick at the Oxford 6 symposium (Bates and Bostwick 1999).

Although Cliff Palace does not contain enough wood to produce aggregates of construction dates, Balcony House (Fig. 7) provides an architectural example at Mesa Verde National Park. A chart of sample dates shows clusters in the early to mid 1200's, in the 1240's, and the mid to late 1270's AD. When a graph of the southern lunar maximum declinations is added, an **approximate** correlation with the maximums of 1204-1206, 1242-1244, and 1279-1281 AD can be observed (Fig 8). To make any conclusions, we must examine the type and location of the architecture represented by the samples. The early dates are associated with Room 4, Room 8, and the woodpile that is believed to be the roof timbers for Kivas A and B. The 1240's dates are primarily associated with Room 8 and the wood pile. The mid to late 1270's dates are associated with Room 6, Room 21, construction of the "Big Wall", and the east and south passageways.

Room 8 was constructed in the 1240's. Studies in 1997 showed the viewshed of this room to include equinox sunrise and possible links to the southern maximum moonrise (Malville and Munson 1998). Observations in 2006 and 2007 found the southern maximum moon rising at the intersection of the northeast corner of the "Big Wall" and the horizon from a basin pecked into the floor of Room 8 (Figs. 9-11). Based on Brunton compass measurements, no other culturally significant astronomical alignment were visually confirmed; however, we did not observe all potetnially significant cultural dates when an astronomical alignment would be expected or anticipated.

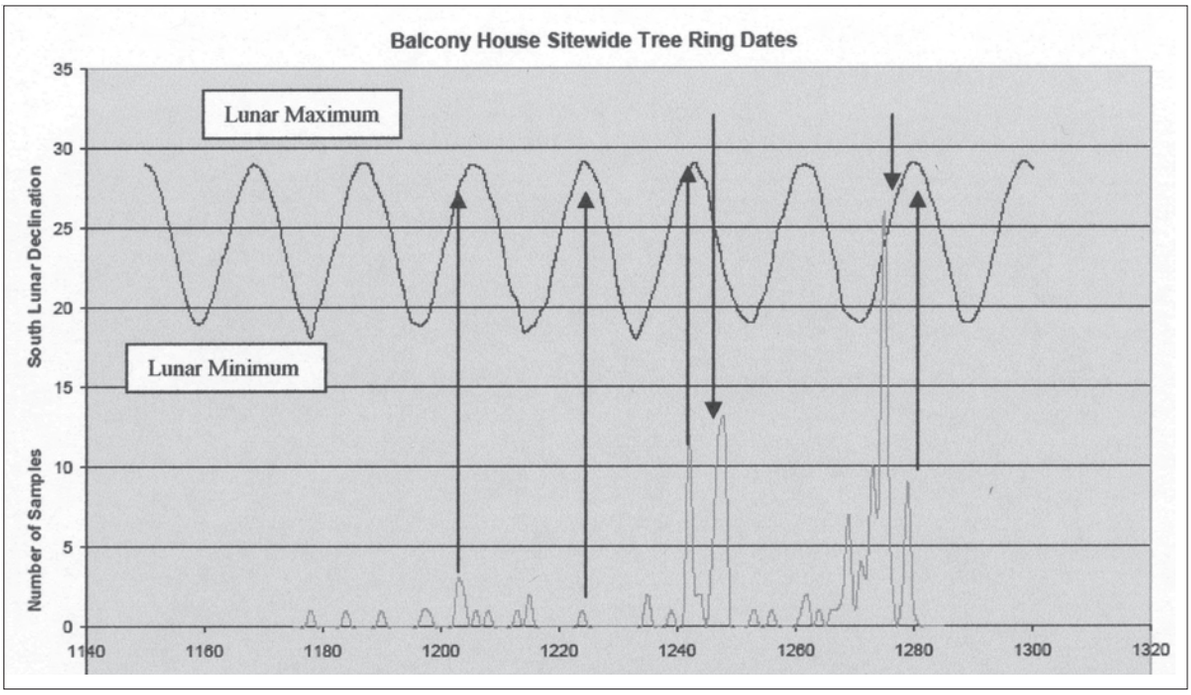

Fig. 8. Tree ring dates at Balcony House.

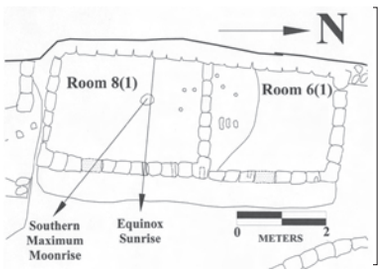

Fig. 9. Balcony House Room 8.

Fig. 10. Equinox sunrise.

Fig. 11. Southern lunar maximum.

Room 21 (Fig. 12) is part of the late phase construction with wood cutting dates between 1273 and 1276 AD. Room 21's architecture includes a T-Shaped door, two upper vents, and a lower vent in the east wall. A mudline on the exterior of this wall suggests additional architecture adjoined this room to the east. There is also heavy smoke staining inside this room even though no archaeologist has yet located the fire pit. Munson observed on December 5, 2006 that the northern maximum moonrise was framed by the upper portion of the T-Shaped door of Room 21 and on a line between Kivas A and B (Fig. 13). Complete architectural documentation is needed for this unit to further assess this association and the potential impact of the adjoining architecture.

The construction, dating, and orientation of some openings toward astronomical observations suggests that some rooms in Balcony House were associated with observation of the lunar maximum cycle. This conclusion cannot be made until a full set of architectural documentation data has been developed. It is through the documentation process that a solid architectural foundation will be formed for further studies at Balcony House.

Square Tower House

Because Balcony House lacks the dendrochronology needed to fully evaluate kiva construction cycles, we turn to Square Tower House, specifically Kivas F and G. (Fig 14). These two kivas represent the most intact kiva roofing available in Mesa Verde National Park. The roof of Kiva F (Fig. 15) shows a strong date cluster at 1203 - 1205 AD (23 samples) with additional small sample numbers through 1245 AD. The samples after 1205 AD probably represent periodic maintenance (Figs. 16). Kiva F was built between 1203 and 1206 AD corresponding to the lunar maxima of 1204-1206 AD.

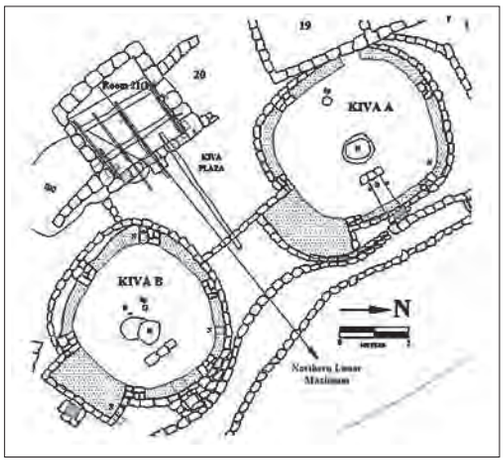

Fig. 12. Room 21, Kivas A&B plan map.

Fig. 13. Room 21 northern maximum moonrise.

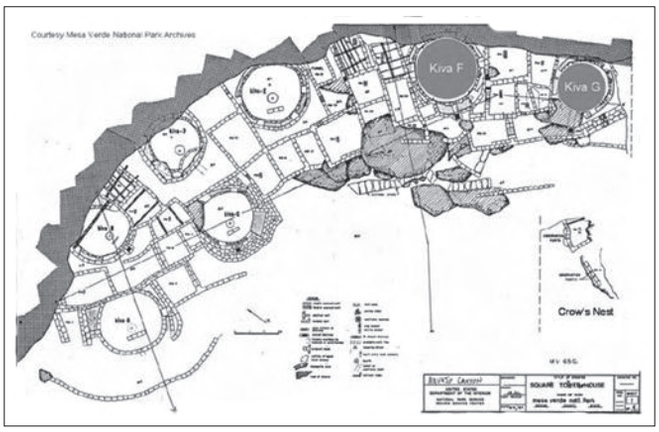

Fig. 14. Square Tower House plan map.

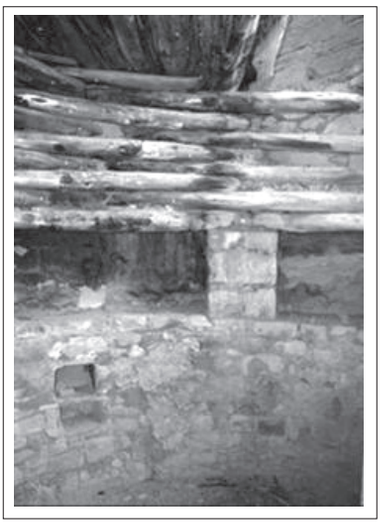

Fig. 15. Kiva F roof.

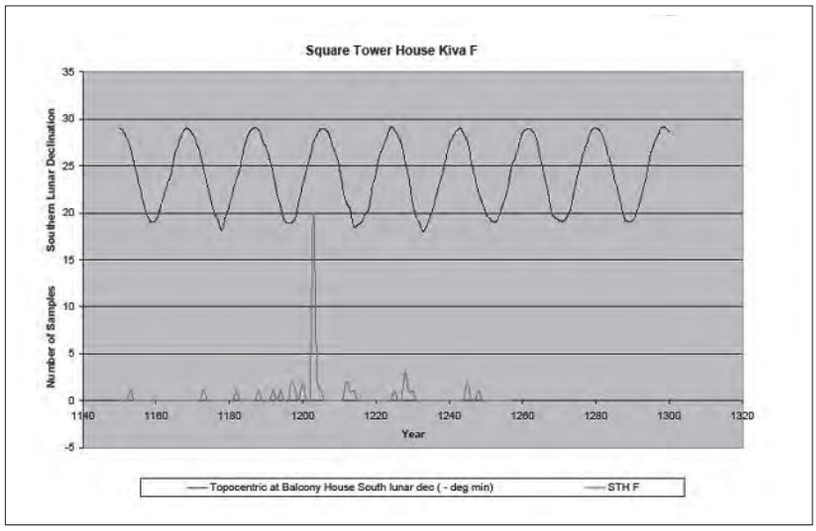

Fig. 16. Kiva F tree ring dates.

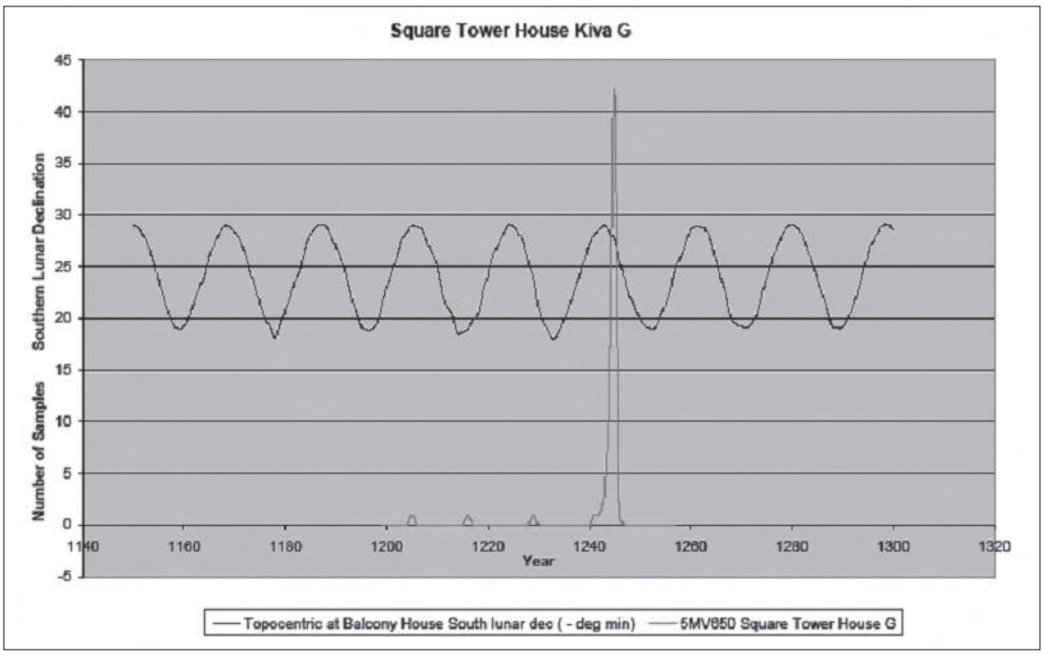

Fig. 17. Kiva G tree ring dates.

The construction of Kiva G is precisely dated to 1243-1245 AD (58 samples) corresponding with the lunar maxima of 1242-1244 AD (Fig. 17). Kiva G is the eastern most kiva in Square Tower House and is most closely associated with the access up to the Crow's Nest.

Following the Oxford VIII Conference, we noted a descrepency in the tree-ring data set for Square Tower House. We obtained corrected data from the Laboratory for Tree-Ring Research (University of Arizona, Tucson, AZ.) and updated our database and graphics as presented above.

As with Balcony House, a full architectural documentation package is needed for Square Tower House before any solidly based conclusions can be made.We are currernty conducting a Mesa Verde wide analysis of all tree ring cutting dates as well as at our control sites in an atttempt to better test our hypothesis.

Summary & Conclusions

In this project we used the principles of architectural documentation to examine form, feature placement, and phases of construction in relation to the Lunar Standstill Cycle. The Sun Temple documentation project confirmed Fewkes' belief that Sun Temple was a special building, but refined many of his observations regarding construction sequencing and potential usage. Sun Temple could have been used as a marker by observers in Cliff Palace for winter solstice sunset and southern lunar maxima moonset. The pictograph and newly recognized features in the Painted Tower of Cliff Palace, as well as direct observations, support our assertion that the area could have been used by sky-watchers and religious leaders for the observation of the 18.6 year lunar cycle. In the case of Sun Temple, a flat tree-covered horizon necessitated the construtction of a human created horizon (i.e Sun Temple) in order to accurately observe the southern maxima lunar standstill. The documented observation of lunar maximum cycles at the Chimney Rock Great House Pueblo provides indirect support for this process occuring at Mesa Verde.

Our examination of the tree ring dating record has revealed a correlation with the lunar maximum cycle. We see the closest associations in the well preserved kivas of Square Tower House and the specialized architecture of Balcony House, although both data sets are incomplete. Date clusters that preceed lunar maximums may be related to the construction of anticipatory architecture and features. Date clusters that follow lunar maximums are probably related to repair/replacement of roofs and not to observed astronomic cycles. In addition, consideration must be given to the influence of climatic cycles such as drought and localized environmental factors such as resource depletion. Our data set currently contains over 3000 dendrochronology samples from nine surface archaeological sites and 14 major cliff dwellings. Additional data is being incorporated so that a more thorough statistical analysis can be performed with additional construction units.

Our reseach clearly reveals that there is a correlation between the building of specialized architecture and

the lunar standstill cycle at Mesa Verde National Park. The question remains whether the construction of these buildings was driven by (a) astronomy or (b) enviornmental/cultural concerns. To answer this in part, we need to continue to evaluate construction dates of special function architecture (as documented by tree-ring analysis, palynology and other datable methodologies). But further, we need to assess what information the ancestral cultures derived from this astronomy. Per David Whitley, "it is necessary to identify why (not how) [astronomy] was done and how this knowledge and practice was used." (Whitley 2006, p.91). Such information could have been used to construct architecture for prediction, observation, and celebration for the purpose of maintaining agricultural or ceremonial calendars that time public gatherings which establish kinship groups and reaffirm cultural identity.

We now hypothesize that this correlation is intentional and we will continue to assess the physical data (astronomical/ tree ring) at regional and contemporary sites in the Mesa Verde region while also probing the "why" or what information the lunar min-max cycle may have provided the ancestral cultures and how they used that information. To assess the latter, we will analyze the records of J.W. Fewkes and others via their archived records at the National Anthropological Archives as well as continuing to interview living and knowledgable Puebloans about the extent of the astronomical knowledge within their culture.

Acknowledgments

We would like to thank the staff and management of Mesa Verde National Park for their invaluable assistance in the completion of this project. In addition we would like to thank Jeff Dean of the Laboratory for Tree Ring Research for providing tree ring data. The financal assistance of the Ballantine Family Fund, David Donald, MaryAnne Munson, and Bryan Bates is gratefully acknowledged. This project would not have been possible without the generous assistance of Larry V. Nordby and Bryan C. Bates.

References

BATES, B.C., BOSTWICK, T., 1999. Issues in Archaeoastronomy methodology. In: C. ESTEBAN, J.A. BELMONTE, eds. *Astronomy and cultural diversity.* Proceedings of the Internacional conference „Oxford VI and SEAC 99". La Laguna: Organizmo Autonomo de Museos del Cabildo de Tenerie, 147-155.

BATES, B.C., ODELL, A., 1987. Observation of Northern Lunar Moonrise on the "Sun Dagger", Fajada Butte, Chaco Canyon National Historical Park. *Unpublished manuscript on file at Chaco Canyon National Historical Park, National Park Service, USA.*

CARLSON, J.B., 1987. Romancing the Stone, or Moonshine on the Sun Dagger. In: J.B. CARLSON, W. J. JUDGE, eds. *Astronomy and Ceremony in the Prehistoric Southwest.* Papers of the Maxwell Museum of Anthropology, No. 2, 1983 Conference, University of New Mexico Press.

FAIRCHILD-PARKS, J. A., DEAN, J.S., 1993. Analysis of Tree-Ring Dates from Balcony House - Mesa Verde National Park, Colorado, *Unpublished report on file at Mesa Verde National Park, National Park Service, USA*.

FEWKES, J.W., 1916. *The Excavation and Repair of Sun Temple.* Washington, D. C.: Government Printing Office.

MALVILLE, J.M., 1993. Astronomy and Social Integration Among the Ancestral Pueblo. In: J.E. SMITH, A. HUTCHINSON, eds. *Proceedings of the Anasazi Symposium, 1991.* Mesa Verde National Park, Colorado, USA: Mesa Verde Museum Association, Inc. 155-166.

MALVILLE, J.M., ed., 2004. *Chimney Rock: The Ultimate Outlier*. Lanham, MD: Lexington Press.

MALVILLE, J.M., MATLOCK, G., eds., 1993. *The Chimney Rock Archaeological Symposium; 1990 October 20-21; Durango, Colorado, USA.* General Technical Report RM-227, Fort Collins, CO: U.S. Department of Agriculture, U.S. Forest Service, USA.

MALVILLE, J.M., MUNSON, G.E., 1998. Pecked Basins of the Mesa Verde. *Southwestern Lore,* 64(4), Winter 1998, Denver, Colorado, USA: Colorado Archaeological Society, 1-35.

NORDBY, L.V., METZGER, T., WILLIAMS, C.L. and MAYBERRY, J.D., 2002. *Mesa Verde National Park Archeological Site Conservation Program Guidelines Volume 1: Standards for Field Data Collection and Documentation.* Field manual published and on file with the Division of Research and Resource Management, Mesa Verde National Park, Colorado, National Park Service, USA.

SOFAER, A. and SINCLAIR, R.M., 1983. Astronomical Markings at Three Sites on Fajada Butte. In: J.B. CARLSON and W. J. JUDGE, eds. *Astronomy and Ceremony in the Prehistoric Southwest,* Papers of the Maxwell Museum of Anthropology, Number 2, 1983 Conference, Albuquerque, New Mexico, USA: University of New Mexico Press, 43-66.

WHITLEY, D.S., 2006. Issues in Archaeoastronomy and Rock Art. In: T.W. BOSTWICK and B.C. BATES, eds. *Viewing the Sky Through Past and Present Cultures: Selected Papers from the Oxford VII International Conference on Archaeoastronomy.* Pueblo Grande Museum Anthropological Papers No. 15. Phoenix, Arizona, USA: City of Phoenix Press, 85-102.

WINDES, T., 1995. Wood Sampling at Oak Tree House and Fewkes Canyon, MVNP. *Unpublished report on file at Mesa Verde National Park, Division of Research and Resource Management, Mesa Verde National Park, National Park Service, USA.*

Received: 16 October 2007; Revised: 10 March 2008

SKAITANT ARCHITEKTŪRINIUS ĮRAŠUS: KAIP ASTRONOMINIAI CIKLAI GALI ATSISPINDĖTI ARCHITEKTŪRINĖSE KONSTRUKCIJOSE MESA VERDE NACIONALINIAME PARKE, KOLORADO VALSTIJOJE, JAV

Gregory E. Munson, Bryan C. Bates, Larry V. Nordby

Santrauka

Dendrochronologinio datavimo būdu ištyrus architektūrinių konstrukcijų iš Mesa Verde nacionalinio parko amžių ir statinių orientacijų ryšį su pagrindiniais Mėnulio azimutais, buvo nustatyta koreliacija, leidusi iškelti hipotezę, kad šie statiniai ir jų konstrukcijos galėjo būti orientuojami atsižvelgiant į 18,6 m. trukmės Mėnulio ciklą apie 1150–1300 m. Detali architektūrinė ir dendrochronologinė Saulės šventovės (Sun Temple) analizės patvirtino pradinę hipotezę, kad pietinis „aukšto“ Mėnulio azimutas buvo stebimas virš Saulės šventovės iš Dažyto bokšto (Painted Tower) Uoliniuose rūmuose (Cliff Palace). Analogiški statinių konstrukcijų ir reikšmingų Mėnulio azimutų sąryšiai buvo aptikti ir kituose statiniuose.

Anksčiau atlikti Čakų kanjono (apie 800–1100 m.) ir Kamino uolos (Chimney Rock) archeologinės vietovės (1000–1100 m.) archeologinių tyrimų duomenys taip pat parodė, jog senieji krašto gyventojai pueblai stebėjo architektūriškai pažymėtą 18,6 m. trukmės Mėnulio ciklą. Kita vertus, šios hipotezės pagrįstumą sustiprina ir XIX a. etnografinė medžiaga, XX a. pradžios fotonuotraukos bei dokumentuoti pokalbiai su Pueblo genties vyresniaisiais.

Tolesni tyrimai turėtų atsakyti į klausimą, kokiems konkretiems tikslams buvo naudojamos šios astronomiškai reikšmingos konstrukcijos.

Vertė Jonas Vaiškūnas

THE XIANGFEN, TAOSI SITE: A CHINESE NEOLITHIC 'OBSERVATORY'?

DAVID W. PANKENIER, CIYUAN Y. LIU, SALVO DE MEIS

Abstract

The Taosi late Neolithic site is located in Shanxi Province in north-central China. Three decades of excavation have unearthed storage pits, dwellings, and many artifacts, identified as the Taosi culture type (4300 to 3900 BP). Recent excavations led to the discovery of the tombs of chiefs of the Early Taosi period, and the largest walled-town in prehistoric China. A semi-circular foundation built in about 4100 BP along the southern wall was also discovered. The design of the raised terrace within it would have permitted observations of sunrise at specific dates along the eastern horizon. Here we report on what has been learned about this fascinating site, and analyze its astronomical features and function.

Key words: China, Neolithic, Taosi culture, solstice observation, archaeoastronomy, horizon calendar.

Introduction

The Xiangfen, Taosi site (N 35° 52' 55.9" E 111° 29' 54" in Shanxi Province is located some 5.5 km from the Fen River to the west and barely 10 km from Ta'er Mountain to the east. According to historical accounts and local tradition, this area was the heartland of the first dynastic polity in Chinese history, the Xia, which ruled the north central China plains area along the Yellow River from ca 2100 to ca 1600 BCE. Taosi lies only 20 km from Pingyang, which is identified in ancient sources as the location of the capital of "Emperor" Yao, the semi-legendary hero whose sagely governance supposedly played a crucial role in the formative period of Chinese civilization.

The Taosi site contains the ruins of at least four walled cities which were successively occupied for some four-five hundred years during the late Neolithic. Abutting the southeast wall of the large Middle Period city (ca 2100 BCE) is a smaller walled enclosure with a raised platform which has excited great interest. The arc of this foundation approximates the range in azimuth of sunrise along the eastern horizon at the latitude of Taosi. Observations from the center of the platform suggest that features on the foundation are oriented toward points on the mountain ridge to the east/southeast where the sun rose on certain dates. Below we report on the design and purpose of the site and evaluate the hypothesis that the Taosi site is a solar 'observatory'.

Archaeological and astronomical features of the Taosi site

Archaeological characteristics

Excavations at Taosi from the late 1970s through the 1990s uncovered dwellings of commoners and an elite cemetery at the site, resulting in the identification of the Taosi culture type (ca 4300 to 3900 BP). Subsequent excavations led to the discovery of over 1 300 elite tombs, including those of the chiefs of the Early Taosi period, pointing to the emergence of a pre-dynastic kingdom. The ^{14}C dating and the location are both consistent with a transition to the early dynastic period which followed.

From 1999 to 2001, archaeologists excavated a huge pounded-earth enclosure from the Middle Taosi period (4100 to 4000 BP). Rectangular in shape with an inner area of 280 ha, it makes the Taosi site the largest walled town in prehistoric China. In addition to numerous building foundations, burials, storage sites, etc., the archaeological finds include a bronze bell, fine jades, painted pottery, and evidence of extreme social stratification. In addition, the discovery of a mark written with a brush and paint and reminiscent of the Shang dynasty oracle-bone script half a millennium later has led to speculation about the possible contemporaneous use of writing.

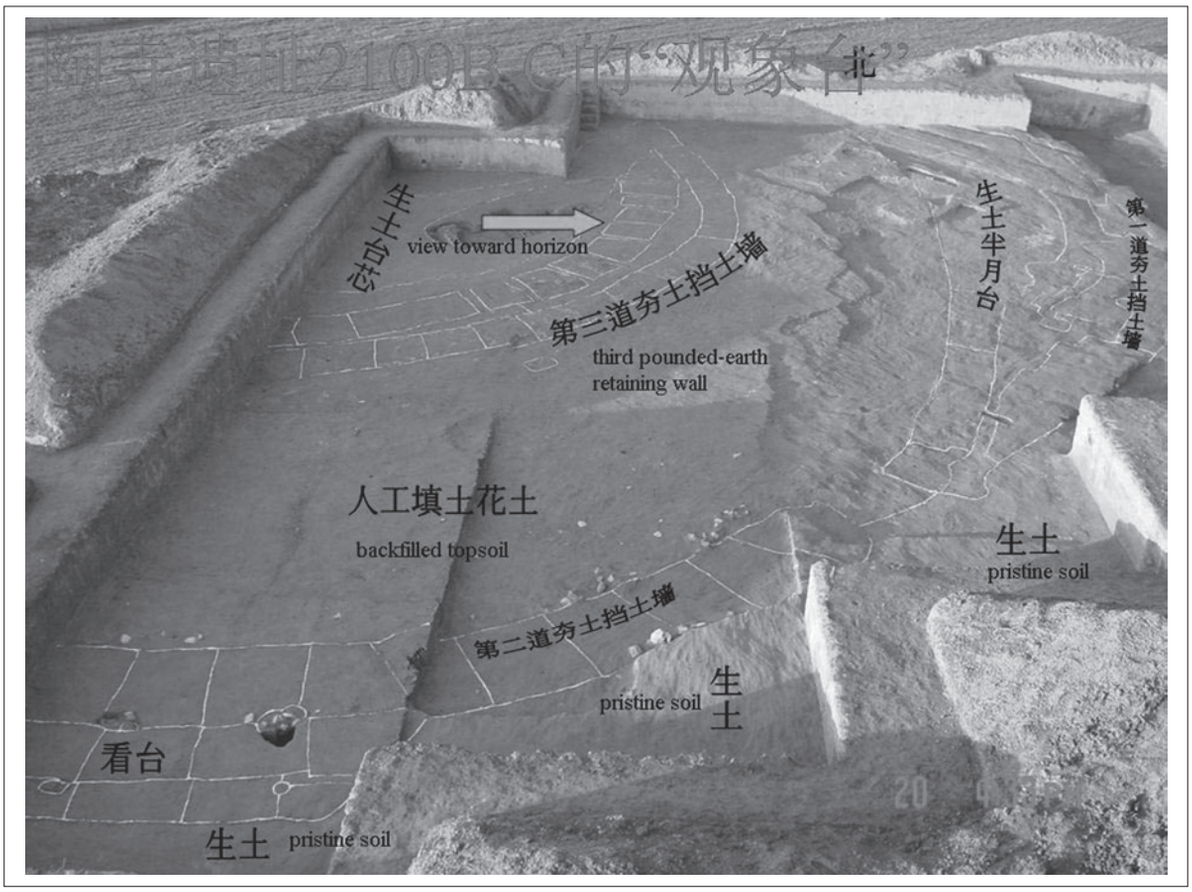

Fig. 1. Taosi observation terrace.

Excavations during 2003-04 unearthed a semi-circular enclosure along the southern perimeter of the Middle Taosi period city wall (Fig. 1).

The enclosure consists of an outer ring-shaped path and a pounded-earth platform with a diameter of about 60 m and an area of nearly 1,740 m^2. It can be reconstructed as a three-level altar. The third level, the top of the altar complex, is a semi-circular platform. On it a curved pounded-earth foundation faces east-southeast, its upper surface scored by twelve regularly spaced grooves, each about 1.4 m apart, an average of about 25 cm wide, and 4 to 17 cm deep. Analysis of the grooves indicates that the raised portions of pounded-earth between them are the remains of more or less uniformly shaped earthen pillars, rectangular or trapezoidal in cross-section, erected at regular intervals to create narrow apertures. The arc of the semi-circular foundation approximates the range in azimuth of sunrise along the eastern horizon at the latitude of Taosi. Standing at the center of the platform and observing through the reconstructed apertures, it was found that most are oriented toward the mountain ridge to the east-southeast. The range in azimuth defined by apertures E2 to E12 precisely matches the arc defined by the sun's azimuth at sunrise between the solstices. These features of the site immediately suggested to archaeologists the possibility that the site had been used to observe the rising sun throughout the year and that the apertures served as backsights.

Preliminary analysis, based on calculation as well as on-site observations in 2003-04, suggested that the apertures were originally intended to permit observation of the rising sun at certain times, especially the solstices. In other words, the complex is thought to have been a sacrificial site and solar 'observatory' whose design would have permitted the establishment of a horizonal calendar. The discovery would be unprecedented in China and would lend support to early historical accounts of the use of such observational methods at this time.

Astronomical study

The archaeological team led by He Nu which excavated the semi-circular platform in 2003-04 (He 2004) recognized that the length of the pounded-earth foundation suggested a possible use in connection with sunrise observations and sacrifices. Preliminary measurements were made with transit and compass from the presumed center of the arc, followed by simulated

Fig. 2. Central observation point.

sunrise observations in 2004-05. The observations were accomplished by fabricating an iron frame with the same dimension as the viewing apertures, and then erecting the frame on one slot after the other to determine whether the sun rose in the framed space. It was only after these measurements and observations had been completed that a circular pounded-earth platform was discovered under a previously unexcavated column of earth (Fig. 2). At the very center of this small circular platform was a pounded-earth core 25 cm in diameter, which apparently marked the precise point from which the original observations were made.

This central observation point lay only 4 cm from the center of the platform computed by the archaeologists, lending strong support to their presumption about the platform's observational function. Preliminary calculation of the sun's rising points on the solstices at Taosi in 2100 BCE by Wu Jiabi and He Nu (2005) confirmed the presumption that the structure was used for that purpose. Further consultation with astronomers then led the archaeologists to conclude that the preliminary measurements and observations initially based on the computed center of the platform had to be repeated, this time using the actual central observation point as well as higher precision equipment. This was accomplished in 2004-05.

Structural features

Several things are immediately apparent from the design of the structure. First, the sun could never have risen in the southernmost aperture (E1) because this backsight is oriented toward a point on the horizon several degrees south of winter solstice sunrise. This has given rise to speculation that alignment E1 may have been intended to mark the moon's major standstill limit. Second, for the backsights E2-E12 to have served the intended purpose, the pillars (or posts) which originally defined them would have to have been 3-4 m tall in order to bracket the sun's rising point on the mountain ridge some 10 km distant. Third, the two backsights E11 and E12 at the northern end of the arc are significantly offset from the curve of the main foundation and also deviate somewhat in their dimensions, suggesting the possibility of a different purpose or, perhaps, construction at a different time. Subsequent detailed analysis of the physical features of the structure (Wu et al. 2007) indicates that in general it was crudely built, in that the pounded-earth foundation conforms poorly to the arc of a circle. As a result, several of the backsights (E1, E6, E9) do not actually point toward the original observation point. (Fig. 3) This has the effect of drastically narrowing the apparent size of the aperture in some cases from the perspective of the

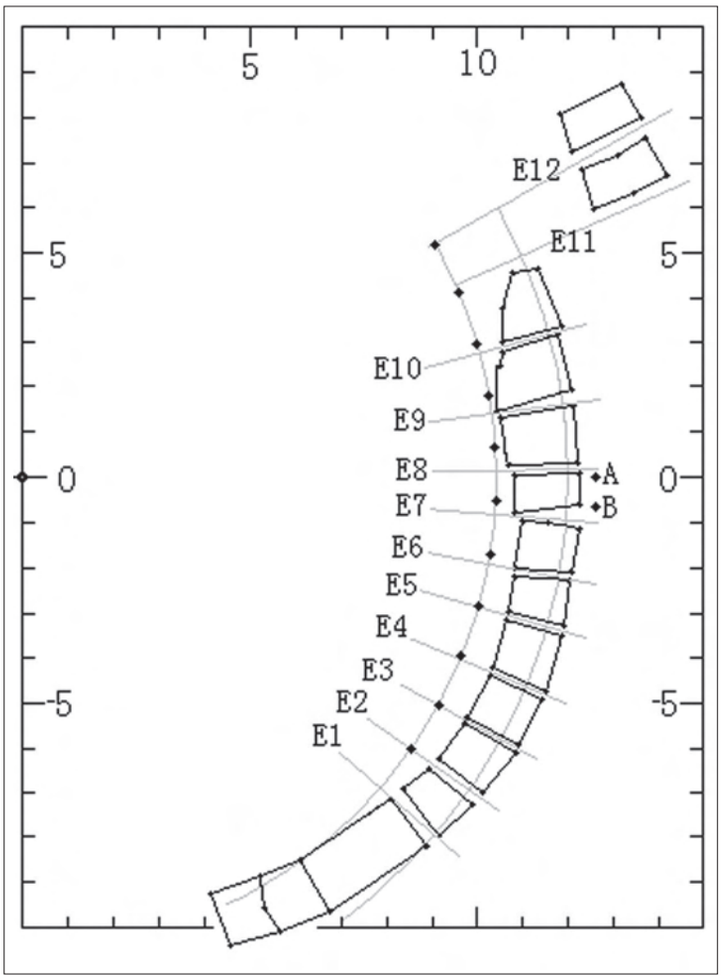

Fig. 3. Theoretical layout (in gray) superimposed on a precision drawing of the actual structure (after Wu et al. 2007).

central point (marked by the dot at zero meters on the lefthand scale). It is also curious that the backsights number exactly twelve and were regularly spaced, since the sun moves much faster along the horizon around the equinox by comparison to the weeks near the solstices. This means that the intervals defined by the 12 backsights, rather than demarcating fortnightly periods, would have varied greatly in length. In this the Taosi structure resembles the towers of Chankillo in Peru from two thousand years later which appear to have served a similar purpose (Ghezzi et al. 2007).

Astronomical Analysis

Shown here in Table 1 are the characteristics of the Taosi site derived from the latest survey data (IACASS 2007). The first six columns on the left reproduce the physical features of the twelve backsights E1-E12. Column four shows the approximately 5°-6° difference in azimuth between backsight midlines, which is a reflection of the more or less regular size of the slots and the pillars separating them. As noted above, this regularity is not reflected in the apparent slot width in those cases where the backsight does not accurately point toward the central observation point. The misalignment has the effect of drastically compromising the aperture's usefulness, for example in the case of backsight E6, whose apparent width is only 0.09°. Deviation from the norm is also apparent in the case of backsights E10 and E11 marking the transition between the main curve of the foundation and the significantly offset pillars that define backsights E11-E12 on the north end of the array. This deviation also has the effect of drastically altering the structural symmetry in terms of the number of days intervening between the sun's appearance in successive backsights near the solstices (column 10, "Δ n days", in Table 1). For example, before and after winter solstice up to five weeks intervened between the sun's appearances in backsights E2-E3, while near the summer solstice it took about half that time to move between E11 and E12.

Table 1 shows the conversion to declination of the midline azimuth of each backsight (column 6) based on the survey data shown in columns 2-4. Column 7 shows the sun's declination within the slot (upper limb tangent) at date between 6 January -1999 and 11 July -2000 (*Starry Night Pro* simulation), followed by the local time of sunrise in three cases: E2, E7, E12. Columns 8-9 give the Julian Day Number and the number of days since the summer solstice. Column 11 shows those "best fit" Julian calendar dates (Gregorian in parentheses) when the sun could have been observed to rise in each of the backsights. Highlighted in the table are the pertinent data for the backsights of particular interest: E2 and E12 associated with the solstices; E7, the only potential candidate for equinoctial association; and E1 for which a lunar association has been proposed. Computed dates for the solstices and equinoxes using the complete VSOP theory for -2000 and -1999 are as follows:

WS Jan 6, 22h26m, TD JDN 990563.4347 (-2000)
VE Apr 7, 17h48m, 990655.2417
SS Jul 11, 0h40m, 990749.5278
AE Oct 9, 18h59m, 990840.2910
WS Jan 6, 4h26m, 990928.6847 (-1999)
VE-WS 91.8070 days, SS-VE 94.2861 days, AE-SS 90.7632 days, WS-AE 88.3937 days; year = 365.2500

Table 1. Dimensions and alignments of the twelve backsights and circumstances of the sun's appearance in each

Backsight number	Midline azimuth	Horizon altitude	App. slot width	Δ Az	Midline δ (GETDEC)	Sun's δ -2000	JDN	Day (ss+n)	Δ n days	Julian date in 2000 BCE (~Gregorian)
E1	**131.07°**	**5.56°**	**0.36°**	——	**-28° 20' 06" -28.33**	——		——	——	——
E2	**125.06**	**5.81**	**1.23**	**6.02°**	**-23 53 51 23.90°**	**-23.93 8:30LT**	**990928**	**179**		**6 Jan -1999 (~20 Dec)**
E3	118.87	5.54	0.68	6.17	-19 32 16	-19.61	990894	145	34	3 Dec (~16 Nov)
					-19.54	-19.59	990962	213	34	9 Feb (~23 Jan)
E4	112.68	6.13	0.56	6.19	-14 26 48	-14.62	990877	128	17	16 Nov (~31 Oct)
					-14.45	-14.81	990979	230	17	26 Feb (~9 Feb)
E5	106.00	7.20	0.70	6.68	-8 35 15	-8.40	990860	111	17	30 Oct (~13 Oct)
					-8.59	-8.96	990996	247	17	15 Mar (~26 Feb)
E6	100.64	5.78	0.09	5.36	-5 14 41	-5.21	990852	103	8	22 Oct (~5 Oct)
					-5.23	-5.97	991004	255	8	23 Mar (~6 Mar)
E7	**94.46**	**4.27**	**0.76**	**6.17**	**-1 12 44**	**-1.51 6:27LT**	**990842**	**93**	**10**	**12 Oct -2000 (~25 Sep)**
					-1.21	**-1.36 6:39LT**	**991016**	**267**	**12**	**4 Apr -1999 (~18 Mar)**
E8	89.11	3.32	1.02	5.35	2 32 37	2.59	990833	84	10	3 Oct (~16 Sep)
					2.54	2.51	991026	277	11	14 Apr 28 Mar
E9	82.30	2.26	0.53	6.80	7 23 41	7.41	990821	72	12	21 Sep (~4 Sep)
					7.39	7.05	991038	292	12	26 Apr (~9 Apr)
E10	74.59	1.91	0.61	7.71	13 23 15	13.66	990804	55	17	4 Sep (~18 Aug)
					13.39	13.03	991055	309	17	13 May (~26 Apr)
E11	66.08	1.12	2.29	8.51	19 38 04	19.75	990783	34	21	14 Aug (~28 Jul)
					19.63	19.01	991076	330	21	3 Jun (~17 May)
E12	**60.35**	**1.27**	**1.42**	**5.73**	**24 12 04 24.20**	**23.92 5:19LT**	**990749**			**11 Jul -2000 (~24 Jun)**

From Table 1 it is apparent that backsights E2 (δ -23.46 to -24.50) and E12 (δ 23.65 to 24.75) precisely bracket winter and summer solstice sunrise, respectively. In contrast, the sun would have risen in backsight E7 (δ -0.91 to -1.52) three days after the autumnal equinox and three days before the vernal equinox. Backsight E1, whose northern edge was nearly 5° south of the sun's southernmost declination, could not have been used to observe sunrise. Therefore, the suggestion has been made that E1 could have been used to observe the moon's major standstill limit. Below are the data for the major standstill closest to the epoch of Table 1, with declination as indicated by backsight E1 (δ -28.21 to -28.46):

Moonrise: -1995.07.11 at 20:44LT
age 14.8d (100%)
az 132.85 alt 5.56 =δ -29.56
(geocentric lunar δ -28.86)

This moonrise occurred at summer solstice on 11 July -1995, when the full moon rose at least two lunar diameters south of backsight E1. Hence, although the moon could have been observed to rise within backsight E1 some time earlier, strictly speaking, backsight E1 does not mark the southern lunistice.

Discussion

Although summer solstice sunrise cannot be observed in backsight E12 today, when the change in obliquity of the ecliptic since -2100 is taken into account, it is evident that solstitial sunrises could have been observed through backsights E2 and E12 to an accuracy of a few minutes of arc. The alignment in -2100 was better than at present, whether one defines sunrise as upper limb tangent or sun's center on the horizon. Thus, the potential use of the complex to observe and conduct sacrificial rituals at sunrise on the solstices is confirmed by the astronomical analysis.

The situation is more ambiguous with regard to backsight E7 and its possible association with the equinoxes, as well as the possible association of backsight E1 with the southern lunistice. In neither case is the degree of accuracy of alignment close to that achieved on the solstices. In the absence of persuasive evidence of ritual or calendrical focus on those particular dates, especially given the extreme difficulty of accurate prediction, the argument that the two backsights were intentionally designed for the purpose is problematic. The earliest textual evidence from China of interest in the midpoint of the seasons does not appear until over a millennium later in the canonical *Yao dian*, though that text's astronomical content clearly refers to a time centuries earlier. Still, it is not clear that direct solar observation was involved in determining when the "day is of medium length" rather than simple calendrical calculation. In the case of the lunar maxima and minima, evidence is lacking of an interest in marking the event, although the co-occurrence with summer solstice may have been recognized later. Apart from Taosi's proximity to the traditionally accepted location of Yao's capital, as suggestive as that is, there is no other evidence of a direct connection with that semi-legendary figure.

Careful study of Fig. 3 gives an indication how the complex may have been built. First, the fact that the arc of the main pounded-earth foundation extends well south of the winter solstice position, and yet falls short of the summer solstice position, suggests that the builders did not have a good grasp of the requisite range in azimuth that needed to be covered. Second, the fact that the backsights (E2-E5) nearest the winter solstice conform most closely to the theoretical ideal (shown by the black dots on their centerlines in Fig. 3) suggests that the winter solstice alignment was probably fundamental. Rather than being intentionally placed to observe sunrise on particular days, the remaining slots were laid out sequentially at regular intervals (one yard?) northward, with the result that by the time the halfway point was reached at slot E6 the cumulative measurement error had already produced a serious misalignment vis à vis the central observation point. Third, when it was realized, six months later, that the structure failed to capture summer solstice sunrise in the northeast, an extension was added to create backsights E11-E12, but because of site constraints that extension had to be built as an outlier several meters farther from the central observation point, its idiosyncratic dimensions therefore resulting from its construction at a different time from the rest. Fourth, the design of the complex, with twelve uniformly spaced backsights, displays either a lack of understanding or a lack of concern with the variability in the sun's daily progress along the horizon during the course of the seasons. Its curvature may reflect the emergence of the concept of a circular heaven. Fifth, apart from fixing the solstices and the length of the tropical year, given the irregularities built into the structure it is difficult to imagine what sort of functional calendar the Taosi alignments might have generated. The trial-and-error approach and relative lack of sophistication displayed by the structure seems technologically "age appropriate" with respect to the late Neolithic cultural level of Taosi.

In general, the design and placement of the structure is highly suggestive of the monopolization of ritualized sunrise observation by the Taosi elite who were buried close by, no doubt for reasons of control and prestige. The observation platform was built adjacent to the city wall at a point near where elite dwellings were located. Exclusive access to the walled enclosure was afforded by a passageway through the city wall. Although no trace remains of a roof, it is possible that originally, like most sacred spaces in ancient China, the platform was not open to the sky, and that the shafts of sunlight shining through the apertures into a darkened inner sanctum may have heightened the effect and figured importantly in the observation ritual. The high prestige and sacral function may explain why, when it fell out of use, the site was razed to the ground rather than being simply abandoned.

The comparative crudeness of the construction, the misalignments, as well as the irregular and unsymmetrical sectioning of the seasons produced by the spacing of the backsights, all point to an early stage in the ritualized use of sunrise observations to determine the seasons. Nevertheless, the Taosi site is unprecedented in providing evidence of a rudimentary horizontal calendar and accurate determination of the length of a solar year centuries earlier than expected. Although the Chinese term *guanxiangtai* (lit. "[celestial] observation platform") is frequently applied to the Taosi site, the English translation "observatory" is best avoided because, unlike the Chinese, it connotes a modern facility for dispassionate scientific study of the heavens.

Acknowledgments

The authors are grateful to Wang Wei, Director of the Institute of Archaeology, Chinese Academy of Social Sciences, for photographs of the Taosi site. The present authors did not participate in excavating or surveying the site. The study presented here is based on published data from the latest, most accurate survey and on knowledge of the circumstances of excavation and survey imparted by He Nu, who discovered the site and directed the excavation, and Wu Jiabi, who did the preliminary astronomical analysis. Their cooperation is

gratefully acknowledged. The present authors assume sole responsibility for the opinions expressed in the present analysis.

Abbreviations

IACASS – Institute of Archaeology, Chinese Academy of Social Sciences
IASP – Institute of Archaeology of Shanxi Province
CRBLC – Cultural Relics Bureau of Linfen City

References

GHEZZI, I., RUGGLES, C., 2007. Chankillo: A 2300-year-old solar observatory in coastal Peru. *Science*, 315, 1239-1243.

HE, N., 2004. Taosi zhongqi xiaocheng nei daxing jianzhu II FJT1 fajue xinlu licheng zatan [Notes about the excavations of the large building II FJT1 in the small city of middle Taosi Phase]. *Bulletin of Studies in Ancient Civilizations*, 23, 47-58.

HE, N., 2006. Taosi zhongqi xiaocheng daxing jianzhu jizhi II FJT1 shidi moni guanxiang baogao [Report on simulative observation at the massive building foundation II FJT1 in the inner city of the mid Taosi period]. *Gudai wenming yanjiu tongxun* [*Ancient Civilizations Review]*, 29, 3-14. [http://www.kaogu.cn/en_kaogu/show_News.asp?id=124], 1-6.

IACASS, IASP, CRBLC, 2004. Shanxi, Xiangfen xian, Taosi chengzhi jisiqu daxing jianzhu jizhi 2003 nian fajue jianbao [2003 Excavation on Foundation II FJT1 of a Large Building on the City-site of the Middle Taosi Period in Xiangfen County, Shanxi]. *Kaogu* **7**, 9-24.

IACASS, IASP, CRBLC, 2005. 2004-2005 nian Shanxi, Xiangfen xian, Taosi yizhi fajue xin jinzhan [New progress in the excavations of the site at Taosi, Xiangfen, Shanxi in 2004 and 2005]. *Bulletin of the Center for Research on Ancient Civilizations, CASS*, 10, 58-64.

IACASS, IASP, CRBLC, 2007. Shanxi, Xiangfen xian, Taosi zhongqi chengzhi daxing jianzhu II FJT1 jizhi 2005-2005 nian fajue jianbao [2004-2005 Excavation on Foundation II FJT1 of a Large Building on the City-site of the Middle Taosi Period in Xiangfen County, Shanxi]. *Kaogu* 4, 3-25.

JIANG, X., et al. 2006. Shanxi, Xiangfen xian, Taosi chengzhi tianwen guance yiji gongneng taolun [A discussion about the function of the observatory ruin in the city of Taosi, Xiangfen county, Shanxi]. *Kaogu* 11, 81-94.

LIU, C., LIU, X., MA, L., 2005. A Chinese observatory site of 4,000 year ago. *Journal of Astronomical History and Heritage*, 8(2), 129-30.

WU, J., HE, N., 2005. A preliminary study about the astronomical date of the large building IIFJT1 at Taosi. *Bulletin of the Center of Ancient Civilizations of CASS*, 8, 50-55.

WU, J., CHEN, M., LIU, C., 2007. Taosi guanxiangtai yizhi de tianwen gongneng yu niandai [The astronomical function and date of Taosi observatory]. Forthcoming.

Received: 1 November 2007; Revised: 5 November 2008

TAOSI ARCHEOLOGINĖ GYVENVIETĖ – KINŲ NEOLITINĖ „OBSERVATORIJA“?

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Santrauka

Remiantis istoriniais duomenimis ir vietos tradicija, Taosi buvo pirmosios kinų dinastijos – Sia – branduolys. Maždaug nuo 2000 iki 1600 m. pr. m. e. ši dinastija valdė Šiaurės vidurio Kinijos lygumas išilgai Geltonosios upės. Taosi vietovėje yra mažiausiai keturių dar ikidinastinių miestų, kuriuose buvo gyvenama apie keturis penkis šimtus metų vėlyvojo neolito laikotarpiu, liekanos. Prie pietrytinės vidurinio laikotarpio (apie 2100 m. pr. m. e.) miesto sienos mažesnėje aptvertoje teritorijoje yra aukštesnė terasa, kelianti ypatingą mūsų susidomėjimą. Šio statinio pamato skliautas panašus į rytų horizonto atkarpą, kurioje pateka Saulė. Šis faktas archeologams piršo mintį, kad šioje vietoje visus metus galėjo būti stebima tekanti Saulė.

Keli dalykai nagrinėjamoje struktūroje yra akivaizdūs. Pirma, tekanti Saulė negali būti stebima per labiausiai į pietus nutolusią angą (E1), nes ji yra nukreipta į horizonto tašką, esantį keletu laipsnių toliau į pietus nuo saulėtekio per žiemos saulėgrįžą vietos. Todėl kilo tam tikra spekuliatyvi mintis, kad ašis E1 galėjo būti skirta Mėnulio didžiosios lunisticijos krypčiai pažymėti. Antra, kad stebėjimo vietos E2–E12 galėtų atlikti savo paskirtį, kolonos, kurios kažkada tuos taškus žymėjo, turėjo būti 3–4 m aukščio – tam, kad sutaptų su Saulės tekėjimo tašku virš kalnų grandinės, esančios apie 10 km atstumu. Trečia, dvi stebėjimo vietos – E11 ir E12 – šiauriniame skliauto gale yra akivaizdžiai atskirtos nuo pagrindinio pamato linijos išlinkimo ir nuo kitų skiriasi savo matmenimis. Tai perša mintį apie kitokią jų paskirtį arba galbūt nevienalaikę statybą. Tolesnė detali fizinių šios apskritos konstrukcijos savybių analizė rodo, kad statinys buvo pastatytas primityviai ir nelabai atitiko apskritimo lanko formą. Dėl to keletas stebėjimo angų (E1, E6, E9) apskritai nebuvo orientuotos centrinio stebėjimo taško kryptimi (3 pav.). Tai ir galėjo lemti drastišką kai kurių stebėjimo angų susiaurinimą.

Šiandien saulėtekis vasaros saulėgrįžos metu negali būti stebimas E12 taške, tačiau įvertinus ekliptikos pasvirimą 2100 m. pr. m. e. tampa aišku, jog vasaros ir žiemos saulėgrįžų saulėtekis per taškus E2 ir E12

tuomet galėjo būti stebimas. Atlikta astronominė analizė patvirtino prielaidą, jog šis kompleksas galėjo būti naudojamas vasaros saulėgrįžos aukojimo ritualo laikui nustatyti pagal Saulės patekėjimo kryptį. Kur kas labiau neaiškus taško E7 interpretavimas, galimos jo sąsajos su lygiadieniais ir tašku E1 (pietinės lunisticijos vietoje). Abiem atvejais stebėjimo krypties tikslumas yra daug blogesnis negu solsticijų azimutų.

Palyginti grubi ištirtos struktūros konstrukcija, netikslus orientavimas, netaisyklingas ir asimetriškas sekcijų tarp stebėjimo angų išdėstymas – visa tai byloja apie ankstyvąjį stebėjimų laikotarpį, kai ritualiniais tikslais pagal saulėtekius buvo nustatoma metų laikų pradžia. Vis dėlto Taosi archeologinis paminklas yra beprecedentis liudytojas, rodantis egzistavus rudimentinį horizontalų kalendorių ir bandymus nustatyti Saulės metų trukmę keliais šimtmečiais anksčiau, negu buvo tikėtasi.

Vertė Vykintas Vaitkevičius

ON THE ORIGIN OF THE ROMAN *IDEA OF TOWN*: GEOMETRICAL AND ASTRONOMICAL REFERENCES

GIULIO MAGLI

Abstract

Recent ideas about the formation of the Roman tradition of town layout and the associated foundation rituals are briefly reviewed. The example of Cosa is used as a case study to investigate the possible existence of an archaic, tripartite layout, as is mentioned by some authoritative ancient writers.

Key words: ancient town planning - astronomical orientation of towns.

Introduction

"The remains of Roman towns are still visible, are still part of everyday experience in Western Europe and round the Mediterranean: and the more closely they are examined, the more puzzling they appear." With these words begins the book by Joseph Rykwert on the Anthropology of the Urban Form in Rome (1999), where the author makes the effort to integrate pieces of information scattered in archaeological remains as well as in many Roman texts. As is well known, Roman historians such as Varro, Plutarcus and Pliny the Elder describe the town's foundation ritual as following a rule directly inherited from the Etruscans' sacred books belonging to the haruspices, called *Disciplina*. A fundamental part of the haruspices' ritual was connected with cosmic order, and consisted of the identification of a terrestrial image of the heavens (*templum*) in which the gods were "ordered" and "oriented". This is shown by the *Piacenza Liver*, a first-century B.C. bronze model of the liver of a sheep, whose external perimeter is divided into 16 sectors, each devoted to a different god. Once oriented, the liver itself became an image of the cosmos on the earth. By analogy, the same became true of the place from which the auspices had to be taken (the *auguraculum*) and, in fact, of the whole, ritually founded town (Aveni and Romano 1994). Correspondingly, the ideal "centre", or *mundus*, was an icon of the centre of the world, and so contained a deposit, placed at the time of foundation, containing soil, and/or some of the first crop, from the place of birth of the founders (for a recent complete overview see Briquel 2004). Rykwert concluded that the foundation rituals and the layout of urban space originated in "ceremonies of the religion of the Italic people" back as far as the 8th-9th century B.C., if not before. To investigate this intriguing hypothesis, however, many problems have to be tackled and the research requires a fully interdisciplinary approach. In particular, the main questions needing to be addressed are:

1. How far back in the archaeological data can we find traces of the foundation ritual and its connection with astronomy?
2. Why do some authoritative ancient authors - both Greek and Roman, such as Plato and Servius - speak about *tripartite*, or even radial, town planning? Are traces of these kinds of layout visible in ancient towns before the orthogonal layout became the rule?
3. How were the foundation ritual and the orthogonal town planning glued together? In particular, was orthogonal town planning imported from Greece or did it develop independently in Italy?
4. Did the final product of this evolution, namely the Roman *castrum* town, have any astronomical connection?

In recent years, advances have been made both from the point of view of the archaeological records and from the point of view of their interpretation. In the present paper the advances in addressing questions 1 and 2 will be briefly reported, including (partly unpublished) recent research that has been carried out by the present author on ancient Italic towns. For further developments, concerning points 3 and 4, the interested reader is referred to Gottarelli (2003) and Magli (2008).

The Archaeological Records Concerning *Auguracula*

From the Roman period - around the beginning of the first century B.C. - one example of an auguraculum survives (Torelli 1966). This find is not very spectacular and, perhaps consequently, it is poorly known; howev-

er it is fundamental, being the only known example of such a structure in the Roman world (the possible Cosa auguraculum will be discussed later on). The structure was located in the Bantia acropolis and comprised nine stone cylinders that were placed on the ground so as to form three lines of three oriented to the cardinal points. In this way the directions from the centre identified the eight main divisions of the cosmos (a simplified version of the 16 Etruscan divisions). Each cylinder has an inscription on the top: the central one is dedicated to the sun [SOLEI], the eastern one to Jovis [IOVI] and the western one to Flusa [FLUS], a local chthonic deity. The inscriptions on the other cylinders are intended to identify the omens of the birds that might eventually come from the corresponding directions: the north-eastern one reads BIVA (=*bene iuvante ave*); the south-eastern one SINAV (=*sinistra* or *sinente ave*); the south-western one CAEN (=*contraria ave enebra*); the north-western one CAVAP (=*contraria ave augurium pestiferum*); and finally the southern and northern inscriptions read RAVE (=*r... ave*) and TAR (=*t... ave r...*) respectively (their complete reading is uncertain). The cylinders were disposed in such a way that the spells could be read in the north-south direction, and the haruspex stood in a sort of tribune located at the west of the structure.

Only in relatively recent times has the existence of an early, pre-Roman tradition about *auguracula* been proved as well. First of all, an intact example has been uncovered in the excavations at Meggiaro, near Este, a zone once inhabited by the Italic people called *Veneti*. Here, as in Bantia, a rectangular "sacred space" (measuring 7.5 x 5.0 m, i.e. in the proportion 3:2) was delimited by eight stone blocks. The blocks bear no inscriptions but there is no doubt that this area was ritually "inaugurated", since a stratigraphic layer containing offerings of various kinds has been found. What is quite astonishing is the *age* of this structure: its construction is securely dated to the end of the 6th century, with a *terminus ante quem* around 480 B.C. (Ruta Serafini 2002). During this period Rome "had very far to come" (the Romans were fighting with the Etruscan city of Veii, 20 km away from the Palatine hill). The orientation of the east-west diagonal of the Meggiaro *auguraculum* is about 11.3° south of east, so that the longest sides align 45° south of east. It is likely that this orientation (which of course corresponds to one of the eight divisions at Bantia) had a symbolic element.

Another example of what is very probably a pre-Roman auguraculum has been unearthed at the Lavello (the Roman *Forentum*) acropolis (Tagliente 1999). Here, a rectangular enclosure of 6.0 x 4.0 m (again in the proportion 3:2) - of is delimited by small holes (*bothroi)* disposed symmetrically. The fact that the holes were filled with offerings demonstrates the ritualistic nature of this enclosure, which is dated to around the middle of the 4th century B.C., again well before the "arrival" of the Romans (the orientation of the enclosure is reported to be north-south, but unfortunately no quantitative data are available).

Of fundamental importance, of course, is the study of Etruscan towns. One of the main difficulties in tracing back the origins of the foundation rituals is the fact that most of these towns were re-planned by the Romans, so that their original urban design is uncertain. However, interesting finds have been made in Tarquinia, where a "sacred complex" has been found dating to the 7th century B.C. and oriented in the cardinal directions (see Bonghi Jovino in Carandini and Cappelli 2000), and in Misa (today's Marzabotto), which was founded in the 6th century B.C. and is the only Etruscan town to have been destroyed by the Celts before the Romans' arrival (Mansuelli 1965).

The excavations at Misa have shown that the town plan was based upon an orthogonal grid oriented 2.5° west of north, with the sacred area located upon an "acropolis" - actually a gentle hill - which was itself located *outside* the grid, near the north-western corner of the town (Fig.1). Until a few years ago, most scholars agreed that the orthogonal plan at Misa was inspired, if not simply "copied", from the contemporary town planning of the Greek colonies, and that no traces of the foundation ritual could be found in the town (Castagnoli 1971). This viewpoint, however, does not explain the cardinal orientation of the grid, something that is barely visible in Greece, nor does it explain an interesting find that was made beneath street level at the very centre of the town. It is a rounded stone with an inscribed *decussis* (cross). This stone was left under the foundation layer of the street, and it is therefore difficult to negate its ritualistic, rather than functional, meaning. Similar rounded stones, although uninscribed, have been found beneath two other street crossings (denoted by "x" in Fig. 1) and others may exist in unexcavated areas. In recent years, taking into account these findings, Gottarelli (2003) has carried out a complete re-evaluation of the symbolic content of the urban layout of Misa. Among the results of this analysis, the one that is of special relevance here is that the *whole* urban layout of Misa may actually have been conceived as a *templum*, in which the eight main street crossings - each allegedly corresponding to a rounded stone (of which three have been found to date) - played the role of the eight stone cylinders of the Bantia auguraculum. Accordingly, the so-called "Temple D" of the Acropolis,[1] a cardinally oriented stone podium identified until now

[1] It was unearthed in the 19th century and named thus at that time.

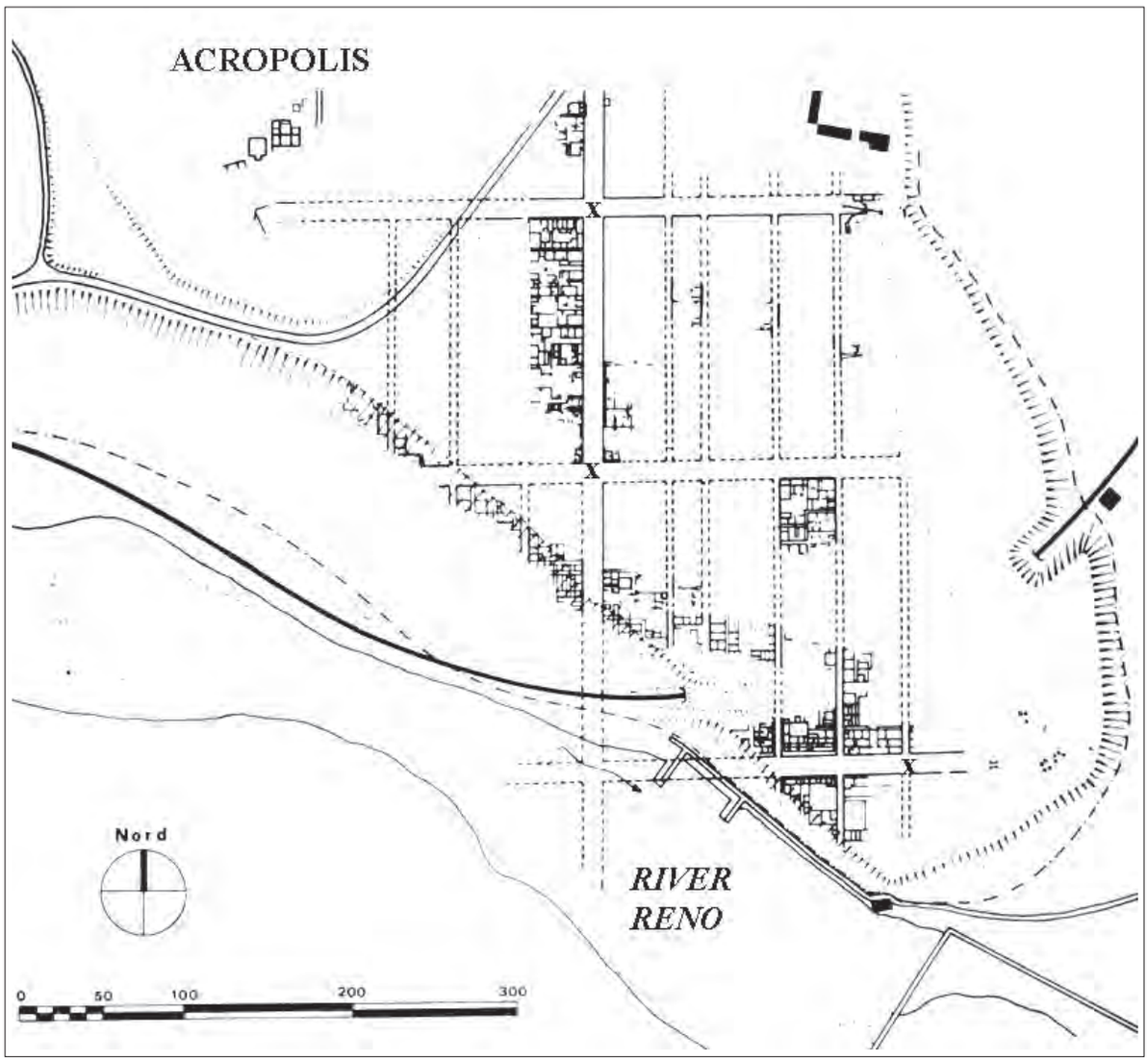

Fig. 1. Plan of Misa.

as some kind of ceremonial platform, might actually be the town's auguraculum. A nearby pit might have been the *mundus*. Indeed, many geometrical referents – and particularly the main diagonal of the town – clearly indicate the existence of such structures.

Cosa

Several ancient towns of west-central Italy are surrounded by megalithic polygonal walls. This impressive technique makes its first appearance during the Bronze Age, although all the polygonal walls in Italy are currently dated by most archaeologists – on the basis of quite scant evidence – to the first centuries of the Roman expansion, between the 5th and the 3rd century B.C. (Recently, the problem of dating the polygonal walls in Italy has been the subject of a comprehensive reassessment by the present author, see Magli 2006, 2007a, 2007b.) Of particular relevance here is the case of one of the most beautifully preserved of these towns: Cosa, in southern Tuscany (Fig.2). The walls at Cosa are masterpieces of polygonal masonry and are equipped (uniquely in Italy) with several towers. Since the interior urban plan follows a rigid orthogonal grid and the foundation of a colony named Cosa in 273 B.C. is mentioned by some Roman historians, most archaeologists date the town to the first decades of the 3rd century B.C. and consider the walls, towers, and orthogonal grid to be contemporary with the original project (Brown 1951). However, there is no definitive proof of such assertions. Indeed, the towers were probably added to the walls in later times, since there is no visible joint between the blocks of the walls and those of the towers. Added to this, the orthogonal grid might have been superimposed by the Romans upon an existing town: the "decumanus" does not directly connect the two "west-east" gates (P1 and P3) and the "cardus" does not connect two gates either, since the town actually has only three main gates. We are thus dealing with a town that certainly dates back as far as 273 B.C., but

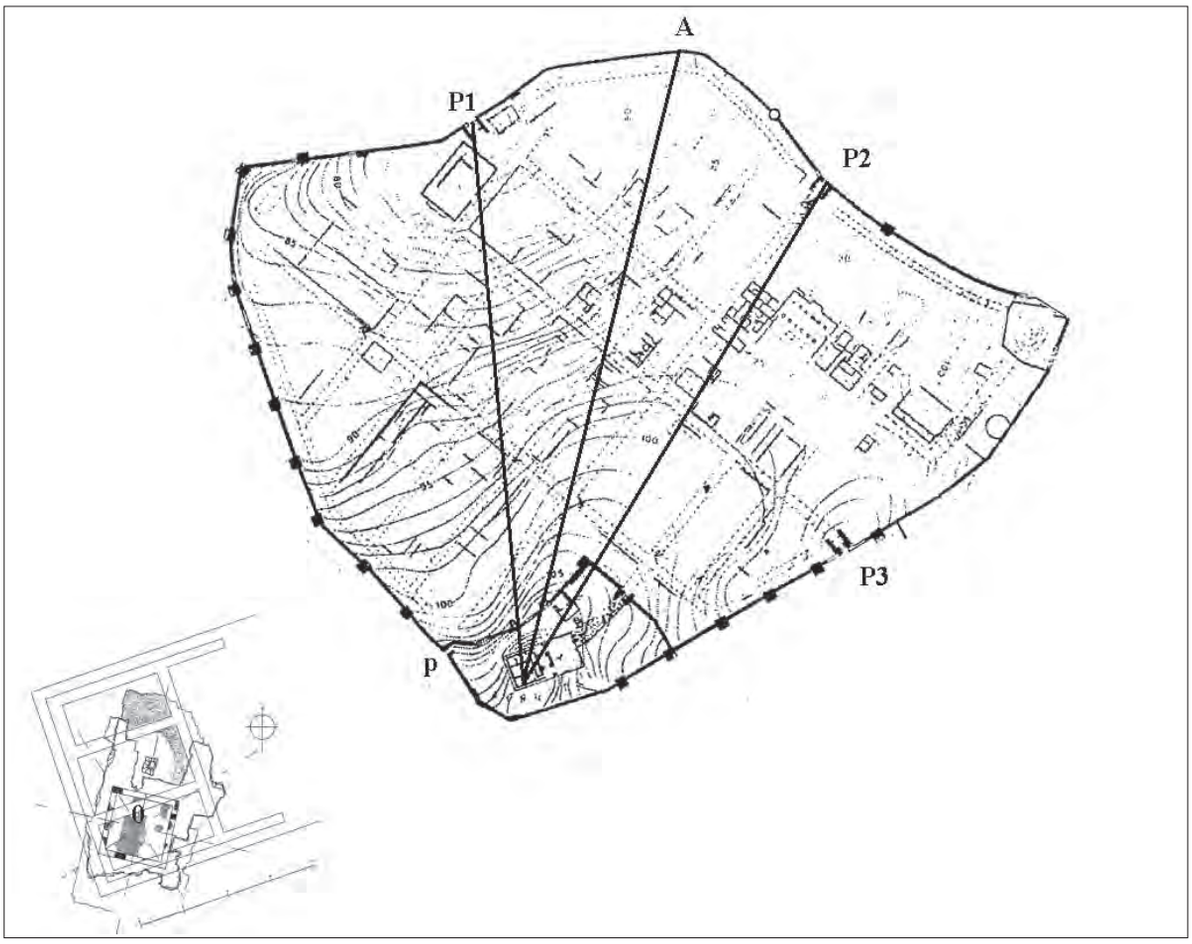

Fig. 2. Plan of Cosa – see the text for an explanation of the superimposed lines.

is perhaps much older. In fact, an Etruscan town named Cosa is cited by Vergil (Aeneid 10.168) and Etruscan towns such as Roselle – some 80 km north of Cosa – were equipped with megalithic walls as far back as the 6th century B.C.

The Acropolis of Cosa is located in the southern corner of the area within the town boundary, upon a small hill which overlooks the rest of the town. During the excavation of the main temple of the Acropolis, a pre-existing structure was unearthed: the Capitolium, constructed around the middle of the 2nd century B.C. (Brown 1960). It comprises a square basement oriented 12° east of north and, a few meters behind the basement and in the alignment, a natural pit in the rock (Fig. 2, inset). The pit contained traces of a foundation deposit of burned vegetables. It is probable, therefore, that the basement and the pit are simply the original auguraculum and mundus of the city, respectively. Whether or not these structures were consecrated in a pre-Roman phase, they were subsequently obliterated by the Romans (with the construction of the Capitolium) in a very careful and respectful way. Indeed, the whole temple, which is quite huge, was laid out in such a way as to locate the pre-existing foundation pit at the very centre of the most sacred part of the new building, the central *cella*. Furthermore, an altar located in the forecourt was constructed with the same orientation as the square basement. (A similar ritual obliteration also occurred at Lavello.)

The Problem of the "Tripartite" Town

The evidence discussed above clearly demonstrates the existence of a pre-Roman and early Roman tradition of foundation rituals as described by the classic writers (for recent, important advances on the problem of the foundation of Rome see Carandini and Cappelli 2000). However, many things remain unclear, especially from the point of view of the astronomical and geometrical references. In particular, it is puzzling that there exist sources which clearly mention a "tripartite" town geometry. In the Latin context the most important passage is the famous one by Marius Servius, who, in his comment to Vergil Aeneid, says: "the experts of the Etrusca Disciplina state that those founders of towns who do not plan the layout with three gates, three main streets, and three temples dedicated to Jupiter, Juno and Minerva, cannot be considered as people obey-

ing the rules" [translation by the author]. This passage describes a sort of radial, or at least triangular, town. While the dedication to three gods can be easily explained in the Roman context, the town's layout based on the number three can hardly be accommodated in an orthogonal grid or, even worse, within the Roman *Castrum*. As a consequence, this passage has generated much confusion among those scholars who have tried to interpret it. Similarly, there are some enigmatic passages by authoritative Greek writers who mention a radially planned town (e.g. Plato's "ideal" city described in the *Laws*, and the star-like town described by Aristophanes in *Birds*) that have always eluded explanation (see e.g. Castagnoli 1971). In this connection, the pre-Roman and early Roman megalithic towns of Italy are of special interest (Magli 2007b). For instance, Ferentino (in southern Lazio) and Erice in Sicily clearly exhibit a triangular plan, and Alatri and Norba (again in southern Lazio) are very suggestive of an original *radial* plan. In addition, in Alatri a foundation pit and an obliterated original temple exist on the Acropolis, and in Norba and on the Ferentino Acropolis the presence of a single squared tower – among many kilometres of megalithic walls – suggests a sacred purpose and also perhaps the existenceof an auguraculum. Research is continuing on this subject, but we shall concentrate here on the case of Cosa. As we have seen, the basement is not cardinally oriented, nor has it a recognizable bearing with the orientation of the town's grid. According to the excavators, its orientation was "a function of the field of vision delimited by significant natural features of the immediate horizon"; however, none of the elements visible at the horizon has a clear and unequivocal interpretation as a topographic foresight (such as the summit of a prominent hill), and no such topographical alignments are known elsewhere in the Italic context. Therefore, the interpretation of the complex on the hill, and its orientation, seem quite disconnected from what is actually visible in the *Roman* town. A possibility of reconciling the evidence comes, however, from the following considerations. Suppose for a moment that the original layout of the city was *not* based on the orthogonal grid, and consider only the elements that certainly belong to the first phase, namely the walls with their monumental gates and the sacred area on the Acropolis. It can then be seen (referring again to Fig. 2) that the complex on the Acropolis does have a relevant role in the planning of the town: the lines connecting the centre of the basement to the two northern gates (O-P1 and O-P2) divide the city into three parts which are very similar in size. Furthermore, the ideal line O-A, orthogonal to the northern side from the centre of the basement and therefore oriented 12° east of north, crosses over the *Mundus* and further divides the city into two roughly equal sectors.

References

AVENI, A. and ROMANO, G., 1994. *Orientation and Etruscan Ritual*. Antiquity, 68, 545-563.

BRIQUEL, D., 2004. L'espace consacré chez les Étrusques : réflexions sur le rituel étrusco-romain de fondation des cites. In: S. RIBICHINI, ed. *Lo spazio consacrato*. Torino: Electa.

BROWN, F., 1951. *Cosa I. History and Topography*. Memories of the American Academy in Rome, Vol. 20.

BROWN, F., 1960. *Cosa II. The Temples of the Arx: Architecture.* Memories of the American Academy in Rome, Vol. 26.

CARANDINI, A., CAPPELLI, R., 2000. *Roma: Romolo e Remo e la fondazione della città.* Torino: Electa.

CASTAGNOLI, F., 1971. *Orthogonal town planning in antiquity*. Cambridge: MIT press.

GOTTARELLI, A., 2003. *Auguraculum, sedes inaugurationis e limitatio rituale della città fondata.* Ocnus, XI, 135-150.

MAGLI, G., 2006. The Acropolis of Alatri: astronomy and architecture. *Nexus Netw. Journal – Architecture and Mathematics*, 8(1), 5-16.

MAGLI, G., 2007a. *Possible astronomical references in two megalithic buildings of ancient Latium.* Mediterranean Archaeology and Archaeometry 7, 1, 13-22.

MAGLI, G., 2007b. Non-orthogonal feautures in the planning of four ancient towns of Central Italy. *Nexus Netw. Journal - Architecture and Mathematics*, 9(1), 71-92.

MAGLI, G., 2008. *On the orientation of Roman towns in Italy*. Oxford Journal of Archaeology 27 (1), 63-71.

MANSUELLI, G.A., 1965. Contributo allo studio dell'urbanistica di Marzabotto. *Parola del Passato,* XX, 314-325.

RUTA SERAFINI, A., ed., 2002. *Este preromana: una citta e i suoi santuari.* Treviso: Canova.

RYKWERT, J., 1999. *The Idea of a Town: The Anthropology of Urban Form in Rome, Italy, and The Ancient World* . Cambridge: MIT Press.

TAGLIENTE, M., 1999. L'acropoli di Lavello e i suoi monumenti. In: A. BOTTINI, M.P. FRESA, eds. *Forentum II*, Lavello: Tipolito Alfagrafica Volonnino.

TORELLI, M., 1966. Templum augurale d'età repubblicana a Bantia. *RAL*, 21, 293-315.

Received: 28 October 2007; Revised: 1 June 2008

DĖL ROMĖNŲ MIESTO IDĖJOS KILMĖS: GEOMETRINIAI IR ASTRONOMINIAI ASPEKTAI

Giulio Magli

Santrauka

Gerai žinoma, kad miesto įkūrimo ritualas, aprašomas romėnų istorikų (Varo, Plutarcho ir Plinijaus Vyresniojo), yra tiesiogiai perimtas iš etruskų šventų haruspi-

cijų knygų, vadinamų *Disciplina*. Pagrindinė ritualo paskirtis susijungti su kosmine tvarka, siekiant sukurti žemišką dangaus atvaizdą (templum). Remdamasis šios idėjos analize, Rikvertas (Rykwert) darė išvadą, kad miesto įkūrimo ritualas ir urbanizuojamos erdvės struktūros principai kilo iš „italikų religinių ceremonijų“ ne vėliau kaip apie IX–VIII a. pr. m. e., jeigu ne dar anksčiau. Šios hipotezės ištyrimas reikalauja tarpdalykinio tyrimo pastangų. Tyrimų metu turėtų būti atsakyta į šiuos svarbiausius klausimus:

1) Kokius seniausius laikus siekia miesto įkūrimo ritualas ir kokios yra jo galimos sąsajos su astronomija, kurias galima būtų atsekti pagal archeologinius duomenis?

2) Kodėl patikimi ir senovės graikų, ir senovės romėnų veikalų autoriai, tokie kaip Platonas ir Servijus, kalba apie tridalį ar net radialinį miestų planavimą? Ar senuosiuose miestuose galima aptikti tokio suplanavimo pėdsakų prieš tai, kai įsivyravo stačiakampio miesto planas?

3) Kaip tarpusavyje buvo suderinamas įkūrimo ritualas ir stačiakampis miesto planas, o ypač – ar stačiakampis planas buvo paimtas iš Graikijos, ar nepriklausomai išvystytas Italijoje?

4) Ar šio miesto plano vystymosi rezultatas – romėniškas miestas (castrum) – turi kokių nors sąsajų su astronomija?

Vertė Vykintas Vaitkevičius

THE NURAGHIC WELL OF SANTA CRISTINA, PAULILATINO, ORISTANO, SARDINIA. A VERIFICATION OF THE ASTRONOMICAL HYPOTHESIS: WORK IN PROCESS, PRELIMINARY RESULTS

ARNOLD LEBEUF

"*O that the ladder to heaven were longer*
And the lofty mountain loftier!
Then I would fetch and offer to my lord
The waters of life
Which Tsukuyomi treasures,
And restore him to youth and life"

Manyoshu (Shinkokai 1965, p.306).
[Tsukuyomi is a Moon goddess].

Abstract

The Nuraghic well of Santa Cristina, Sardinia has been regarded as a ritual monument built to receive moonlight on its water mirror at the time of the meridian passage of the moon when it reaches its highest point in the sky during and around the major northern lunistice. In this paper we investigate the precision that could have been achieved and conclude that the well could indeed have served as an instrument for measuring the lunar declination during half of the draconic cycle of 18.61 years.

Key words: Moon, Lunar standstill, sacred well, Nuraghic culture, camera obscura, eclipses, Phoenicians.

Introduction

The sacred well of Santa Cristina is situated in the neighbourhood of the small city of Paulilatino, in the Oristano province of Sardinia. Its coordinates are: 40º3'41" North, 8º43'58" East. This construction, built of perfectly hewn stones of greyish-black basalt, has been dated by the archaeologists to about the year 1000 BC (Lilliu 1998, p.529; 2006, p.72; Santoni 1990, p.169-193). It belongs to the so-called Nuraghic culture of the late Bronze Age. The Santa Cristina well impresses the visitor first of all because of the perfection of its masonry and the extreme elegance of its architectural proportions. It is unquestionably a masterpiece, combining unusual restraint in its general appearance with an incredible architectural complexity. At Santa Cristina, the horizontal layers of stones are painstakingly worked and aligned. They are set in place without cement, stone on stone, almost without any interstices. In contrast to other buildings of the same type, each successive layer is set slightly back from the one beneath it, leaving at each level a space, a narrow margin of about two centimetres. This layout must be functional, since it not only complicates dramatically the geometry of each stone to be hewn or carved and the general process of construction but also weakens these upper edges, exposing them to the further risk of being broken. Of nearly a hundred Nuraghic wells known in the island, almost all are built of rough stones: only three are of carved stones, and only Santa Cristina is preserved in its integrity.

The general shape of the well is that of a long bottle. Each horizontal layer is circular, with the upper opening measuring 27 cm and the diameter of the lower part at water level being 255.5 cm. The upper opening is 643 cm above the water level.

The staircase leading down to the water is a monumental construction trapezoidal in shape. The upper step measures 347 cm while the lower one is only 140 cm. The side walls of the staircase are built of horizontal layers of stones as is the tholos of the well itself. The overhangs of the layers of stone catch the sunlight during the day and the moonlight at night, producing various extremely beautiful optical effects.

The Astronomical Function

In 1972, Carlo Maxia and Lello Fadda, building upon a proposal of Eduardo Proverbio, presented an hypothesis concerning the astronomical function of this unique construction. According to these authors, the meridian diagonal from the upper southern edge to the northern lower edge of the well is inclined at an angle of 11.5

degrees to the zenith. Subtracting 11.5 degrees from the latitude (40º 3' 41" North), we obtain roughly 28.5 degrees. This value is very important because it represents approximately the lunar declination at the time of the major northern lunistice. It is regrettable, then, that although this idea was published several times in successive papers and repeated by different authors, it has not been better developed and more precisely described. The different articles by Maxia and Proverbio only present approximate measurements and the plan, copied many times, lacks any sort of precision. I have known of these hypotheses since their publication, but it was only on the occasion of the 2005 SEAC conference in Sardinia that I had the opportunity to visit the monument. The first thing that struck me was the unparalleled perfection and regularity of the circles formed by the edges left between the layers of stones. I reasoned, then, that if the approximate measurements made by Proverbio could be confirmed, and that indeed every 18.5 years the moonlight reached the water mirror at the time of the major northern lunistice[1], then the other levels could have indicated the successive lunistitial moon declinations during the rest of the draconic cycle or part of it. If this were true, then this building would have been much more sophisticated that had hitherto been proposed, and we would have to consider it not to be only a symbolic and ritualistic construction but also a scientific instrument capable of measuring the declination of the moon at the lunistice over a much larger part of its cycle, and with much higher precision. One detail of the construction had also attracted my attention: although all of the layers of stones are approximately of the same height, about 30 cm, one of them is conspicuously larger, about 45 cm, and this was surely significant.

I returned to Santa Cristina in 2005, 2006, and 2007, first of all to observe the phenomenon of the lunar illumination of the edges between the layers of stone in the well and to verify the supposed optical effects, but also of course to take a series a measurements with the utmost care. We need two series of complementary measurements: first those of the architecture itself by classical triangulation, and then time measurements of the moments when each successive edge of a stone layer becomes illuminated by the moon, i.e. the moments of first contact. We can then calculate the corresponding altitude and declination of the moon for each point of contact, which gives us a means of checking the plan and, eventually, of seeing if it could have been improved.

[1] By this term, we mean the northern lunistice occurring at the time of major standstill, i.e. the furthest northerly declination ever reached by the moon.

The Archaeology and Documentation

Of all the published plans, none was acceptable for archaeoastronomical studies. The best ones were those drawn by Prof. Enrico Atzeni who was in charge of the archaeological investigation and the restoration of the well in 1967-1973 and 1977-1983. The restoration is perfect but unfortunately the archaeological investigation was stopped before completion and leaves many questions unanswered. Considering that the work was not finished on such an important site, Professor Atzeni did not judge it suitable to publish his results, which he considers incomplete. So I had to draw the plans anew.

Description of the Phenomenon of the Moonlight Descending the Well of S.Cristina

Owing to the proper motion of the Earth from West to East on its axis, the Moon, like all other celestial bodies, moves through the sky from East to West. When it is high enough in the sky, its light entering through the upper opening reaches the first edge, between the first and second layers of stones inside the well (Bb in my 2007 plan). We must wait for some time until the moon gains enough altitude for its light to reach the second edge, separating the second and third layers. The time taken to reach each successive level decreases steadily from one step to the next as the moon gains altitude. When the moonlight reaches the bottleneck (F-J of the plan), its rays are tangential to the wall of the well and so the light progresses more rapidly from one row to the next. If we look from the inside of the well, that is to say from the lower steps just over the water mirror, it is impossible to determine the exact number of layers illuminated from the top because the line of sight is tangential to the inner wall of the well and all the upper marks are confounded. Nor is it possible to count the number of steps still untouched by the light, starting from the water level, because we are in total darkness. In fact, comfortable and precise observation only becomes possible from the moment the light reaches the lower edge of the single larger layer of stones (Kk - Ll) which is easily visible from the lowest steps of the monumental entrance. We will designate the lower edge of this larger layer (Ll) to be level zero. The descending light creates a ladder. Because we are in a camera obscura, in the dark, the only way to count the number of steps illuminated is to rely on the larger space defined by the two lines of light marking the upper and lower edge of the broader layer of stones, which is different from all the others in size. It then becomes easy to count the number of illuminated rows

starting from level zero. This reveals the reason for this architectural anomaly.

Because the upper opening is circular and the light falls upon the wall at a slant, the spot of light is elongated, creating a long ovaloid shape with a sharper lower end. Because of the bottleneck profile of the wall, there comes a moment when the ladder of light separates into two parts. The lower one then starts to form a kind of elongated mandorla, which glides slowly along the wet surface of the wall towards the bottom of the well. As the mandorla of light progresses down the wall, then if the water source falling along the wall is not too abundant and the water's surface is calm enough, we can see the reflection of the light ladder in the water mirror. The two ladders move towards each other and allow the observer to identify the exact moment when the light reaches the water's surface, i.e. when the two points merge together. As the Moon's altitude increases still further, the column of moonlight moves further onto the water's surface and the upper steps switch off one after the other. During my observations, there were always at least two steps lit over the water, and we shall see why.

The lunar spotlight bathes in the water for about half an hour and then the layers light up one after the other upwards, the ladder progresses back up, the movement is inverted (with some change in azimuth) and the light returns back, up and finally out of the well.

The declinations obtained for the Moon at the time of its maximal advance on the water mirror fully confirmed Proverbio's hypothesis, but with a degree of precision unsuspected by that author. The result of these new measures appears on the 2007 plan drawn at a scale of 1:10. It is likely that new measurements will be necessary to verify our results before full publication, but we will be content for now with the calibrated measurements of the site plan and the full list of original time measurements given in Tables 1 and 2 (for the original measurements see the tables that accompany the Lebeuf 2007 plan).

Explanation

The analysis of these measurements shows clearly that it is not possible to suppose for one instant that such a unique, precise and effective construction could result from chance, fortune or accident.

Nowadays, two layers of stones remain lit even when the moonlight is in its lowest position, but at the time of construction, in the tenth or eleventh century BC, the absolute maximum of the Moon's declination was 29º6', and then the moonlight would have entered the water mirror completely without continuing to cast any light at all on the wall. At such times the circle of moonlight was tangential to the larger circle of the water mirror. This bathing of the moonlight lasted for some 15–20 minutes before the moonlight started to climb up again out of the water. The actual gap between the two circles cannot have differed from perfect tangency by more than two or three arc minutes. So the absolute maximum of the Moon at major lunistice (maximal inclination of the orbit) could be determined very precisely. This marks the passage of the ascending node of the lunar orbit through the vernal point (ecliptic longitude 0º). At around this time an observer would notice the months during which the Moon reaches this extreme and the months when it only approaches it, leaving one step lit. This would give him information about the wobble. The absolute maximum can only be reached during September and March, when the sun passes near to the nodes which are then on the equinox points of the ecliptic.

This interest in meticulous observations of the draconic cycle, lunistices and associated nodal positions is fully confirmed by the other limit, marked as level zero (Kk -Ll). This layer of stones, distinguished by its size and its optical function as a point of absolute reference in the camera obscura of the well, corresponds very precisely to the declination of the Moon when it passes the medium lunistice – when the nodes are near to the solstitial colure. Let us explain this point. The declination of a star illuminating this row zero is 23º15'. We might immediately be tempted to interpret this declination as that of the Sun at summer solstice (currently 23º26'), but this would be a mistake. While the declination of the solstitial Sun is now 23º26', at the time of the construction it was 23º49'. This difference makes the solar explanation unacceptable because the declination of the Sun at the solstices is extremely easy to establish with a margin of error not exceeding one arc minute even by the most primitive means (we could even accept up to three minutes for the sake of generosity). Moreover, the observation of the solstice itself is of very limited interest, and it would be most astonishing to find that so much art, science and skill was expended in building such a monument when a simple stele or any mark on the horizon would have offered the same advantages (or even more precision if it is distant from the observation point).

However, if we consider the declination of the Moon at the lunistice, 23º15' corresponds exactly to the medium lunistice in the year 1000 BC. The medium lunistice can be defined as the moment when all the perturbations of the lunar orbit merge together and disappear. Knowing this position permits one to define the ecliptic longitude of the nodes (see the graph at the

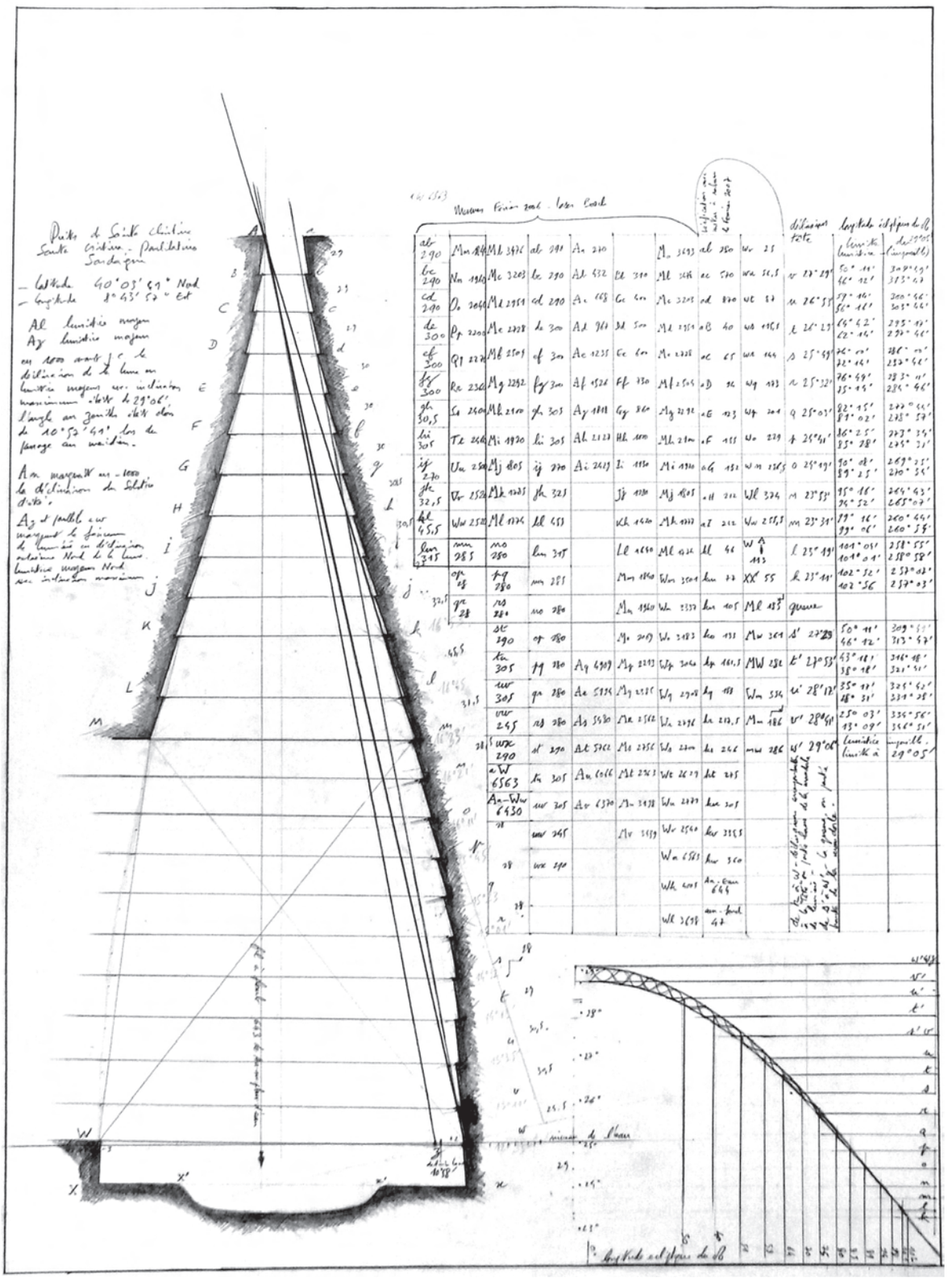

Fig.1. Plan of the well at Santa Cristina, A. Lebeuf, 2007.

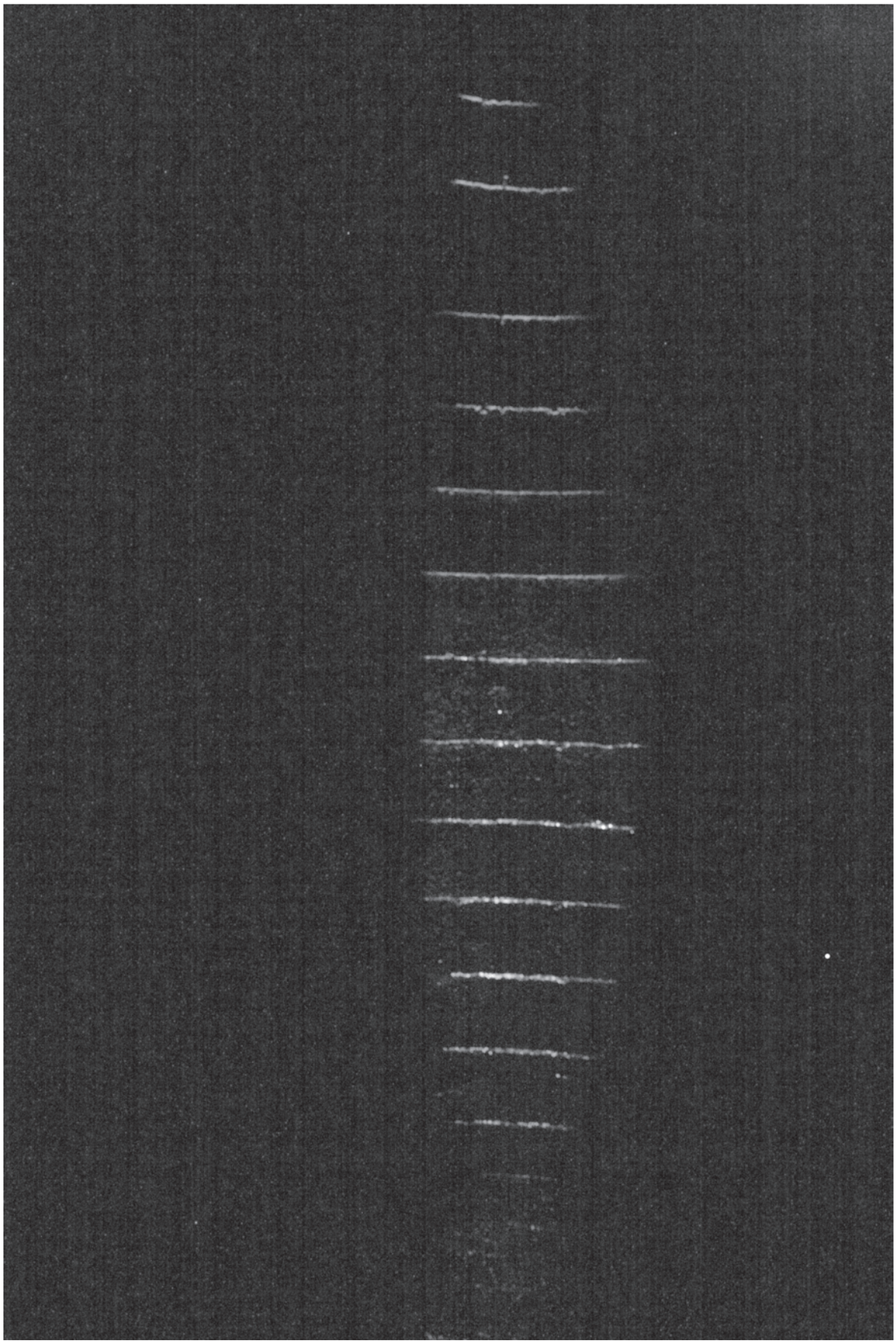

Fig.2. The ‘ladder’ of light in the sacred well at Santa Cristina. Photograph by Tomasz Stanco.

bottom right corner of the plan in Lebeuf 2007). This privileged moment does not occur at a longitude of 90° measured from the vernal point, as we might expect, but at around 102-103°. I shall return in a later paper to a detailed explanation of these technical issues, but for the interested reader I would mention that I have discussed these questions elsewhere: see Lebeuf bibliography.

The perfect concurrence of so many significant aspects forming a system with a surprising degree of precision could not have arisen by chance. Furthermore, the sacred well at Santa Cristina may not be the only example of a lunar observatory belonging to the Mediterranean Bronze Age, although it is probably the best preserved.

A large number of quasi-historical, legendary and mythological sources associate the wells with dragons, mirrors, camerae obscurae and astronomy as well as with priestesses for a Moon cult and sacrificial victims. The recording and analysis of legends, myths and iconography is currently being undertaken and the ritual aspects are being studied: the full results will be published later. For now, we shall present just the plans and measurements of the monument, and the tables of measurementss with their corresponding declinations.

These plans and measurements demonstrate the perfect efficiency of the well as an instrument for measuring the declinations of the Moon at the moments of the lunistices and thus constitute an excellent means of predicting eclipses. I plan to proceed with this study and later to present a full and detailed report duly augmented with historical, legendary, mythological, ethnographical and iconographical materials showing that the hypothesis is well supported historically and culturally. I also hope to proceed with the study of more of these wells in order to check if the case is unique or can be confirmed by other examples.

Were it confirmed, we would then be confronted with new problems. Is the scientific community ready to accept a monument of art and science such as this within a Bronze Age pastoral clan culture?

Acknowledgments

I received support for this investigation from the Institute for the History of Religions at Cracow University and from the Dean of the Faculty of Philosophy at Cracow University (fund for scientific research). I am also indebted to the Sardinian friends and colleagues who greatly assisted me during my observations, for their help in transporting me to the archaeological sites at night, and their warm hospitality. I am also grateful for their interest in my investigations and for offering me the possibility of presenting my hypothesis and results at a lecture organized at Santa Cristina during my third trip. I shall certainly not forget the scholarly assistance of the librarians in Cagliari who located old and rare publications and offered me a set of photocopies.

My particular thanks are due to Enrico Atzeni, Julio Cannella, Salvatore Cossedu, Rosanna Delogu, Mariola Flis, Giovanna Manunzo, Antonio Piras, Marcello Ranieri, Angelo Saba, Tomasz Stanco, Lukasz Trzcinski and Mauro Zedda.

References

LILLIU, G., 1988. *La civilta dei Sardi dal paleolitico all'eta dei nuraghi*. Torino: Nuova Eri Edizioni Rai.

LILLIU, G., 2006. *Sardegna nuragica.* Nuoro: Il maestrale.

LEBEUF, A., 1989. L'Observatoire astronomique de la cathédrale Saint-Lizier de Couserans. *Publication de l'Observatoire astronomique de Strasbourg: Astronomie et Sciences Humaines*, 3, 39-78.

LEBEUF, A., 2003. *Les éclipses dans l'ancien Mexique.* Kraków: Jagellonian University Press.

MAXIA, C. and FADDA, L., 1972. Il misterio dei nuraghi rivelato con l'astroarcheologia. Cagliari: Ed. Castello.

MAXIA, C. and PROVERBIO, E., 1973. Orientamenti astronomici di monumenti nuragici. *Rend. Ist. Lombardo, Accad. Sci. Lettere, Cl. Sci*. A, Vol. 107, 298 - 311 = Pubbl. Stn. Astron. Int. Latitudine, Carloforte-Cagliari, Nuov. Ser., No. 28.

ROMANO, G. 1992. *Archeoastronomia italiana*, Padova: CLEUP.

SANTONI, V., 1990. *I templi di eta nuragica, in La civilta nuragica*. Milano: Elemond editori, Electra.

SHINKOKAI, N.G., transl., 1965. *Manyoshu*, New York: Columbia University Press.

Table 1. Table of the light measurements in the Santa Cristina Well

-X marks indicate the number of layers illuminated from the moment of formation of the mandorla of light for each level reached.
-The bold **X** marks and declinations show the extrapolation on the water mirror (water's surface).
-Row B is the first edge formed at the limit between the first and second layer of stones counting from the top. When the light falls at an angle to the plane of the meridian, we observe non-negligible torsions in the calculation.

Row	Date hour	Alti-tude	Decli-nation	Date our	Alti-tude	Decli-nation	Date-hour	Alti-tude	Declin-ation	Date-hour	Altitude	Declin-ation	Date-hour	Alti-tude	Dec-lin-ation								Declin (Tail)	Declin. (cali-brate (Head)
	15.XII 05			18.XII 05			7.II 06			28.I 07			29.I 07											
B																								
C																								
D																								
E																								
F																								
G	22:19	70°09'	20°14'																					
H	22:24	70°56'	21°01'																					
I	22:32	72°09'	22°14'	00:24	71°51'	21°56'																		
J	22:34	73°02'	23°06'																					
K	22:37	73°27'	23°32'	00:33	73°04'	23°09'	19:24	72°51'	22°56'															23°12'
0				00:35	73°12'	23°16'				18:50	73°12'	23°16'	19:44	73°09'	23°13'	X							25°25'	23°15'
1				00:38	73°32'	23°36'	19:28	73°25'	23°29'	18:52	73°28'	23°32'	19:46	73°23'	23°37'	X								23°33'
2	22:39	73°43'	23°48'	00:39	73°38'	23°42'	19:31	73°48'	23°44'	18:54	72°44'	23°48'	19:48	73°39'	23°43'	X	X						25°50'	23°45'
3	22:41	74°00'	24°04'		73°44'	23°49'	19:33	74°04'	24°09'				19:50	73°56	24°00'	X	X							24°00'
4	22:44	74°24'	24°28'		74°09'	24°13'	19:35	74°19'	24°14'	18:57	74°06	24°10'	19:52	73°13'	24°17'	X	X	X					26°27	24°16'
5	22:46	74°39'	24°44'	00:48	74°31'	24°35'	19:38	74°41'	24°46'	19:01	74°36'	24°57'	19:55	74°36	24°40'	X	X	X						24°44'
6	22:49	75°02'	25°06'	00:52	74°51'	24°56'				19:04	74°57'	25°01'	19:58'	75°00'	25°04'	X	X	X	X				26°57'	25°02
7	22:51	75°17'	25°21'	00:58	75°18'	25°22'				19:07	75°17'	25°21'	20:01	75°22'	25°36'	X	X	X	X	X			27°33	25°25'
8	22:56	75°51'	25°55'	01:07	75°48'	25°42'				19:12	75°48'	25°52'	20:05	75°50'	25°53'		X	X	X	X	X		28°18	25°50'
9	23:01	76°22'	26°27'							19:16	76°11	26°15	20°12	76°35	26°39'			X	X	X	X	X	***28°33'***	26°27'
10	23:08	77°01'	27°06'							19:23	76°45	26°49'	20:15'	76°52'	26°56'				X	X	X	X	***28°50'***	26°57'
11 water	23:14	77°28'	27°33'								77°05'	27°13'	20:22	77°28'	27°32'					**X**	**X**	**X**	***29°06'***	27°26'
water	23:20	77°50'	27°54'										20:28	78°18'	28°22'						**X**	**X**		
max	23:35	78°14'	28°18'										20:38	78°27'	28°30'							**X**		
water	23:52	77°46'	27°50'										20:56	78°16'	28°26'									
													21:07	77°44'	27°48'									

Table 2. Measurements of the declination of the moon passing the meridian corresponding to each of the layers of stone in the Santa Cristina well

"Head" signifies the lowest point of light impact on the light ladder, while "tail" means the upper point of the light ladder. The third column marks the corresponding ecliptic longitudes of the ascending node for each level. The calculation reflects the situation for the year 1000 B.C. We see that row zero (L) perfectly marked the crossing point of the lunar perturbations and permitted the precise determination of the ecliptic longitude of the nodes of the moon's orbit.

Level	Declination	Longitudes of the ascending node of the moon's orbit.	Longitudes of the descending node of the moon's orbit.
K (head)	23º 12'	Medium lunistice. 102 º 53' / 102 º 56'	Medium lunistice. 257 º 07' / 257 º 04'
L (head) 0	23º 15'	**102 º 20" / 102 º 21'**	**257 º 40' / 257 º 39'**
M (head) 1	23º 31'	99 º16' / 99 º06'	260 º 44' / 260 º 54'
N (head) 2	23º 53'	95 º 16' / 94 º52'	264 º 43' / 265 º 07'
O (head) 3	24º 19'	90 º 08' / 89 º 25'	269 º 25' / 270 º 34'
P (head) 4	24º 41'	86 º 25' / 85 º 28'	273 º34' / 274 º 31'
Q (head) 5	25º 03'	82 º 15' / 81 º 02'	277 º 44' / 278 º 57'
R (head) 6	25º 32'	76 º 49' / 75 º14'	283 º 11' / 284 º 46'
S (head) 7	25º 49'	74 º00' / 72 º 14'	286 º 00' / 287 º 46'
T (head) 8	26º 29'	64 º 42' / 62 º 14'	295 º 17' / 297 º46'
U (head) 9	26º 55'	59 º 14' / 56 º 16'	300 º 46' / 303 º 44'
V (head) 10	27º 29'	50 º 11' / 46 º 12'	309 º 49' / 313 º 47'
W(head in water)	27º 33'	50 º 11' / 46 º 12'	309 º 49' / 313 º 47'
S' (tail)	27º 33	50 º 11' / 46 º 12'	309 º 49' / 313 º 47'
T' (tail)	28º 18'	43 º 18' / 38 º 18'	316 º 18' / 321 º 41'
U' (tail)	28º 33'	35 º 17' / 28 º 31'	324 º 42' / 331 º 28'
V' (tail)	28º 50'	25 º 03' / 13 º 09	334 º 56' / 345 º 51'
W'(tail)	29º 06'	0 º Major lunistice	180 º Major lunistice (i.max). The moonlight leaves the wall and illuminates the water mirror (water's surface).

Received: 29 October 2007; Revised: 20 September 2008

NURAGŲ KULTŪROS SANTA KRISTINOS ŠALTINIS (PAULILATINO, ORISTANO, SARDINIJA). ASTRONOMINĖS HIPOTEZĖS VERIFIKAVIMAS: PIRMIEJI REZULTATAI

Arnold Lebeuf

Santrauka

Santa Kristinos šaltinis trykšta šalia nedidelio Paulilatino miestelio, Oristano provincijoje, Sardinijoje. Jo geografinės koordinatės – 40º3’41,43” šiaurės platumos, 8º43’57,08” rytų ilgumos.

Tai nepaprastai preciziškai tašytų pilkai juodo bazalto akmenų statinys, archeologų datuojamas apie 1000 m. pr. m. e., taigi priklauso vėlyvojo bronzos amžiaus laikotarpiui, vadinamajai Nuragų kultūrai.

1972 m. Karlas Maksia (Carlo Maxia) ir Ledo Fada (Lello Fadda) išplėtojo Eduardo Proverbijo (Eduardo Proverbio) mintį, suformuluodami hipotezę apie astronominę šio unikalaus statinio paskirtį. Anot pirmųjų dviejų autorių, meridiano įstrižainė, einanti nuo viršutinio pietinio iki apatinio šiaurinio šulinio kampo, sudaro 11,5° kampą, o šis atitinka Mėnulio deklinaciją didžiosios šiaurinės Mėnulio lunisticijos metu. Deja, K. Maksijo ir E. Proverbijo straipsniuose buvo pateikti tik apytiksliai objekto matavimai, o planas stokojo tikslumo.

Jeigu Mėnulio šviesa iš tiesų pasiekdavusi Santa Kristinos šaltinio vandens paviršių meridianinio perėjimo į svarbiausią lunisticiją metu, tai akmeninės matuoklės laipsniai buvo apšviečiami vienas po kito, laipsniškai, ir šviesa, tokiu *camera obscura* principu projektuojama ant sienos, sudarė tarytum kopėčių efektą. Jeigu tai būtų tiesa, tai reikštų, jog analizuojama akmenų struktūra buvo kur kas tobulesnė, nei manyta iki šiol. Taigi turėtume kalbėti ne apie simbolinę ritualinę konstrukciją, o pirmiausia apie mokslinį instrumentą, kuris teikia galimybę matuoti Mėnulio deklinaciją daug ilgesnėje jo judėjimo ciklo atkarpoje. Ir svarbiausia, tai daryti su daug didesniu tikslumu.

Mano dėmesį taip pat atkreipė viena konstrukcijos detalė – visos akmenų eilės yra maždaug to paties aukščio, apie 30 cm, ir tik viena yra akivaizdžiai didesnė – apie 45 cm aukščio. Šis išskirtinumas veikiausiai turi kokią nors specialią prasmę, kurią dar reikėtų išsiaiškinti.

Nauji tyrinėjimai, sudarytas tikslus planas ir keturios serijos Mėnulio šviesos matavimų, atliktų Santa Kristinos šaltinio statinio viduje, aiškiai rodo, jog ši akmeninė konstrukcija galėjo turėti instrumento tikslioms lunisticijų deklinacijoms nustatyti ir Mėnulio orbitos mazgų ekliptinei ilgumai apskaičiuoti funkciją.

Vertė Vykintas Vaitkevičius

IMAGES ON THE STONES AT SCEBIARAKY VILLAGE IN NORTH-WEST BELARUS

ANDREI PROKHOROV

Abstract

This paper focuses on five stones with ancient incised images containing the symbol of a pole with a semicircle or a cross at its top. This symbol had a cosmological meaning and represented a projection of the "heavenly sphere" onto a flat surface. The strict orientation of the stones and the symbols to the north indicates a ceremonial "world axis" directed to North Star. This symbol of the "world axis" was used during funerary rituals at gravestones The Scebiaraky site is an example of Baltic sacred stones (*stabas*) in the Baltic-Slavic contact zone.

Key words: sacred stones, mythological "world axis", "heavenly sphere", funeral ritual, stone barrows, stone burials, Baltic-Slavic contact zone, ritual crosses.

Introduction

In the 1990s a group of five stones was documented at the village of Scebiaraky in the Vilejka region of north-west of Belarus (Fig. 1).

The stones are located in a forest, one behind the other, forming a line. The first contains a slightly inclined image of a pole with a triangle at its top and a horn turned upwards. A similar image is depicted on the second stone. The third stone contains the simplest image – just a pole with a semicircle at its top. On the fourth stone is a distinctive cross on a pole and a horn turned upwards. The final image, on the last stone, contains a pole with a semicircle together with a small cross (or possibly another semicircle) at its top and a horn turned downwards.

The stones at Scebiaraky village are absolutely unique in Belarus. They contain the only examples of images of a horn in the territory of the republic. The long vertical line – a particular representation of a "pole" – is common to the images on all the stones, although different compositions – triangle, semicircle and cross – are found at its top.

No image in the Scebiaraky complex is repeated and it is possible to suppose a certain *system* in this sequence of images. The consecutive arrangement of images on the stones fits the idea that they were a single composition. This is especially important, because in other cases we deal with separate images on single stones.

Naturally, it is necessary to combine possible mythological parallels in order to attempt a decoding of these symbols' meaning. In hoping to propose and explain mythological parallels to the symbol set, it is necessary to use materials from the folk cultures of the Balts (Lithuanians, Latvians and surviving fragments of religious-mythological ideas of other tribes), and Slavs (primarily Belarusians). In short we are dealing with cultural phenomena of the Baltic-Slavic contact zone.

The astronomical hypothesis

The key fact is that the Scebiaraky stones are strictly arranged on a North-South line. If an observer watches the images he looks due North. Such precision in the arrangement could not arise by chance. At that time, such an accurate orientation to the North was only possible by using astronomy. That is why we are able to assume that the images had (at least partly) a cosmological meaning that was connected and included into concrete astronomical movement. The orientation to the North means that the symbols are connected with the northern constellations and, primarily, with the North Star (Pole Star). An observer could see it over the stone complex at night.

The direct orientation to the North shows that the symbol of a pole with a semicircle could have been comprehended as a mythological axis connecting the terrestrial world with the North Star. The name of the North Star is connected with a concept such as a column, pole, or nail in many parts of the world, including our region. Belarusians named the North Star 'the Big Column' (Karpenko 1985, p.22). The name 'Column' is widespread in some regions of Russia and among other Slavic peoples, as well as among Estonians, Mongols and Turks. Polish Catholic legend supported the idea that there exists a pole connecting the North Star with hell (Cetwiński, Derwich 1987, p.189).

A possible conclusion is that the image of a pole with a semicircle is a graphic representation of the heavenly sphere. As such, it is the simplest representation

Fig. 1. The Scebiaraky stone complex, Vilejka region. Photograph by V.Obukhovski.

of the movement of the heavens at night. Such movement creates the sensation of "a heavenly dome". This heavenly sphere was fixed upon, and supported by, a kind of "world column".

Sacred stones

The name of the village close to which the stone complex is located – Belarusian *Сцебяракі*, *Сціберякі* (Russian *Стеберяки*) – gives us important information.

In the territory of north-west Belarus we find names such as *Сцёп-камень*, *камень Сцяпан* "stone [called] Stepan". This originates in a myth connecting such stone names with people called *Степан (Stepan)*. The best known stone with the name of Stepan is located near to the source of the river Vilija and local inhabitants still honour it nowadays. Edward Liaukou was the first to propose a paronymic transition of these names from the Lithuanian word *stabas* into the Belarusian language and mythological tradition (Liaukou 1992, p.139-140).

This village name Scebiaraky *Сцебяракі* can be connected with the Latvian word *Staburags*, plural *Staburagi* which clearly derives from the Latvian *stabs* 'a column' and *rags* 'a horn'. We should also mention the Lithuanian *stabas* 'a sacred stone'. In fact, all the semantic layers also have a connection with a stone complex and its images. It is possible to see these stones with complex composite images that included a pole with a semicircle as part of broader practices using sacred stones in the Baltic region. We would suggest that these sacred stones carrying the image of a world axis were in fact analogues of this world axis.

The name *Сцебяракі* evokes the nearest toponymic analogue – the Latvian legendary rock by the Daugava river known as *Staburags*. Legends existed describing the creation of the *Staburags* stone by giants (Latyshskije predaniia, p.101-102).

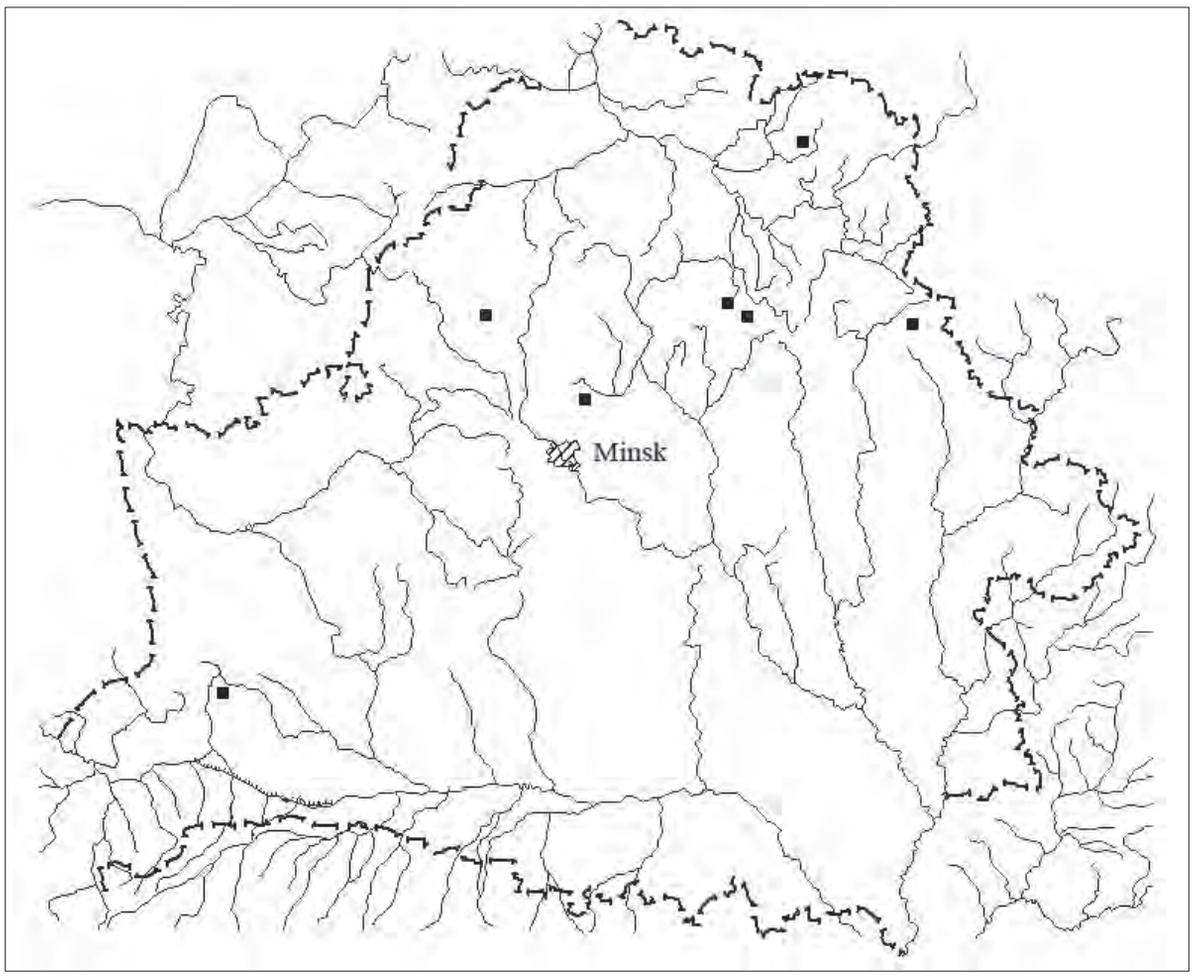

Fig. 2. Distribution map of gravestones discovered to have the image of a pole with a semicircle.

These Baltic parallels are also supported by the presence of similar carved symbols on rocks found within the territory of modern Latvia. The world axis is found at the centre of these images too. And these symbols in Latvia are connected with pagan cosmological representations of space (Laime 2003, p.2-20).

Symbols on funerary stones

In some regions of north-western Belarus, one of the symbols seen on the Scebiaraky stones – namely a pole with a semicircle or rarely with a triangle – is often encountered on gravestones. But in these cases it is always incuse and found in isolation.

The pattern of occurrence of this symbol on funerary stones has not yet been systematically determined (Fig. 2). However, some preliminary data have been collected. In Pruzhany, for example, there is a stone in the form of a cross with anthropomorphic characteristics and containing the image of a pole with a semicircle in the middle (Plate V: Fig. 3). Some images are located near to the Vilija river and Scebiaraky stones. A stone from the Logojsk region was brought into the Museum of Stones at the Institute of Geological Sciences of the National Academy of Sciences of Belarus (Fig. 4). Similar symbols are also noted in the north of the Borisov region and in the Lukoml', Orsha and Gorodok regions.

Ethnic and chronological attribution of the complex

The region of distribution of funerary symbols in the form of a pole with a semicircle can help to establish the ethnic attribution of the creators of the Scebiaraky complex.

Everywhere one can find gravestones with this symbol located near to burials in stone tombs, which date from the end of the eleventh to the end of the sixteenth centuries). Archaeological studies have established a direct connection between these burials and earlier burials in stone barrows. And, according to the Belarusian archaeologist Alla Kvjatkovskaia, the burials of these archaeological cultures in north-western Be-

larus are connected, in their turn, to the Baltic tribe of Yatvingians (Kviatkovskaia 1998, p. 26-27, 176-187). The pagan meaning of the funerary rituals in these cultures has, it seems, remained constant in spite of other changes (Kviatkovskaia 1998, p.173).

Gravestones containing the image of a pole with a semicircle are related either to the late period of existence of stone tombs or to traditional burials that replaced stone tombs at the end of the sixteenth century. Similar symbols can be found in cemeteries adjacent to the emergent Christian symbolism – crosses.

The Scebiaraky stone complex is located in a region where Yatvingian stone tombs are closely linked with burials of the Slavic tribe of Krivichs. Barrow burials were widespread in the Krivichs territory until the end of the twelfth century. Pagan beliefs were also maintained here for a long time during the Middle Ages. Yet some funeral stones containing the symbol of a pole with a semicircle also exist in the interior of the Krivichs territory. It is unclear whether this symbol implies the existence of separate Baltic enclaves or whether it had no particular ethnic connotation in the Baltic-Slavic contact zone and was simply connected with wider religious-mythological ideas.

In other words, the pole-with-semicircle image could be a pagan symbol that was not connected in those times with particular ethnic groups, but rather as a whole with the common development of pagan beliefs in the north-western part of late Kievan Rus and subsequently in the territory of the Great Duchy of Lithuania.

Funerary ceremony

Why did this cosmological sign appear on gravestones? Since antiquity, the symbolism of a pole on a tomb is a feature of funerary rites in the region, among both Slavs and Balts.

Many Eastern Slavic tribes incorporated a pole in their tombs in early times. Describing the customs of the tribes of Radimichs, Vyatichs and Severians, the *Primary Chronicle* mentions that these tribes put small vessels containing the ashes of the dead on poles near to roads (Povest' 1999, p.11, 147).

The oldest funerary monuments in the Lithuanian tradition are arguably *krikštai* – the wooden poles that symbolized the sacred "world tree". These columns assisted the souls of the dead to progress towards the upper world.

Accounts of cremation ceremonies appeared subsequently. The funeral rites of the Dukes of the Great Duchy of Lithuania are described in the most detail. Following the will of the legendary Duke *Shvintorog*, the cremation ceremony began to be carried out traditionally in the sanctuary of Vilnia / Vilnius. The chroniclers describe this ceremony in detail. A corpse was burned together with many personal items and symbols of authority, whereupon

"they collected the ashes and buried them in the ground, having put with them lynx and bear claws in case there should be a day of reckoning, and they spoke, saying that the god would come to judge people and would sit down on a high mountain, judging fair and sinful men, and it would be difficult to get on to that mountain to face that godly courthouse without lynx or bear claws" (Hronika 1975, p.31).

The Lithuanian and Samogitian Chronicle describes the funerals of several Dukes conforming to such a ceremony: the legendary *Shvintorog*, *Gedemin*, and finally *Kejstut*, in the year 1382 (Hronika 1975, p. 41-42).

Recent folkloric sources also explain the meaning of the ceremony, saying that dead men need to scale the mountain of "glass" or "sharp stones" on which the supreme deity will be waiting for them. According to Lithuanian songs, the Sun dances "on the silver mountain in silver boots" on the day of the summer solstice, June 24th (Gimbutas 2004, p.210). An image of this mythological mountain has been connected with the heavenly dome for a long time (Gimbutas 2004, p.198).

We would also draw attention to the following Lithuanian folklore concerning a distant country in the West: the land where the sun comes down has "a grey stone and a solar tree or an iron column, and two horses that are near to a column" (Gimbutas 2004, p.198). Thus, in the other world there is also a pole or tree which is supporting the heavenly dome.

When we consider the funerary ceremonies of Slavs or Balts, it is clear that the main overall task of all recorded rituals is to transport the souls of the dead into the upper, heavenly world. Accordingly, we can postulate that the same applied to funerary customs among those who built the stone tombs with the image of a pole with a semicircle depicted on their gravestones. This symbol was a good representation of cosmological creation and of interrelationships with the other, upper world. The use of a stone containing the image of a pole with a semicircle could also have been an alternative to building an additional column. Perhaps this change was influenced by the Christian custom of erecting burial stones. A gravestone with this symbol was also a representation of the world axis.

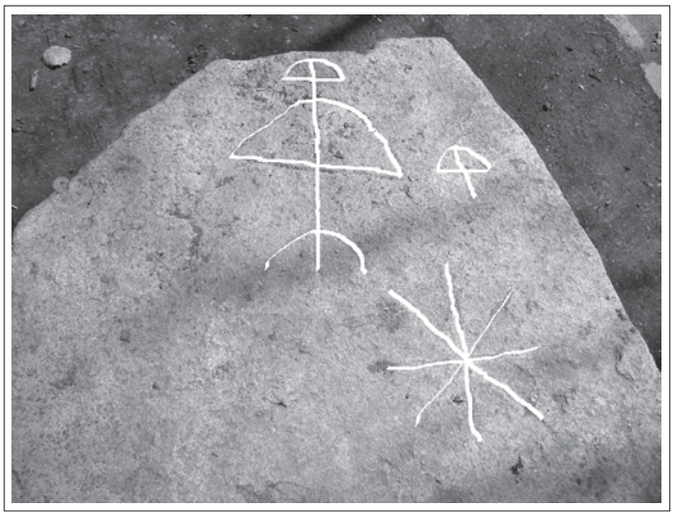

Fig. 4. A stone from the Logojsk region with the image of a pole with two semicircles.

This enables us to understand the mythical idea contained in Baltic folklore that the souls of dead ancestors existed simultaneously in the upper heavenly world and close to the world of people, within various funeral objects. These worlds were connected by a funerary "world axis". This axis, in the form of a column or symbolic images, enabled movement between the worlds.

During a feast devoted to the worship of the ancestors, living people met their souls in places where there were burials. At such times a column or the symbol of a pole with a semicircle embodied not only the opportunity of movement upwards, but also the idea that the souls of the dead might return for short periods to this world.

Funerary barrow

Notwithstanding the main idea of a funeral ceremony – to move the soul of a dead man into the upper world – late Lithuanian folklore and legends describe other places where souls may reside or else pay short visits to the world of living people. The souls of the dead are imagined to be present in the neighbourhood of the world of the living, within funerary objects such as barrows, columns and stones (Gimbutas 2004, p.197).

Among the compound images containing the symbol of a pole with a semicircle from north-western Belarus, there is a specific variant with hemispheres consistently located one above the other. In this case, the symbolism of a pole with several semicircles helps to explain the mythical idea that the souls of the dead were simultaneously in the heavens and nearby the world of living people.

A pole with a semicircle could not only be comprehended as a representation of the heavenly sphere, but simultaneously alluded to the funerary barrows of the Balts as a structural model of the Universe. The barrow could be interpreted as another sphere, another world alongside the upper "heavenly" world.

Given this, we should draw attention to an important feature of the Yatvingians' barrows. They have been covered by stones or, more likely, naturally consisted of piled stones. Funerals in barrows covered by stones form a very old tradition in Baltic lands.

Such stone barrows correspond to the mythical idea of stone heavens widespread among Indo-Europeans and among Balts in particular.

Ritual columns

Despite the preceding discussion, preliminary archaeological excavations in the immediate vicinity of the Scebiaraky stones have not revealed burials. One possibility, then, is to reject the idea that the complex had a funerary origin. In addition it is evident that the Scebiaraky images are more complex than on those funerary stones with one symbol.

Stones containing symbols of the "world axis" can also be considered as a created "world axis". Cosmological symbolism is attributed not only to sacred stones but also to poles erected during the course of various rituals. In fact there are many rituals among the Slavs and Balts in the region at which a column performed an important ceremonial function. During those rites, the creation of a cosmological structure was necessary.

The symbolism of a column and the ceremony of its erection in Slavic and Baltic cultures reflect traditions originating in an ancient pagan epoch. It is possible to discern at least four major semantic forms of a ceremony of erecting a pole or its analogues of ceremonial, ritualistic "world support":

- funerary rituals;
- the erection of a pole during the course of calendrical rites;
- the sacred perception of a central pole in a village house; and
- the erection of a ritual pole or house pole during special ceremonies, for example a wedding.

The erection of a pole was an integral part of certain calendrical rites among the Slavs and Balts. During feasts in Pancake Week and on *Kupal'e,* putting up

a pole is one of the best known ceremonial events among the Eastern Slavs. The tops of the poles were often crowned by solar signs, these columns then forming the focus of all ritual actions.

It is also customary among Lithuanians to erect a column or a tree of the Sun – *Saulės Medis* – on the day of summer solstice – on *Kupolė* or *Rasa*. In eastern Lithuania, three branches placed on top of a column were explained as being the Sun, the Moon and a star. The cosmological semantics of an erected column is clearly visible in calendrical rites.

The main central column in the village dwellings of Slavs and Balts, which supported the roof, was especially revered. This central column was particularly significant in the ritual life of families of Eastern Slavs (Bajburin 2005, p.174). A very significant reflection of this occurs in the Belarusian wedding ceremony called "*столбовой обряд*" "column rite" because the basic actions took place around a column. Gods were present here, and the application of a ritual formula meant that these gods would "forge" the wedding, performing the main ceremony of connection between the newly-weds. N. Nikols'kii has compared this column in dwellings with the family altars of Mediterranean and Near Eastern antiquity (Nikol'skii 1956, p.144-176). Belarusians have also preserved the sacred nature of the central column in ancient names for it, such as "*дзед*" 'grandfather', "*каневы слуп*" 'horse's column' or simply "*конь*" 'a horse'. For a long time, the last two have been compared with Sanskrit *aśva-yupa* 'a horse-column' which was represented as "a world column". It follows that this name can be linked to ancient Indo-European heritage (Bajburin 2005, p.174; Ivanov 1974, p. 75-138). The cosmological semantics of the column supporting the roof in Lithuanian houses was emphasized by the engraving of symbols of the Sun, Moon, and stars in the upper part and images of horses or grass-snakes in the lower part.

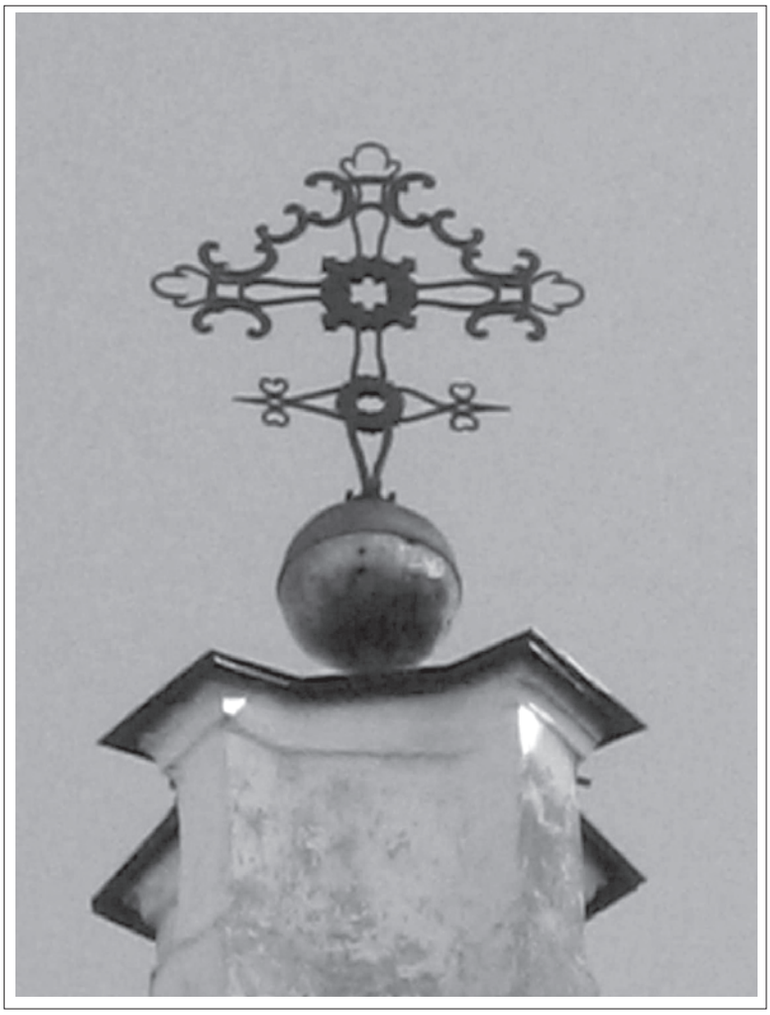

Fig. 5. Cross from the town of Slonim.

Lithuanians had a custom of erecting special columns during significant events, such as a marriage, illness, or epidemic, or to proposition for a good harvest. Maria Gimbutas proposed that such columns with symbols of the Sun, Moon and stars at the top had a cosmological meaning (Gimbutas 2004, p.204; Vaiškūnas 2005, p.195-206).

In sum, the mythical semantics of a column represent, first of all, cosmological ideas on the creation of sacred communication with the other world at the necessary ritual moment.

Penetration of paganism into Christian tradition?

We have already mentioned that the use of the symbol of a pole with a semicircle on funerary stones could be connected with the spread of Christian customs of erecting tombstones with Christian symbols. But pagan symbolism may also have penetrated in a different way into practices among the conquering Christians.

During the Christian epoch a transition took place from the use of a column to the use of a cross. As a result, the cross itself had evident pagan overtones for local populations. The Catholic authorities understood this and struggled against it: thus in 1426, the Bishop of Sambia

characteristically prohibited the erection of crosses in a cemetery, an example that demonstrates well the pagan basis of the local Baltic tradition (Čepienė 2000, p.45).

We are able to observe the continuation of the symbolism of the "pole-column-axis" in Catholic crosses both in Lithuania and western Belarus. In Lithuania, these traditional iron crosses on churches are well studied (Kontrimas 1991). Unfortunately, however, this cultural phenomenon has not been investigated in the territory of western Belarus, despite the fact that such crosses are still widespread.

These crosses typically have a compound form (Fig. 5 and Plate V: Fig.6). One of their main characteristics is that their upper ends often approximate to the shape of a sphere. The lower part, on the other hand, is either free from images or (more frequently) carries a symbol of the young Moon. Thus, these crosses also form a semicircle-sphere. Studying the continuity of the symbol of a pole with a semicircle and the traditional iron crosses of Lithuania and Belarus could be very perspicacious.

Conclusions

Unfortunately, it is impossible at the moment to give a definitive interpretation of the semantics of the Scebiaraky stone complex. However, it is clear that it connects with Baltic sacred stones *stabas* and represents the ceremonial "world axis" directed towards the North Star. Thepurpose of constructing the stone complex was to create such an axis and to connect the world of living people with the upper world. This unique stone complex could give us significant insights into the manner in which paganism developed in the Baltic-Slavic contact zone and into the formation of religious ideas within the Great Duchy of Lithuania.

References

BAJBURIN, A., 2005. *Zhilisce v obriadah i predstavlenijah vostochnyh slavian*. Moskva.

ČEPIENĖ, I., 2000. *Historia litewskiej kultury etnicznej*. Kaunas: Šviesa.

CETWIŃSKI, M., DERWICH, M. 1987. *Herby, legendy i dawne mity*. Wrocław: Krajowa Agencja Wydawnicza.

GIMBUTAS, M., 2004. *Balty. Liudi jantarnogo moria*. Moskva: Centrpoligraf.

HRONIKA, 1975. = Hronika Litovskaja i Zhamojtskaja. *Polnoje sobranije russkih letopisej.* T. 32. Moskva: Nauka.

IVANOV, V., 1974. Opyt istolkovaniia drevneindijskih ritual'nyh i morfologicheskih terminov, obrazovannykh ot aśva – "kon'" (zhertvoprinoshenie konia i derevo aśvattha v drevnei Indii). In: G.A. ZOGRAF, V.N.TOPOROV, eds. *Problemy istorii jazykov i kul'tury narodov Indii*. Moskva: Nauka.

KARPENKO, J., 1985. *Nazvanija zvezdnogo neba*. Moskva: Nauka.

KONTRIMAS, Č., 1991. *Lietuvos geležiniai kryžiai*. Vilnius: Mintis.

KVIATKOVSKAIA, A., 1998. *Jatviazhskije mogil'niki Belarusi (konec XI – XVII vv.)*. Vilnius: Diemedžio leidykla.

LAIME, S., 2003. Cosmological Ideas in Latvian Rock Carvings and Distaff Designs. *Cosmos, 19, 2–20*.

LATYSHSKIJE PREDANIJA, 1962. = *Latyshskije narodnyje predanija. Izbrannoje*. Riga: Izdatel'stvo Akademii nauk Latviiskoi SSR.

LIAUKOU, E., 1992. *Mauklivyja svedki minuuschyny*. Minsk: Navuka i tekhnika.

NIKOL'SKII, N., 1956. *Proishozhdenije i istorija belorusskoj svadebnoj obriadnosti*. Minsk: Izdatel'stvo Akademii nauk Belorusskoi SSR.

POVEST', 1999. = *Povest' vremennyh let*. Sankt-Peterburg, 1999.

VAIŠKŪNAS, J., 2005. Representations of an Ancient Cosmovision on Lithuanian Distaffs. In: M. KOIVA, I. PUSTYLNIK and L. VESIK, eds. *Cosmic Catastrophies: a collection of articles* (Proceedings of the European Society for Astronomy in Culture (SEAC) 2002. Tartu, 195-206.

Received: 3 November 2007, Revised: 10 November 2008

ŽENKLAI ANT STEBERAKŲ KAIMO AKMENŲ ŠIAURĖS VAKARŲ BALTARUSIJOJE

Andrei Prokhorov

Santrauka

Straipsnis skirtas ženklams, aptiktiems ant penkių Steberakų (Сцебяракі) kaimo akmenų Vileikos rajone. Dažniausiai šiuose ženkluose pasikartoja stiebo su pusapskritimiu arba tam tikros konfigūracijos kryžiumi motyvas. Geografinė kompleksą sudarančių akmenų orientacija šiaurės kryptimi byloja apie astronominę orientaciją į Šiaurės žvaigždę ir kosmologinę simbolio prasmę. Stiebas su pusapskritimiu vaizduoja pasaulio ašies laikomą dangaus kupolą.

Vertė Vykintas Vaitkevičius

THRACIAN DOLMENS AND THEIR ORIENTATIONS

ANTONIO CÉSAR GONZÁLEZ GARCÍA, VESSELINA KOLEVA, DIMITAR KOLEV, JUAN ANTONIO BELMONTE

Abstract

Spread over south-eastern Bulgaria, northern Greece and the European part of Turkey are a large number of megalithic tombs. These dolmens were built from around the twelfth century BC to about the sixth century BC. The monuments were built with well cut slabs, defining a rectangular space with a roof. A small hole marks the entrance. A dromos is also present in some dolmens and all of these structures used to be covered by a tumulus. We present the first results from a series of campaigns devoted to measuring the orientation of these structures. The first campaign was carried out in the Strandja Mountains where 31 dolmens (among other monuments) were measured. The dolmens are not orientated at random, and a particular pattern of orientation has been found for the entrance of these monuments. Several tentative explanations are attempted and supported with information provided by contemporary Greek sources.

Key words: megaliths, orientations, landscape archaeology, Thracian culture.

Introduction

A large number of dolmens built by the Thracians are found in the regions of south-eastern Bulgaria, northern Greece and the European part of Turkey. The end of the third millennium BC witnessed migrations of peoples from the north-west. These peoples could have culturally mixed with the local population and we refer to them as proto-Thracian people by the second millennium BC. These Thracians could be those mentioned by Homer as allies of the Trojans in the Iliad (Venedikov 1982; Velkov et al. 1985).

The period for dolmen construction coincides with the end of the Bronze Age and the early Iron Age, from c. 1200 BC to c. 500 BC, when we can properly talk of Thracian tribes. We do not have written Thracian sources, and must rely on the written accounts by Greek historians (notably Herodotus), who by the end of this period describes the Persian Campaigns and the peoples they encountered in their conquest (the Thracians among them).

After the foundation of Greek colonies on the coasts of the Black Sea and the retreat of the Persian forces, the Odrisian Kingdom appears as a true Thracian kingdom closely interacting with the Greek world, with mutual beneficial influences. By the middle of the first century BC the Thracian kingdom was incorporated into the Roman Empire (Velkov et al. 1985; Fol and Fol 2005).

The Thracian economy was mainly based on agriculture in the river valleys and cattle breeding in the mountains. Mining of copper, iron, gold and silver was also highly important to Thracian society, especially in the mountains. In addition, there was a body of artisans who manufactured goods that have now become famous masterpieces. Many of these objects are part of the treasures found in the tumuli spread across Bulgaria.

The known funerary customs and related artefacts suggest social stratification, with a tribal aristocracy owning both land and the herds in the mountains. The 'king' was one of these aristocrats. Beneath them were the peasants who had certain obligations to the aristocracy. There is also the suggestion of the existence of a lower stratum of society consisting of enslaved servants and shepherds (Velkov et al. 1985; Fol and Fol 2005).

Thracian art can be divided into styles that correspond to the two periods of its history. The first of these is characterised by simple, geometric artwork with stylized lines. The dolmens and rock-cut tombs were constructed during this period. The second period, in the second half of the first millennium BC, shows significant influence from Greek and Persian sources, especially in architecture (the construction of false vault and cupola tombs), sculpture (e.g. the tomb of Kazanluk) and goldwork (e.g. the Panagyuriste treasure).

Thracian religion

Because we do not have direct accounts of Thracian religion written by Thracians, we have to rely on Greek and Roman sources. Herodotus mentions four deities whom he argues were equivalent to Artemis, Dionysos, Ares and Hermes. Strabo describes the sacrificial mystery surrounding the hierogamy, or sacred union, between two gods: the Mother and the son/Sun-fire god. He also mentions a triad of gods including the Great Goddess Mother and her two offspring, Artemis and Apollo (Fol and Fol 2005).

There are numerous sources that refer to Orpheus as a Thracian king. The Greeks practised a mystery cult related to Orpheus (i.e. Orphism) and they also mention that the Thracians introduced their cult to Greece. However, there seems to have been somewhat of a difference between the adoption of the cult in Greece and in Thrace. There was an 'open level' where the cult was accessible to everyone and there was a second, 'restricted' level only accessible to the initiated aristocrats. Apparently, the king was initiated in these rituals in order to achieve immortality (Fol and Fol 2005).

Fol (Fol and Fol 2005) describes this Thracian Orphic cult in terms of ten degrees or stages:

- there is a Great Goddess-Mother/cosmos/mountain in a state of rest;
- the Great Goddess-Mother (GGM) self-conceives;
- the GGM carries her child;
- a son (solar-chthonic character) is born;
- the sun rises on the horizon;
- he sets the Cosmos in motion;
- the sun has a marital relation with the Great Goddess-Mother;
- a child is born;
- this child becomes a king-priest;
- the king-priest has a symbolic marital relation with the GGM, becomes immortal, and secures a new cycle. Hero cult.

According to Fol, the Great Goddess Mother—the image of the original mountain and thus of the whole Universe—is at the heart of Thracian cosmogony. Her self-conceived child, the Sun, will break the state of rest, setting the cosmos in motion. This son has chthonic character, since he is born from the earth (the mountain), but also has a solar character, since he is the Sun itself. The Sun then has a marital relation with the GGM. The child conceived will become the king-priest of the Thracian community. As a result, the king-priest's power is linked to the divinity through his own divine origin. The king-priest has to be initiated in order to secure a new cycle and become immortal. This is performed in a hierogamy, i.e. a new symbolic marital relation, with the GGM. After the death of the king, he is worshipped as a hero, most probably at his tomb.

These cults were at the centre of Thracian society and as such they may help in the interpretation of the funerary customs.

Funerary customs

The first period of Thracian history is characterised by the use of the so-called dolmens and rock-cut tombs. Thracian dolmens are found mainly in the mountainous areas, and particularly in the Strandzha, Sakar and Rodophe regions. There seems to be a lack of dolmens in the low plains and valleys (Fol 1982; Rousseva 2000). The rock-cut tombs very much resemble the dolmens but are found in different places: the two kinds of monuments only overlap in a small geographical area (Owen 2000; Fol 2003).

The dolmens were built from around the twelfth century BC to about the sixth century BC. They typically consist of four large stone slabs defining a rectangular space with another one for the roof (Plate VI: Fig. 1). The entrance is usually a hole (typically c. 75 x 50 cm) in one of the vertical slabs. In a number of monuments, the entrance is prolonged by two vertical slabs, forming a dromos. The whole structure was probably covered by a tumulus. We can distinguish two types: the simple dolmen, where there is only one chamber, perhaps with a dromos, and the double dolmen where there is an additional ante-chamber. In the most elaborate monuments, a façade was also built in the entrance area. One can imagine a process of evolution from the simplest dolmens (one-chambered without a dromos) to the most elaborate ones (double-chambered with dromos and façade) and perhaps also to the later false cupola Thracian tombs, although this last point is still controversial (Maleva 2000).

These monuments were reused on several occasions. In the majority of cases a funerary use is attested although some of them could have been mere cenotaphs. They were apparently built for the aristocracy, given the wealth of the goods found in them (Owen 2000).

The subsequent evolution of Thracian culture, along with their increasingly frequent contact with the Greek colonies of the Black Sea coast, translated into more sophisticated yet still 'megalithic' burials for their leaders. These leaders were worshipped as heroes. The most widely known features of these monuments are the use of a false cupola and their impressive carvings and decorations (Rousseva 2000).

The Orientation Data

The Strandzha tombs

From within the tomb, the sense of orientation provided by the entrance hole is very evident. We measured this wherever possible. We also measured the orientation perpendicular to the back-stone, at those monu-

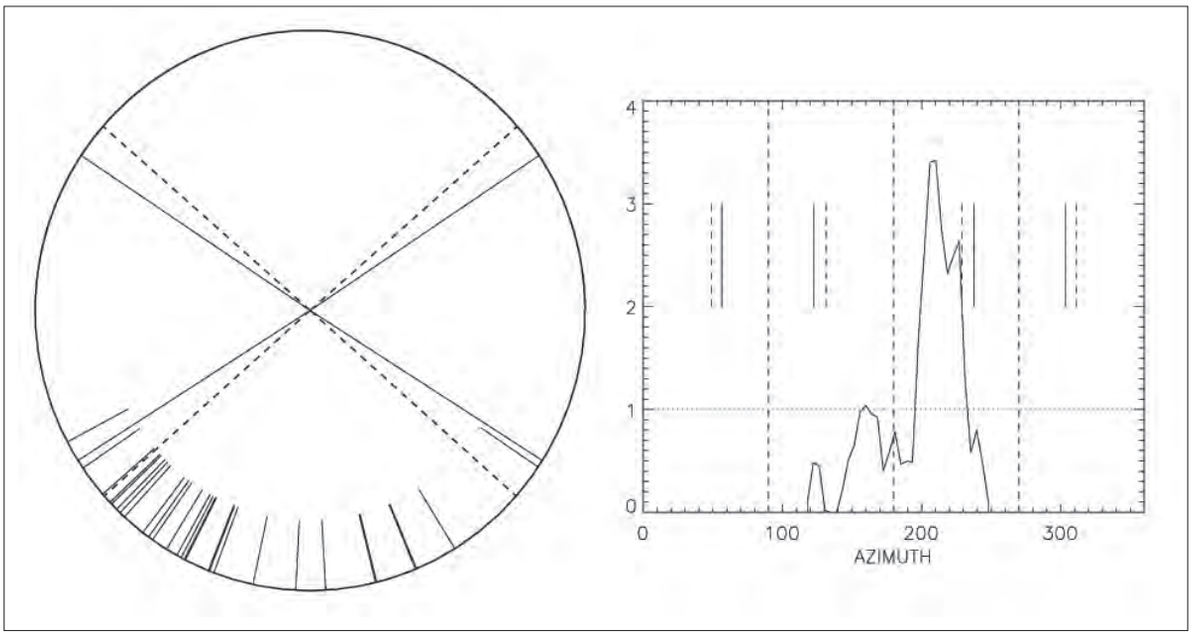

Fig. 2. Left: orientation diagram of the 31 dolmens measured in the Strandzha Mountains. The long solid lines are the solar limits, while the dashed lines are the lunar limits. Right: Histogram of the azimuths v. normalized frequency. The long dashed lines indicate the cardinal points, the short solid lines the solar limits and the short dashed lines the limits for the Moon. We find a concentration to the south-west, with a tentative accumulation towards the Southern Major Lunistice.

ments where nothing remains of the entrance. In this paper, we present some preliminary results from the first campaign that collected data relating to the Thracian dolmens. These data were collected in the spring of 2006 from 31 monuments in the Strandja Mountains in south-eastern Bulgaria, close to the border with Turkey. We also measured five Thracian Tombs (from the clasic Thracian period) and 34 Roman cists from the necropoleis of Propada and Mishkova Niva, near the town of Malko Tarnovo; and we also visited several open-air sanctuaries. All of these will be reported upon in a forthcoming paper.

Fig. 2, left panel, presents the azimuths of our 31 measured dolmens. We find that most of them are orientated outside the range of sunrise, and just a few are inside the range of moonrise. Fig. 2, right panel, presents the histogram of the azimuths normalized by the mean. This means that any value greater than 1 is above the mean. In a statistical sense, we could say that a value is highly significant if it is above 3; a value of 2 is also quite significant. We find that we have a highly significant peak at a value close to 210 degrees, far from any obvious solar or lunar connection. There is a secondary peak (with a value of 2) close to the Southern Major Lunistice.

Azimuths are only meaningful on a flat level horizon. The dolmens are located in mountains and hills, often surrounded by forest. However, we were able to measure the altitude of the horizon in most cases and hence to obtain the distribution of declinations. This is more reliable in searching for possible astronomical alignments, and the declinations obtained are shown in Fig. 3. We find a clear peak close to declination –35° and a possible secondary peak close to the Southern Major Lunistice.

Discussion and Conclusions

As previously mentioned, Thracian religion is commonly believed to have had a Solar-Chthonic character. The evidence from the tomb orientations challenges this hypothesis, however. Indeed, from the data collected so far we can rule out the sunrise/sunset hypothesis (Hoskin 2001), although the data remain partial so far.

Both Dermendzhiev (2005) and Belmonte (2005) analyzed the orientation of Bulgarian dolmens from maps. The results of both are quite similar to those presented here. Dermenzhiev (ibid.) notes that, according to Pausanias, the bones of Orpheus should not be seen by the Sun or else a huge catastrophe would befall the Earth. Euripides makes a similar claim in relation to the remains of Rhesos. Dermenzhiev then argues that the orientation of the dolmens is such that the Sun never illuminates the bones of the dead. However, an easier way to have achieved this would have been to orientate the monuments to the north, not to the south as they are.

Alongside the above arguments we should note that Herodotus and Diogenes Laertius, when referring to hero cults, state that burial offerings were made in

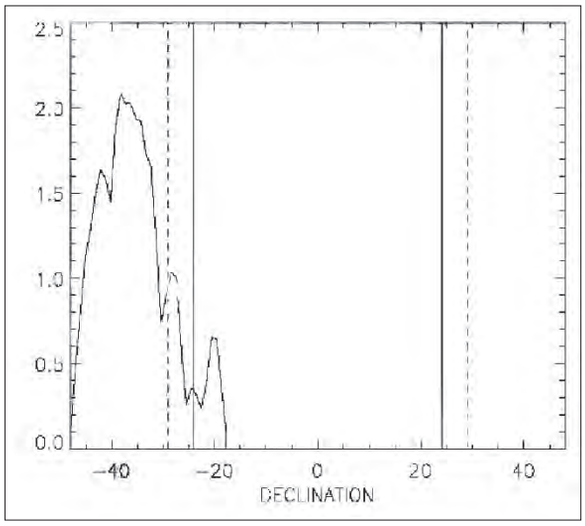

Fig. 3. Histogram of the horizon declination in the direction of orientation of the dolmens v. normalized frequency. The lines are as in Fig. 2. We find a concentration about declination –35º and a secondary peak close to the declination of the Moon at the Southern Major Lunistice.

the afternoon, when prophesies were offered. Furthermore, Porphyrius states that 'the South is reserved for the gods, curtains were dropped at noon and nobody entered the temples until the Sun God inclined to the south'. Therefore we suggest the possibility that the dolmens were intentionally oriented according to the afternoon sun – what we might call the 'afternoon hypothesis'.

According to Fol's interpretation of Thracian religion, a key ingredient of this was the sacred marriage or hierogamy. There is an obvious connection between the Tumulus-Mound and the Sacred Mountain, which is itself linked with the Great Mother-Goddess as described in Section 1. At this point we should recall that, according to Herodotus, the Thracian Great Mother-Goddess may have been equivalent to the Greek Artemis who, it is claimed, was related to the Moon, as a result of having assimilated the characteristics of Selene and Hecate (Humbert 1994; Littleton 2002). Moreover, the decorations in some later Thracian tombs, such as those in Kazanluk and Sveshtari, contain iconography which is arguably related to the Moon. The possible orientation of some of the dolmens to the major southern lunistice provides some support for this 'Lunar' or 'Great Mother Goddess- (GMG)' hypothesis.

To date, we only have data for a sample of the Thracian dolmens, and we consider these questions still very much open. But we feel safe in concluding that Thracian dolmen orientation is not consistent with either the sunrise or sunset hypothesis as occurs in most of the rest of Europe; instead, it seems consistent with the sun descending (afternoon) hypothesis or with an association with the moon, perhaps related to the GMG, or both.

We hope that new data may help to inform current theoretical thinking and invigorate the debate and the development of new theories.

Acknowledgments

We wish to thank the Forestry Service of the Strandja Park for guidance and help during this campaign. We would like to thank the referee for valuable and useful comments. This work is partially financed under the framework of the projects P310793 'Arqueoastronomia' of the Instituto de Astrofísica de Canarias and AYA2004-01010 'Orientatio ad Sidera' of the Spanish Ministry of Education and Science.

References

BELMONTE, J. A., 2005. On the orientation of megalithic monuments of the eastern Mediterranean: new perspectives, In: M. KOIVA, I. PUSTYLNIK, L. VESIK, eds. *Cosmic Catastrophies.* Proceedings of the SEAC 2002 10th Annual Conference. Tartu.

DERMENDZHIEV, N., 2005. PhD Thesis, Institue of Archaeology, BAS. Sofia. Chapter 4.2.3: *Orientation of Bulgarian Dolmens.*

FOL, A. and FOL, V., 2005. *The Thracians*. Sofia: Tangra Tannakra.

FOL, A., ed., 1982. *Thracian monuments III: The megaliths in Thrace II. Pontic Thrace*. Sofia: Nauka i Izkustvo Press.

FOL, A., 2004. *Orphica Magica I*. Sofia: Universitetsko izdatelstvo „Sv. Kl. Ochridski".

FOL, V., 2003. Rock-Cut Caves with Two Entrances or the Model of the Cosmos. *Tracia 15*. Sofia.

HUMBERT, J., 1994. *Mitología griega y romana*. Barcelona: Ed. Gustavo Gil S.A.

HOSKIN, M., 2001. *Tomb, Temples and their Orientation*. Bognor Regis: Ocarina Books.

LITTLETON, C.S., 2002. *Mythology*. London: Thunder Bay Press.

OWEN, S., 2000. New Light on Thracian Thasos: A Reinterpretation of the Cave of Pan. *The Journal of Hellenistic Studies*, 120, 139-143.

ROUSSEVA, M., 2000. *Thracian Cult Architecture*. Jambol: Ia.

VELKOV, V., VEREDIKOV, I., GUERGOVA, D., SOLAR D., 1985. Los Tracios. *Cuadernos Historia,* 16, 222.

Received: 26 October 2007; Revised: 6 July 2008

TRAKŲ DOLMENAI IR JŲ ERDVINĖ ORIENTACIJA

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Santrauka

Megalitiniai kapai gausiai paplitę Pietryčių Bulgarijoje, Šiaurės Graikijoje ir europinėje Turkijos dalyje. Šie dolmenai pastatyti XII–VI a. pr. m. e., jų statybai naudotos pjaustytos akmeninės plokštės. Su jų pagalba buvo formuojama stogu uždengta stačiakampė erdvė. Įėjimo vietoje būta nedidelės ertmės. Kai kurie iš dolmenų turi pailgintus įėjimo koridorius ir yra užpilti žemių pilkapiais.

Straipsnyje pristatomi pirmieji lauko tyrimų, skirtų erdvinės dolmenų orientacijos matavimams, rezultatai. Pirmoji ekspedicija surengta Stranjos kalnuose. Jos metu, be kitų paminklų, išmatuotas ir 31 dolmenas. Šių dolmenų erdvinė orientacija nėra atsitiktinė. Nustatyta, jog įėjimas į dolmeną buvo įrengiamas laikantis tam tikrų principų. Remiantis vienalaikiais graikų šaltiniais, jie bandomi paaiškinti keliais hipotetiniais būdais.

Vertė Vykintas Vaitkevičius

COSMOLOGICAL MOTIFS OF PERUVIAN HUACAS

JOHN MCKIM MALVILLE, MICHAEL ZAWASKI, AND STEVEN GULLBERG

Abstract

Characteristics of Andean huacas are summarized with examples from Urubamba, Machu Picchu, Llactapata, and Chankillo. We identify the pillars on the ridge above the town of Urubamba as a marker of June solstice sunrise to be viewed from the Palace of Huayna Capac. Both ends of the sightline connecting the pillars and the Palace appear to have been huacas. The large carved Intiwatana stone in the Urubamba canyon symbolically ties together Machu Picchu and the nearby ceremonial center of Llactapata. The astronomically complex site of Chankillo includes evidence for ceremonial observations of the solstices and shamanic ritual, set within a large-scale geometry established by June solstice sunset/December solstice sunrise.

Key words: Inca, shrines, sun, moon, solstices, ancestor veneration, shamanism.

Introduction

The Incas honored and venerated a large variety of features of the natural landscape such as mountains, caves, springs, lakes, and rocks that were endowed with meaning and sacred power. In Quechua these shrines were known as *huacas* (the Spanish equivalent of the Quechua *wak'a*). Around Cusco the huacas were organized along lines or ceques (Quechua, *zeq'e*).

Soon after their invasion of the Inca homeland, the Spanish destroyed the most important shrines such as the Temple of Pachacamac and the Coricancha of Cusco. In 1539 the Spanish began a campaign against the indigenous religion and proceeded systematically to destroy huacas, with the consequences that attendants and worshippers of known huacas were prosecuted, sometimes tortured, and even put to death. The foundations of the shrines were dug out, the objects of worship were destroyed, anything flammable was burned, and finally a cross was often built over the site. An unintended consequence of this campaign of destruction was that the names and locations of huacas were recorded so that they could be examined in the future to make certain no religious activity continued. Some of the huacas, namely large carved rocks, could not be destroyed and remain to this day at sites such as Kenko, Chinchero, Saihuite, and Chulquipalta (Hemming 1982)

The Spanish appear to have been confounded by the variety, complexity, and alien symbolism of the huacas and probably failed to comprehend their fundamental meaning. A valuable perspective for understanding Andean huacas has been provided by the great Peruvian archaeologist, Julio Tello, who recognized that ancestor veneration has been one of the major and enduring features of Andean civilizations (DeLeonardis and Lau 2004). Huacas appear to be major elements in Andean cosmology extending back to 1000 or 2000 B.C. and often were shrines to ancestors who, it was believed, could influence the living. Feeding of huacas was a major motivation for communication with ancestor-gods and for sacrifices (Benson 2001). Blood, corn beer (*chicha*), and water were valuable nourishments. Mummies and images of ancestors were carried in processions, placed on platforms, and fed. Shamanic communication with the supernatural world of the ancestors and movement between the three worlds (underworld, this world, heavens) were intertwined with ancestor worship (Eliade 1964). Stairways, which are signatures of shamanic ascent and descent, are abundant at sites such as Tiawanaco, Chinchero, Ollantaytambo and Machu Picchu. Huacas were often places where the ancestors could be called upon for assistance in agriculture, warfare, health, and fertility.

Sun Pillars of Urubamba

The astronomical function of the pillars on the northeastern horizon of the town of Urubamba had not been identified until recently, although they are easily visible to the local community and were identified by Bauer and Dearborn (1995) as "useful examples of what Inca solar pillars may have looked like." We established in 2005 (Zawaski 2007) and in 2007 that these pillars mark June solstice sunrise when observed from the vicinity of the large white granite boulder (Fig. 1) in the courtyard of Quespiwanka, the palace of Huayna Capac (Fig. 2). The granite boulder may, in fact, be responsible for the Quechua name of the palace, Quespiwanka: *quespi*, "crystal" or "shimmering"; *wanka*, "standing rock" (Farrington 1995). Another translation of *quespi* as "transparent water" may relate to the Inca myth of

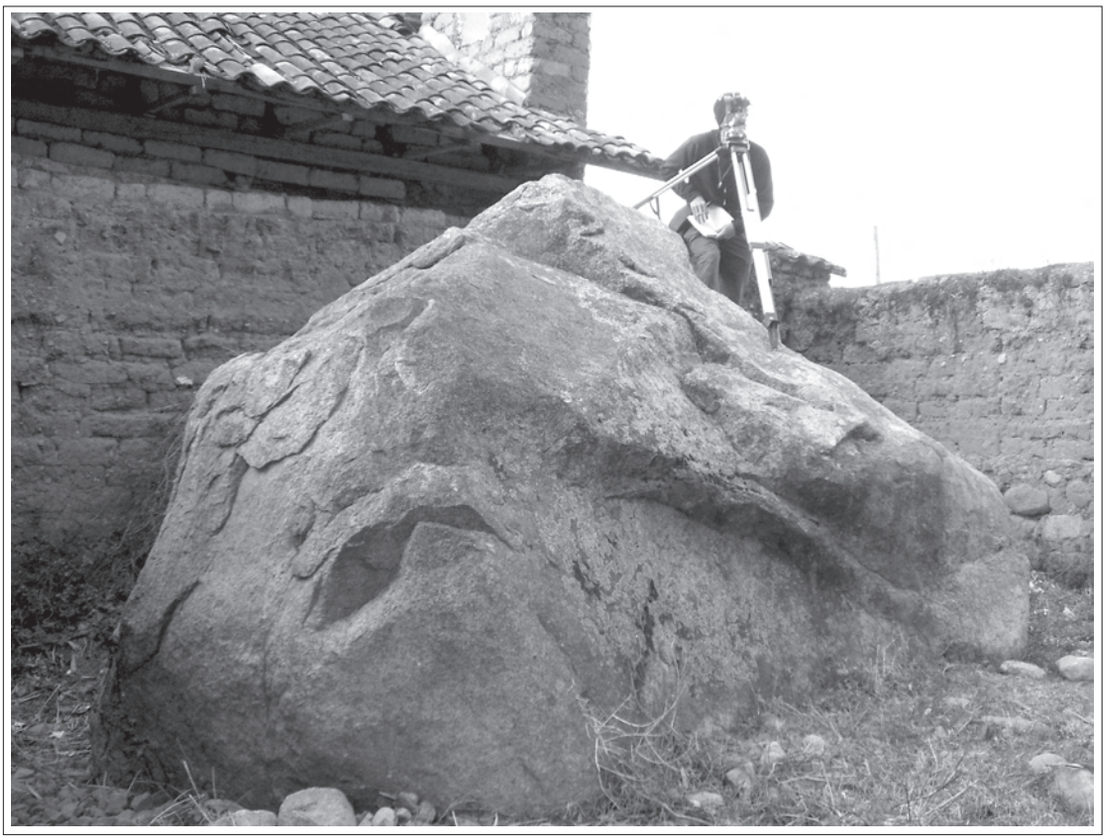

Fig. 1. Granite boulder of Quespiwanka. M.Z is shown with theodolite. Photograph by J. Malville.

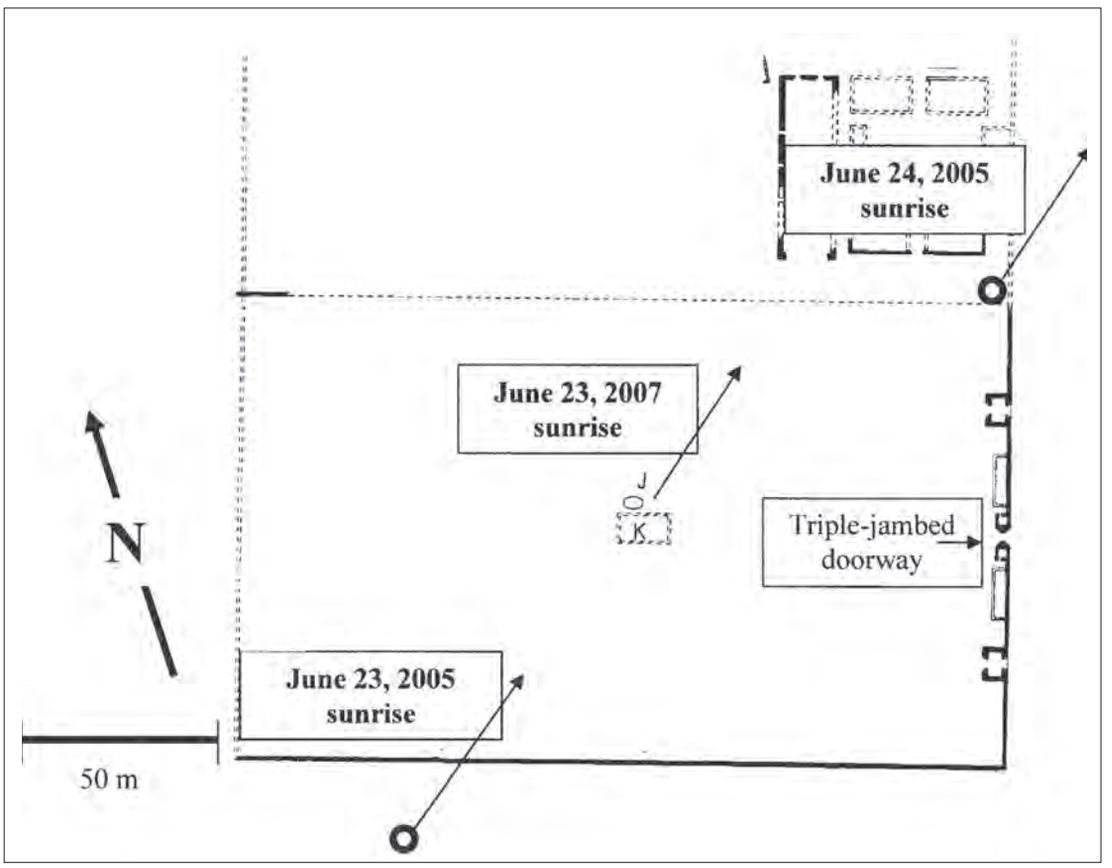

Fig. 2. Three locations in the palace of Quespiwanka where the June solstice sun was observed to rise between the sun pillars of Cerro Saywah. The southern wall contains double-jambed niches. (J, granite boulder; K, modern chapel).

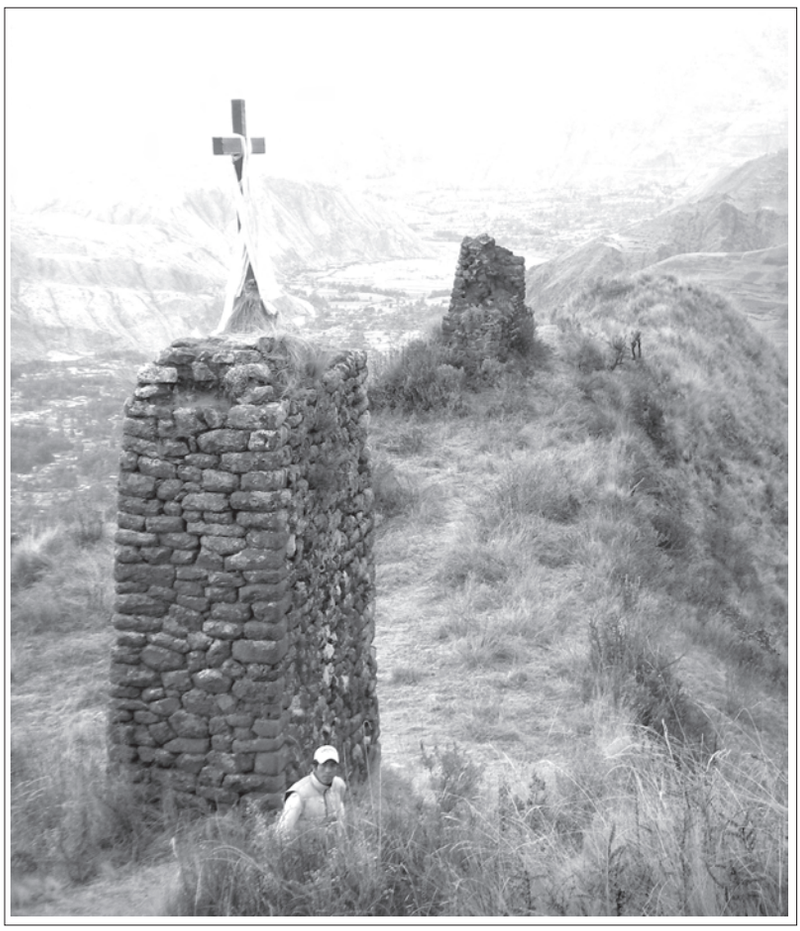

Fig. 3. Sun Pillars above Urubamba. Photograph by M.Zawasky.

the birth of the Sun from a crystal floating in water at June solstice, observed by Pachacuti before his battle with the Chancas (Zuidema 1982). Stone-lined channels in the courtyard of Quespiwanka could have surrounded the boulder with water, and today a modern channel carries water toward the boulder. Built in a previously uninhabited area of the Urubamba River valley during the last decade of the 15th Century, the palace appears to be the only Incan site in the area for observing June solstice sunrise between the pillars.

Our measurements combined multiple sunsights with a Wild T2 theodolite with GPS determinations. As viewed from the granite boulder, the azimuth of the mid point of the pillars is 56° 53'; their mean altitude is 22° 59'. The pillars are 35.3 meters apart on either end of a level terrace and are constructed out of shaped sandstone blocks in contrast to the granite of the palace. They are located along an azimuth of 100° on a ridge of Cerro Saywa at an elevation of approximately 3860 meters. When viewed from Quespiwanka, the separation of the pillars is 0.59°. The easternmost pillar has a height of 4.3 m and a base 1.5 m by 3.3 m; the base of the partially restored western pillar is similar.

Although the courtyard of the palace is greater than two hectares in area, it may not have been the scene of *public* ceremonies. Its eastern wall contains a massive triple-jambed doorway surrounded by two double-jambed doorways. Inca doorways with multiple jambs typically marked entry into a space of special importance to be used only by elites. The courtyard may thus have been similar to the Corichancha of Cusco and the Sanctuary of the Island of the Sun in that non-elites were barred from entry and participation in ceremonies (Dearborn et al. 1998; Seddon and Bauer 2004).

June solstice sunrise can also be viewed from outside the southern wall of the palace. Niles (1999) suggests that there were 40 double-jambed niches along its 190 meter length. The wall faced an artificial lake and large granite boulders. This area may have been a public viewing area where pilgrims and non-elites were allowed to view solstice sunrise between the pillars, in a manner similar to ceremonies on the Island of the Sun (Dearborn et al. 1998; Seddon and Bauer 2004)

A third site for solar ceremony is the 40 meter-long terraced platform built between and around the pillars. On the northern and southern sides of the platform there are retaining walls, which are approximately 1 meter high. Interestingly, the pillars were not built parallel to the ridge, but were rotated such that their long sides with azimuths of 286° and 298° approximately bracket *sunset* on June solstice on the 3° northwestern horizon. Chroniclers noted that sacrifices to the sun were often made at the pillars of Cusco. Steps to a platform at the upper structure of the Island of the Sun suggest that sacrifices were made there as well. The platform between the Urubamba pillars and the orientation of the pillars suggest that this, too, was a place for ceremony. The solid rubble core of the pillars allowed no room for cultural or human remains. The lack of a crypt and the absence of scattered osteological material indicate they were not tombs (*chulpas)*.

The insight provided by the Urubamba pillars is that both ends of the sightline connecting the palace and the pillars appear to have been huacas. Both real and symbolic ascent would have occurred when a procession

Fig. 4. Water channel leading from the double jamb doorway at Llactapata toward Machu Picchu. Photograph by J.Leivers.

of celebrants climbed 950 meters from the valley to the platform, where they could make sacrifices, place offerings, and celebrate the passage of the sun across the sky from dawn to dusk.

How did the Urubamba pillars escape the ravages of colonial politics that destroyed the pillars of Cusco? They are relatively modest features on the high horizon and can easily escape detection from below. Furthermore, Quespiwanka was remote from the political center of Cusco, so remote that the mummy of Huayna Capac, ardently sought after by the Spanish, was successfully concealed in the palace for several decades (Farrington 1995). In his retreat down the Urubamba River valley in A.D. 1536, Manco Inca torched the palace to prevent the Spanish from utilizing the buildings, thereby keeping the hiding place of his father's mummy as well as the presence of the pillars unknown to the Spanish invaders.

Huacas of Machu Picchu and Llactapata

Machu Picchu appears to have served as both a sacred center (Reinhard 2002) and a royal estate (Salazar 2004; Niles 2004). It is possible that before Pachacuti adopted the dramatic location above the Urubamba River, it was already recognized in pre-Inca times as a site of power because of its granite outcrops and caves, the peak of Huayna Picchu, and the cardinality of the surrounding sacred mountains. Salazar (2004, p.41) suggests that Pachacuti established shrines at Machu Picchu because of the special association that he felt existed between him and the "supernatural forces immanent in the landscape and the celestial sphere," and that his connection with these forces needed to be "actively reaffirmed through daily ritual."

The re-discovery of Llactapata, which overlooks Machu Picchu from a distance of 5 km, was reported at Oxford VII (Malville et al. 2006). A remarkable feature of Llactapata is the sun temple of sector I, which has an orientation and architectural design similar to that of the Coricancha of Cusco. The courtyard in front of the double-jambed doorway of sector I contains a stone-lined channel (Fig. 4) leading from the doorway toward the Sacred Plaza of Machu Picchu, approximately in the direction of June solstice sunrise. Ceremonies performed in that courtyard with bright reflecting material such as gold medallions could have been seen from the Sacred Plaza. Because Llactapata is higher than Machu Picchu, reflections from Llactapata on the morning of June solstice are visible 37 minutes before it reaches the sun rises as viewed from the Sacred Plaza of Machu Picchu

Fig. 5. (a) Chankillo towers; (b) Urubamba sun pillar. Photograph by C. Aranibar.

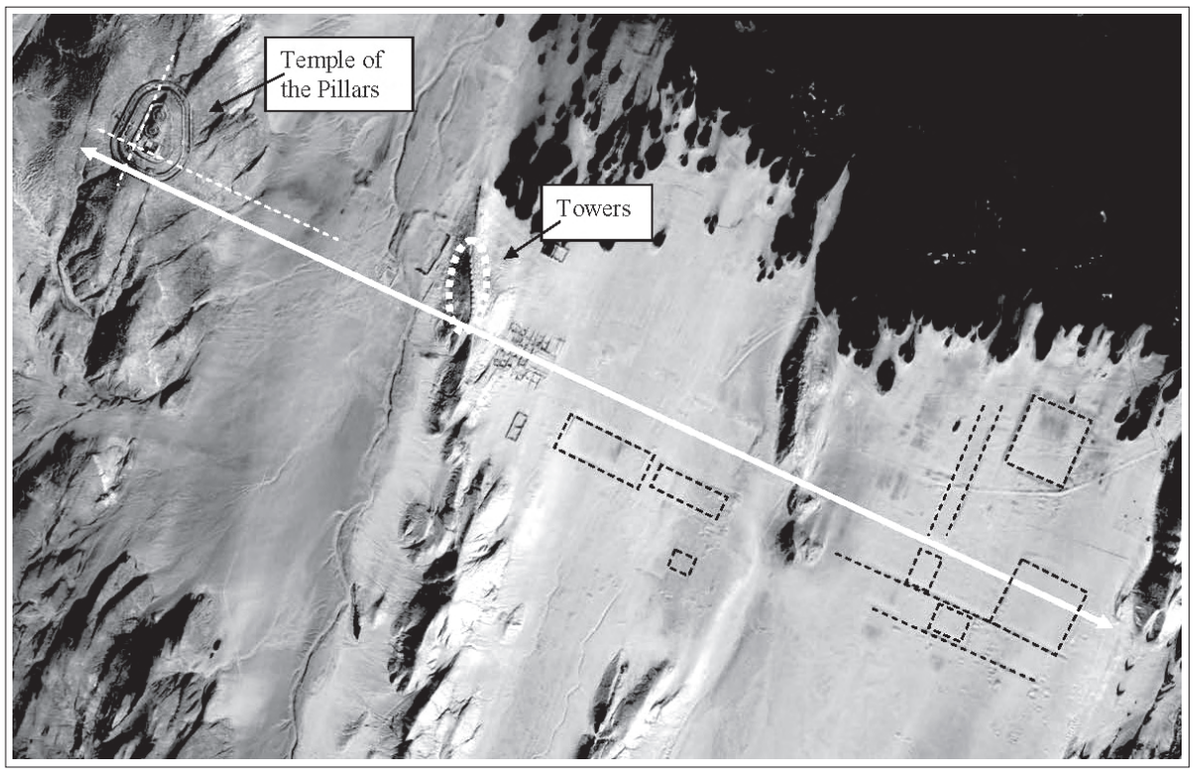

Fig. 6. Ikonos image of Chankillo. The solstitial axis (December solstice sunrise, June solstice sunset) runs diagonally from upper left to the lower right. North is to the top.

There are no carved huacas at Llactapata. Most of the construction material is metamorphic rock. The nearest carved granite boulder with which we are familiar is the River Intiwatana some 600 meters to the northeast, deep in the Urubamba canyon. The vicinity of the huaca contains a platform, carved steps, fountains, a tower, and caves. It lies on the line between the sun temple and the Sacred Plaza of Machu Picchu.

Water or other liquid offerings must have been carried up to the double-jambed doorway at Llactapata and poured into the channel as an offering to the sun. A similar ritual may have occurred in the Coricancha, as suggested by the three small openings in the wall to Ahuacpinta Street. Artificially fed channels also face June solstice sunrise at Saihuite. There is a long standing Andean tradition that liquid offerings encourage the flow of energy necessary to maintain harmonious relations on the earth. Such harmony and balance is associated with a reciprocal exchange between humans and ancestral powers. A common motif of carved huacas is a straight or zigzag channel (Quechua: *qénqo*) through which liquids could flow. The flow of energy necessary to establish harmony and maintain equilibrium in the world was stimulated by the pouring of liquid offerings into these channels. At June solstice, the pouring of water into the Llactapata channel may have represented the feeding of the sun during the dry season (Urton 1981).

Towers of Chankillo

The impressive hilltop fortress and towers of Chankillo were first described in western literature by Squier (1878). Ghezzi (2006, p.80) interprets the area as a scene of ritual warfare and "above all a paramount ceremonial space." Calibrated radiocarbon dates ranges from 320-200 BC, some 200 years following the collapse of Chavin de Huantar (Ghezzi 2006). On the basis of their analysis of the calendrical potential of the thirteen towers of Chankillo, Ghezzi and Ruggles (2007) conclude that the towers functioned as horizon markers for a solar observatory. They identified two observing sites that provide views of the sun rising or setting close to the towers throughout the year. Each of these approximately equally spaced towers has two stairways, to the north and south (Fig. 5a). However, the complex nature of these towers suggests they were initially intended to be more than horizon markers to be viewed from a distance. Horizon markers, such as the sun pillars of the Inca (Fig. 5b), did not need double stairways. Furthermore, in order to function throughout the year the towers needed a variable spacing, with the largest separation at equinox. If calendrical observations had been the primary intent in constructing

Fig. 7. View to southeast from below the 13th tower toward December solstice sunrise of 250 B.C. The solstitial axis of Chankillo is indicated. The foreground structure is near the center of Fig. 6. Photograph by C. Aranibar.

the towers, there should be well established viewing stations. The western observing station proposed by Ghezzi and Ruggles (2007) is not in the center of the major plaza to the west of the towers but is at the end of an adjacent corridor, which does not open to sunrise on June solstice. The assumed eastern observing station is a minor structure, which is noteworthy only because it provides a desired view of the towers.

Ghezzi (2006, p.77) noted that the "location and orientation of the Temple of the Pillars were carefully chosen to define the main axis of the entire site, which is aligned with the December solstice." This axis, which extends for more than 3 km to the southeast from the Temple, has an azimuth of 114º, which corresponds to sunrise on December solstice in 200-300 B.C. (Figures 6). The solar axis is the dominant astronomical feature in the archaeological record of Chankillo. The large area of buildings, courtyards, and extensive walls to the southeast of the towers (Fig. 7) appears to have been the scene of ceremonial feasting, based upon the presence of corn beer storage facilities, remains of maize, panpipes, and spiny oyster (Spondylus) shells (Ghezzi and Ruggles 2007). All sizable structures in this area are contained in the grid that is aligned to the solstitial axis.

The thirteen towers are linked to this astronomical axis by the highest tower, which is rotated from the lower ones by about 22º, bringing its long side into perpendicularity with the solsticial axis. This geometry may have been intended as a symbolic transformation from the spine of the terrestrial hill to celestial axis of the sun. Shamanic transformation was a major theme at nearby Chavin de Huantar, as well as a characteristic of shamanism in general (Burger 1992).

Our interpretation of the towers is that they are essentially thirteen linked platforms with stairways allowing ritual movement between them (Fig. 5). A fourteenth platform lies 175 meters due south of the highest tower.

As viewed from this platform, the December solstice sun rises over the large enclosure that is visible in the right side of Fig. 7. As we have noted, within the tradition of Andean huacas, ritual platforms were places where sacrifices were made, offerings were presented, and huacas were fed. Processions toward the highest tower could have occurred during the bright period of the moon, between new and full moons. Ascent of the first tower could have occurred soon after the first new crescent moon was observed. If each tower was ascended on successive nights, the highest tower would have been reached close to or on the day of full moon. The presence of lunar ceremonialism is also suggested by Spondylus shells, which in Moche times were apparently associated with a lunar cult (Cordy-Collins 2001).

We have established that the June solstice sun sets over the thirteenth tower as viewed from the plazas of the structure to the southeast of that tower (Fig. 7). The Temple of the Pillars, is aligned along this axis, with its atrium and double stairways facing December solstice sunrise. The sun at June solstice also sets over the Temple as viewed from the center of the large plaza below. The wall of the surrounding fortress is lower in the southeast, allowing a view from the plaza of ceremonies performed in the Temple (Ghezzi 2006).

Summary And Conclusions

Ancestor veneration, shamanism, and origin mythologies are intertwined themes in the huacas we consider in this paper. The sun was a preeminent ancestor, and each of these sites involves attention to the solstices. The Urubamba pillars and the Palace of Huayna Capac are on the sightline to June solstice sunrise. The Sacred Plaza of Machu Picchu, the River Intiwatana, and the Llactapata sun temple lie approximately along the line established by June solstice sunrise and December solstice sunset. Water offerings to the June solstice sun could have been made from the double-jambed doorway of the sun temple at Llactapata. The extraordinary historical depth of solstitial alignments in Andean civilizations is demonstrated at Chankillo, where its major geometric axis was established by December solstice sunrise and June solstice sunset. The towers seem best understood as platform-stairway combinations within the long-standing Andean tradition of huacas. They may have been associated with both the sun and moon, ritual ascent/descent on the stairways, and sacrifices on the platforms. Celebrants may have walked along the linked huacas on the days leading up to full moon, and twice a year they could have greeted the solstice sun from the highest tower.

Acknowlegements

Carlos Aranibar has consistently provided excellent support in the field. Nicholas Ashov of Urubamba first drew our attention to the pillars. Gary Ziegler, Hugh Thomson, Greg Danforth, Ward Olin, and Deb Bouvier contributed to our fieldwork. We benefited from the support and encouragement of Xavier Ricard of Centro Bartolome de Las Casas. Our work at Llactapata and Urubamba was undertaken with permission of the Instituto National de Cultura-Cusco.

References

BAUER, B. and DEARBORN, D., 1995. *Astronomy and Empire in the Ancient Andes: the Cultural Origins of Inca Sky Watching.* Austin: University of Texas Press.

BENSON, E., 2001. Why Sacrifice? In: E. BENSON and A. COOK, eds. *Ritual Sacrifice in Ancient Peru.* Austin: Univ. Texas Press, 1-20.

BURGER, R. L., 1992. *Chavin and the Origins of Andean Civilization.* London: Thames and Hudson.

CORDY-COLLINS, A., 2001. Blood and the Moon Priestesses: Spondylus Shells in Moche Ceremony. In: E. BENSON and A. COOK, eds. *Ritual Sacrifice in Ancient Peru.* Austin: Univ. Texas Press, 35-53.

DEARBORN, D., SEDDON, M. T. and BAUER, B.S. 1998. The Sanctuary of Titicaca: Where the sun returns to earth. *Latin American Antiquity,* Vol 9, 240-258.

DELEONARDIS, L. and LAU, G., 2004. *Life, Death, and Ancestors*. In: H. SILVERMAN, ed. *Andean Archaeology.* Malden (MA) & Oxford: Blackwell, 77-115.

ELIADE, M., 1964. *Shamanism: archaic techniques of ecstasy.* Princeton, New York: Princeton University.

FARRINGTON, I.S., 1995. The Mummy, Palace, and Estate of Inka Huayna Capac at Quispeguanca. *Tawantinsuyu,* Vol I, 55-65.

GHEZZI, I., 2006. Religious Warfare at Chankillo. In: W. ISBELL and H. SILVERMAN, eds. *Andean Archaeology III, North and South*. New York: Springer, 67-84.

GHEZZI, I. and RUGGLES, C., 2007. Chankillo: A 2300-Year Old Solar Observatory in Coastal Peru, *Science*, Vol 315, 1239-1243.

HEMMING, J., 1982. *Monuments of the Inca.* Boston: Little, Brown and Company.

MALVILLE, J. M., THOMSON, H., and ZIEGLER, G., 2006. The Sun Temple of Llacatpata and the Ceremonial Neighborhood of Machu Picchu. In: T. BOSTWICK and B. BATES, eds. *Viewing the Sky Through Past and Present Cultures.* Phoenix: Pubelo Grande Museum, 327-339.

NILES, S., 1999. *The Shape of Inca History: Narrative and Architecture in an Andean Empire.* Iowa City: University of Iowa.

NILES, S., 2004. The Nature of Inca Royal Estates. In: L. BURGER and L. SALAZAR, eds. *Machu Picchu, Unveiling the Mystery of the Incas.* New Haven: Yale University Press, 49-68.

REINHARD, J., 2002. *Machu Picchu, The Sacred Center*. Cusco: Insitito Machu Picchu.

SALAZAR, L., 2004. Machu Picchu: Mysterious Royal Estate in the Cloud Forest. In: L.BURGER, and L.SALAZAR, eds. *Machu Picchu, Unveiling the Mystery of the Incas.* New Haven: Yale University Press, 21-47.

SEDDON, M. T. and BAUER, B.S., 2004. Excavations at Tikani. In: C. STANISH and B.S.BAUER, eds. *Archaeological Research on the Islands of the Sun and Moon, Lake Titicaca, Bolivia.* Los Angeles: Cotsen Institute of Archaeology, 83-93.

URTON, G., 1981. *At the Crossroad of Earth and Sky: An Andean Cosmology*. Austin: University of Texas Press.

ZUIDEMA, R. T., 1982. Catachillay: The Role of the Pleiades and of the Southern Cross and α and β Centauri in the Calendar of the Incas. *Annals of the New York Academy of Sciences*, vol 385, 203-229.

ZAWASKI, M., 2007. *Archaeoastronomical Survey of Inca Sites in Peru,* M.A. Thesis, Greeley, Colorado.

Received: 2 November 2007; Revised: 5 May 2008

KOSMOLOGINIAI PERUJIETIŠKŲ HUAKŲ MOTYVAI

John Mckim Malville, Michael Zawaski, Steven Gullberg

Santrauka

Tiriant Peru šventyklas huakas (huacas) išryškėja trys pagrindinės tarpusavyje glaudžiai susijusios temos: protėvių garbinimas, šamanizmas ir kūrimo mitai. Saulė inkų buvo suprantama kaip pati svarbiausia iš protėvių, o šamanizmas greičiausiai yra pati seniausia pasaulio religija. Nagrinėdami daugiau kaip pusantro tūkstančio metų laikotarpį apimančių archeologinių vietų astronominius ypatumus, aptikome, kad visose jose atsižvelgiama į solsticijas. Kiti bendri bruožai yra kilimo aukštyn simbolika ir ritualams skirti paaukštinimai. Vanduo, akmenys ir olos inkų kosmologijoje yra susiję su kūrimo mitais. Urubamba kolonos ir Huayna Capac rūmai Urubambos mieste yra orientuoti saulėtekio kryptimi vasaros saulėgrįžos metu. Maču Pikču Šventoji aikštė, Intiwatana upė ir Llactapata Saulės šventykla yra išsidėsčiusios beveik tiksliai pagal saulėtekio vasaros saulėgrįžos metu ir saulėlydžio žiemos saulėgrįžos metu ašį. Urubambos Intiwatana upė yra archetipinė šventykla (huaka), kuriai priklauso olos, versmės, laiptai ir platformos.

Ypač senas šaknis turinčią solsticinę orientaciją, būdingą Andų civilizacijai, gyvavusiai 1700 metų, atskleidžia Chankillo vietovė. Pagrindinė geometrinė Chankillo ašis atitinka saulėtekį per žiemos ir vasaros saulėgrįžas. Tikėtina, jog kalendorinė bokštų paskirtis galėjo būti suderinta su šamaniškais ritualais, panaudojant laiptus, platformas ir eitynių tarp huakų vietas.

Vertė Vykintas Vaitkevičius

A GEOMETRICAL ANALYSIS OF MESOAMERICAN PRE-HISPANIC ARCHITECTURE: SQUARING TRIADS, NUMBERS, LENGTH UNITS AND THE CALENDAR

MARCELLO RANIERI

Abstract

This work extends to Mesoamerica researches on archaic geometry previously performed on architectures of the "Old World". CAD (Computer Aided Design) tools are used to fit theoretical forms to spatial segments on archaeological plans. The analyses provide quantitative information on the forms, on the numbers involved and on the units of length used. Everywhere, numbers appear mainly to be multiples of 9, 10 and 13, rather than pertaining to Squaring Triads, although these are nonetheless attested in all regions. Three units of length are found: a "Teotihuacán unit" **t** ≈ 0.58 m, a "Monte Albán unit" **ma** ≈ 0.50 m and a "Chichen Itza unit" **ci** ≈ 0.66 m. Units **t** and **ma** clearly appear to be linked to the distances between the main monuments, associated with the Tzolkin calendrical numbers 13-20 at Teotihuacán and with the Haab calendrical numbers 18-20 at Monte Albán.

Key words: geometry, Squaring Triads, length-units, calendar, Mesoamerica, Teotihuacán, Monte Alban, Chichen Itza.

Introduction

The repertory of distinct geometrical forms identifiable on archaeological plans consists mainly of right-angled shapes and circles.

In the vast majority of cases, right-angled shapes prevail and show a remarkable perfection. Among the supposed methodologies that the ancients may have used to achieve the squaring, the most interesting is the one in which three appropriate integer numbers (a Squaring Triad or Triple) define the lengths of the sides and diagonals in terms of given units of length. This approach has proved successful in decoding geometric arrangements of relevant structures in the "Old World" (Ranieri 1997, 2002, 2005, 2006, 2007, 2008; Malgora 2000; Patanè 2006). A suitable repertory of Squaring Triads can be found in Table 2.

Circular forms can be predominant in certain contexts (as for the Nuraghic culture) but are also present in rectangle-dominated contexts. Of importance for the present work is the "Circle-Square-Circle" (CQC) composition: two concentric circles, the smaller of which is inscribed within, and the larger circumscribed to, a square. In CQCs the dimensions of the diameters are those of the sides and diagonal of the square (Fig.1a) so that the circular dimensions can be deduced in their turn from the squaring numbers of the square (first four entries in Table 2). A study of the occurrence of CQC patterns in the geometry of ancient structures is under way and will be presented elsewhere.

Methodological Approach

Even for a single monument – in my experience - a through analysis would require about one year on average. Given that there are hundreds of Mesoamerican sites and monuments, analyses of even only a hundred of them would therefore take a century. Therefore I opted for a more practicable (3-4 years' work) "large-number" approach with less detailed analyses (only providing "good-fits" rather than best-fits) on about 150 monuments in the hope that statistics would eventually help to explain major geometric features (if any existed) common to all Mesoamerican architecture. As we shall see, the results have been more than encouraging with unexpected discoveries of undeniable importance. With few exceptions, plans were taken from Marquina (1951), starting with plans of more than 200 monuments altogether. About 75% were considered eligible for CAD analysis.

"Good-fits"

For the Squaring Triads in the repertory, the differences between two nearby proportion values (r = B/A) can be small. For this reason, "triadic" interpretations may be of low reliability with uncertainties on average greater than 3%. On the other hand (and unlike what had been experienced with "Old World" artefacts), Triads, although clearly present, do not appear to be the principal characters in the numerical repertory of Mesoamerican architecture. It appears rather that the

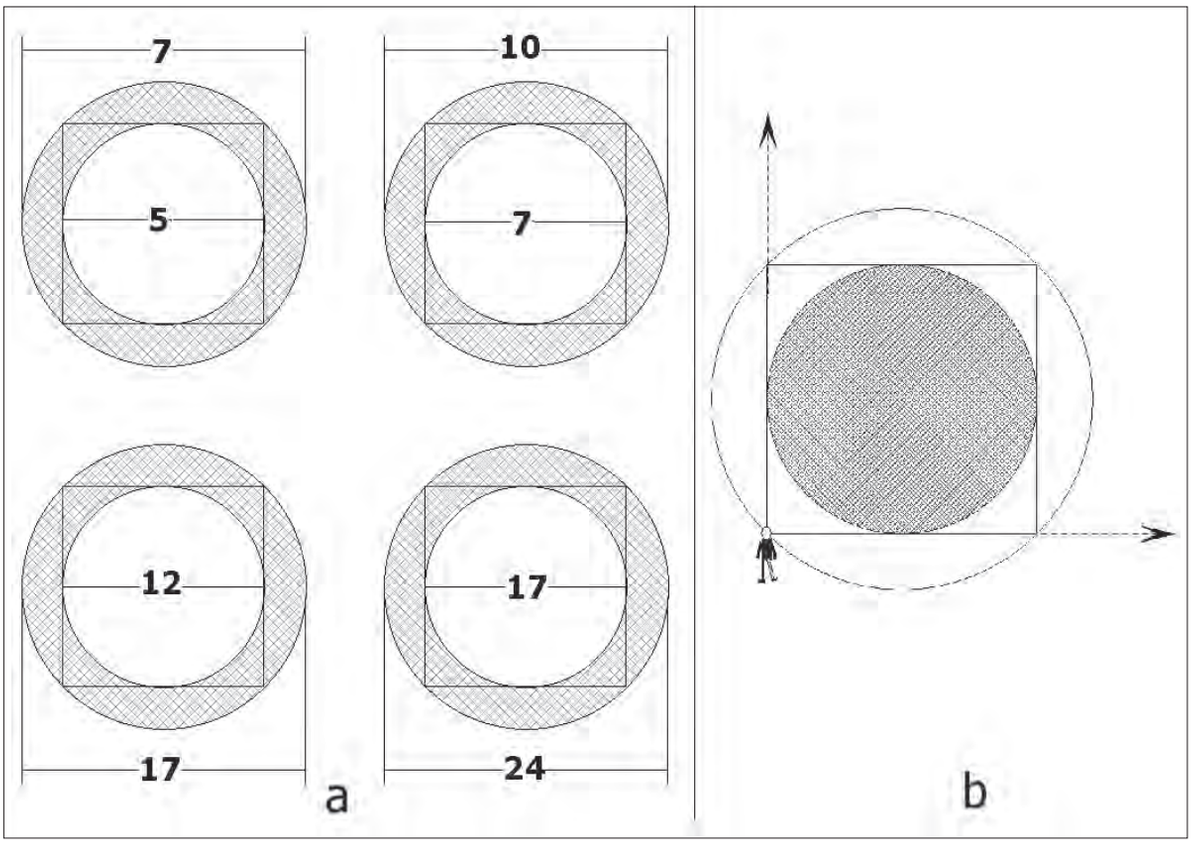

Fig. 1. In CQCs the area of the circular ring equals the area of the inner circle or conversely the area of the outer circle doubles the area of the inner one. From any point on the outer circumference the lines of sight tangent to the inner circumference are orthogonal (Fig.1b).

attention of the Mesoamericans focused on calendrical numbers (13, 18 and 20) and their multiples. A class of "calendrical integers" was therefore introduced, which includes the multiples of 9 (=18/2), of 10 (=20/2) and of 13.

In the CAD analysis, for a single length to be expressed in terms of an integer number of length-units, the uncertainty needs to be better (lower) than the length-unit itself: otherwise nearby integers are indiscernible. This difficulty can often be satisfactorily overcome when fitting a plurality of linear segments if it can be safely hypothesized that a unique length-unit was used. Care was taken not to mix segments belonging to different construction phases. Three parameters were introduced to control the goodness of the fits.

- Parameter "sc.un.": the metric scale uncertainty, CAD-measured in cm.
- This is often the major cause of error in the evaluation of the length-unit.
- Parameter "grafic": the uncertainty represented by the lines' thicknesses (CAD-measured in cm on an average line). This is the main cause of error in fitting forms and segment lengths with integer numbers. Forms and integers are accepted when their lines (or CAD measuring-tool lines) coincide with the plans' lines within the thicknesses or, for a small percentage (<5%) on a single monument, at most 1 "grafic" away.
- Parameter "Rcal": the number of lengths that are expressed with a calendrical integer in a set of N CAD-measures; to be compared with the probability of any randomly chosen integer being calendrical, represented by a density function which ranges around an expected value of 27%.

The search for length-units was for "cubit-like" values (40 – 70 cm).

Analyses and Results

Since the results are mostly of a graphical nature, ideally they should all be presented illustrated by plates and figures. However this would by far exceed the number of pages allowed for these Proceedings. Hopefully, the whole will better appear in a monograph in the future. The results are intended to be "virtual" in the sense that, while they do apply to the plans, they may not correspond to the real structures, at least pending verification of the correspondences between plans and monuments.

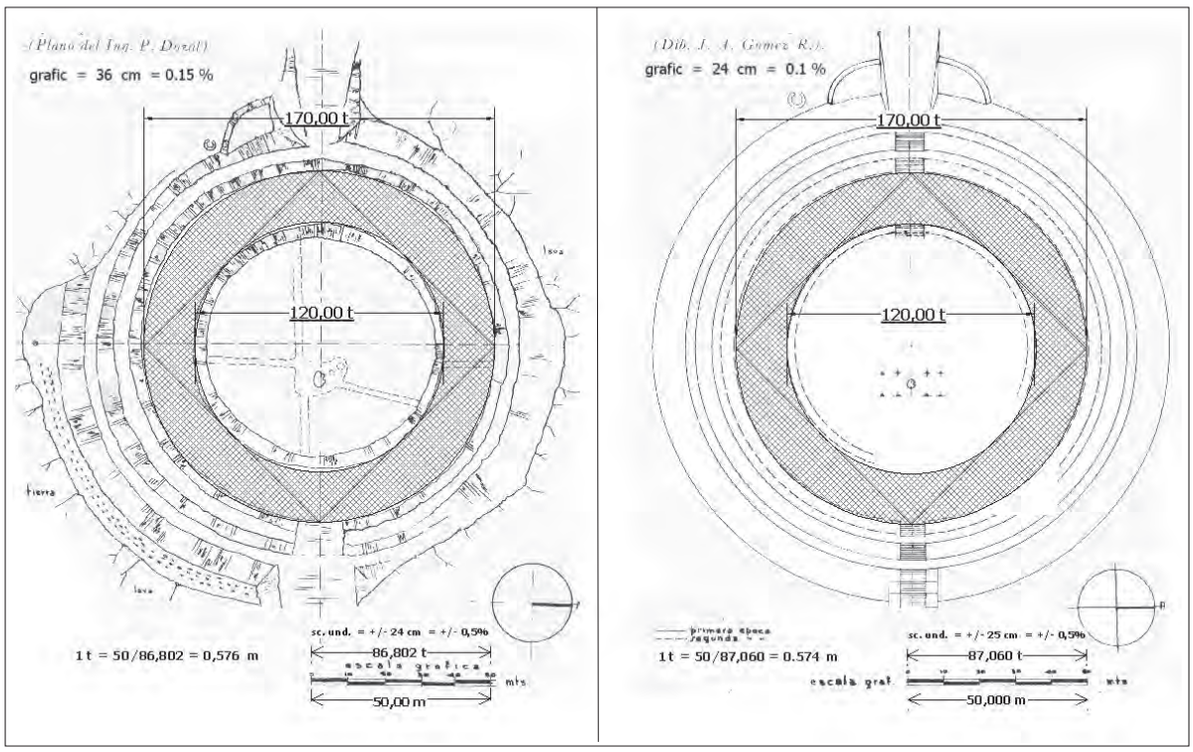

Fig. 2. Cuicuilco: A 12-17 CQC fitting the circumferences outlining the terrace at 3rd level.

Cuicuilco

The first monument encountered in Marquina's book is the "monumento de planta circular" of Cuicuilco: a huge four-level "circular pyramid" some 135 m in diameter at ground level and about 30 m in height. In the published plans[1] (from the 1920s after the excavation and from the 1950s after restoration) a CQC (12x10-17x10) was fitted onto the circumferences that outline the main terrace at the third level (Fig.2). Among the possible values for "cubit-like" units from multipliers 14, 13, 12, 11, 10 and 9, **t** = 0.575 m (multiplier 10) was chosen because it fitted better the other dimensions of the monument.[2] From the two plans the values 0.576 ±0.002 m and 0.574 ±0.002 m yield an average **t** = 0.575 ±0.002 m. As we shall see, **t** suits a large number of other Mesoamerican monuments, Teotihuacán included.

Teotihuacán

The second site is much-renowned Teotihuacán. There is a general plan of the ceremonial centre along the main avenue, together with plans of the Pyramids of the Sun and Moon, the Citadel, and of other monuments (Tepantitla, Tetitla, Atatelco, the Viking group, and Xolalpan).

The Pyramid of the Sun, the Pyramid of the Moon, and the Citadel

In the plan (Fig.3), the Pyramid of the Sun seems to form part of a segmented environment whose main rectangular CAD-measured dimensions are 459.3 ±0.65 m and 345.4 ±0.65 m. Their ratio yields r = 1.330 ±0.003 which, within 0.3%, equals the 4/3 = 1.333... ratio of P-triad D=3-4-5. The fit with a rectangle 600x800 (multiplier 200) yields a **t** unit of 0.574 ±0.006 m, the very same as that found for Cuicuilco. Because of this exact coincidence I retained the value of 0.575 m and tried it out on the plan of the Pyramid of the Sun itself. With sc.un. = 81 cm and grafic =101 cm, the integers in Fig.3 were those that more closely fitted the CAD-measured lengths. It is worth noting the values of 390 and 400 for the base dimensions (390=13x30 and 400 =20x20) and the Rcal value =100%.

For the Pyramid of the Moon, (sc.un. 41 cm, grafic 28 cm) a D proportion was easily found at the second level (Fig.4). Scaling the measurements in **t** units and with a multiplier of 40, a fit of 120x160 could be obtained. The other numbers followed as a consequence yielding Rcal = 84%. Note that the dimensions 108x45 of the

[1] With grafic = 36 and 24 cm respectively and sc.un.=25 cm for both plans.

[2] Other length-units may derive either from the quite imprecise (squaring more than 1° away from 90°) CQC combinations 5-7, 7-10 or from 17-24 and their multiples. The 12-17 combinations were considered first, being more precise than 5-7 or 7-12 and allowing the same precision (only 12' away from 90°) as combination 17-24 but with smaller numbers.

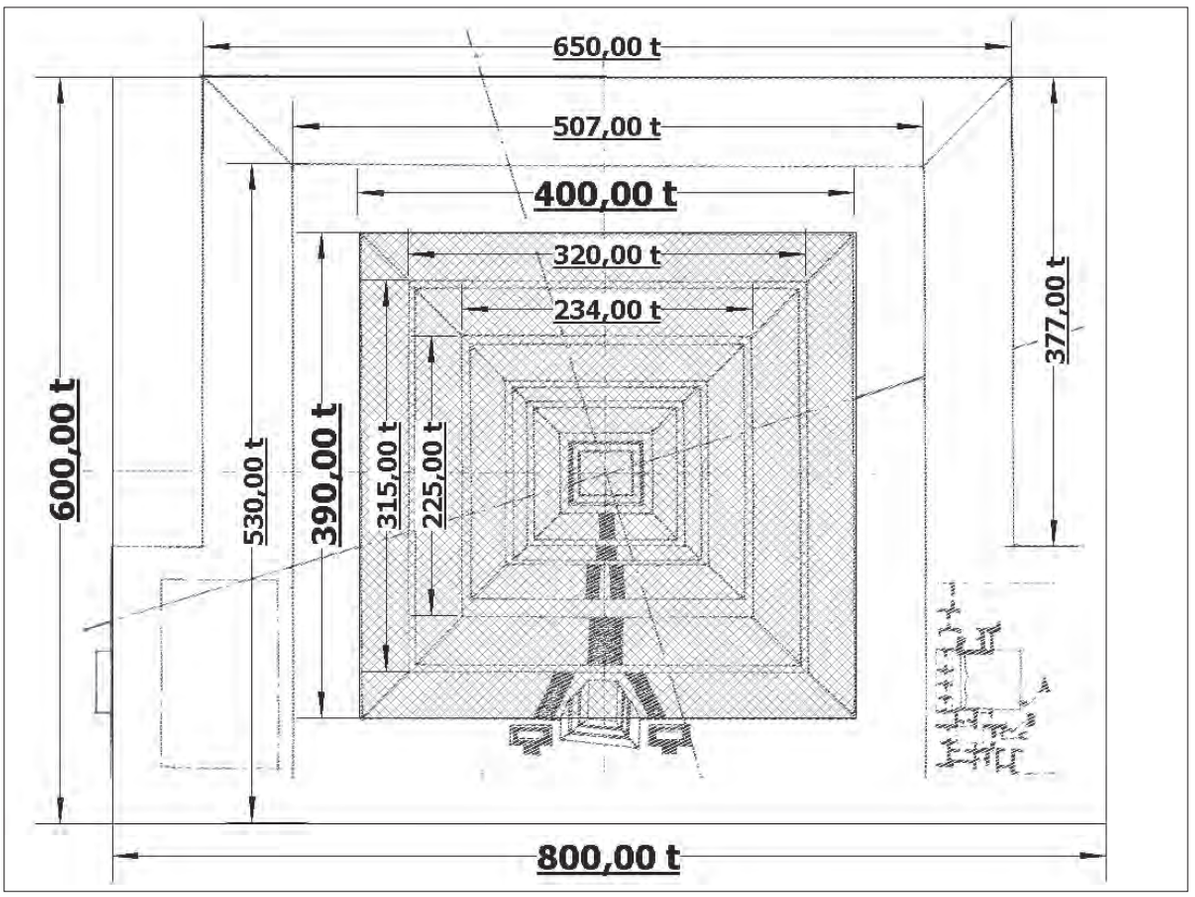

Fig. 3. Teotihuacán: Pyramid of the Sun. Measurements in **t** units of 0.575 m.

lower stairs' basement correspond to the P-triad W=5-12-13 through a (calendrical) multiplier 9.

The plan of the Citadel bears a regrettable discrepancy between the hand-drawn measures and the corresponding CAD measurements based on the metric scale, so that two different units with large uncertainties (±0.033 m) resulted. Averaging yields 0.563 ±0.033 m, **t** being well within this range.

The Street of the Dead

The distances along the Street of the Dead, between the centres of the Pyramid of the Sun and the Pyramid of the Moon, and between the centres of the Pyramid of the Sun and the Pyramid of the Feathered Serpent, were measured by CAD both in metres and in **t** units. The results are shown Fig.5. Clearly, **t** values to within less than 0.04% (grafic 82 cm, sc.un. 150 cm) coincide with 2000 **t** and 1300 **t**, i.e. 100 times the very same Tzolkin calendrical numbers 13 and 20. Such a close correspondence together with the fact that, as shown below, the same **t** unit fits all the 13+2 Teotihuacán and Cuicuilco plans, makes it difficult to consider these circumstances altogether fortuitous. Rather, in my view, the result shows that at Teotihuacán space (distances between main monuments) and time (the calendar) were firmly and inexorably linked together through numerology, very likely since the first establishment of the ceremonial centre. Given that Teotihuacán is acknowledged by most scholars as the most sacred place of the Mexican prehispanic cultures, the result is of special importance and certainly merits future verifications and confirmations.

Tepantitla, Xolalpan, Viking group, Tetitla, Atatelco, Quetzalpapalotl Palace (Plans for the Quetzalpapalotl Palace were taken from Acosta (1964))

The situation is favourable for the plans of these groups, mainly because of the small dimensions of the artefacts. As an example, Fig.6 shows the fits for Tepantitla and Xolapan. Note the high Rcal (35% and 73%) and the presence of integers related to Q-triads (Q, 2Q, 3/W). Comparable results were obtained for the Viking group, Tetitla, Atatelco and the Quetzalpapalotl palace: fits were obtained for all of them in t units within the thickness of the lines.

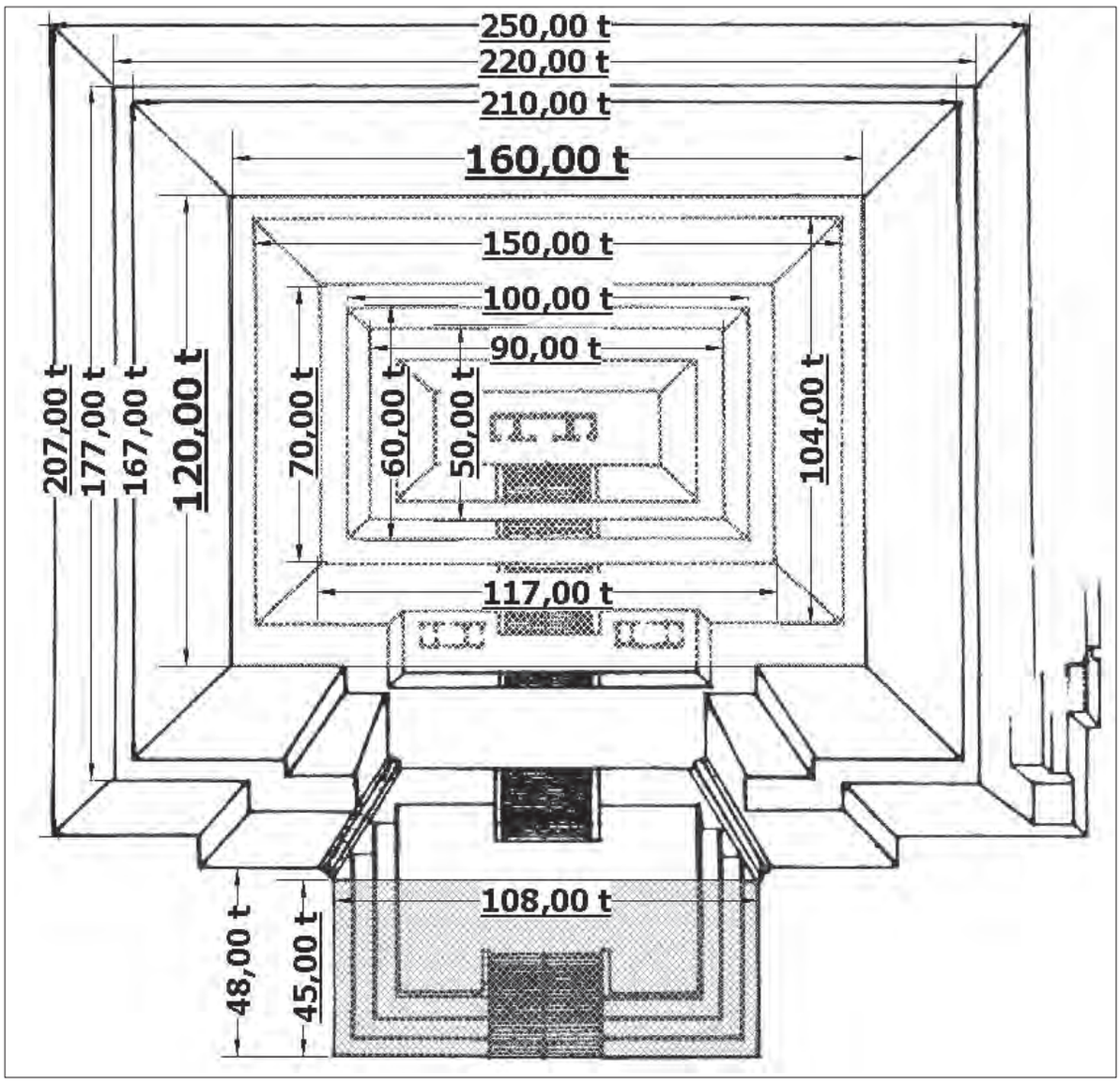

Fig. 4. Teotihuacán: Pyramid of the Moon. Measurements in **t** units of 0.575 m.

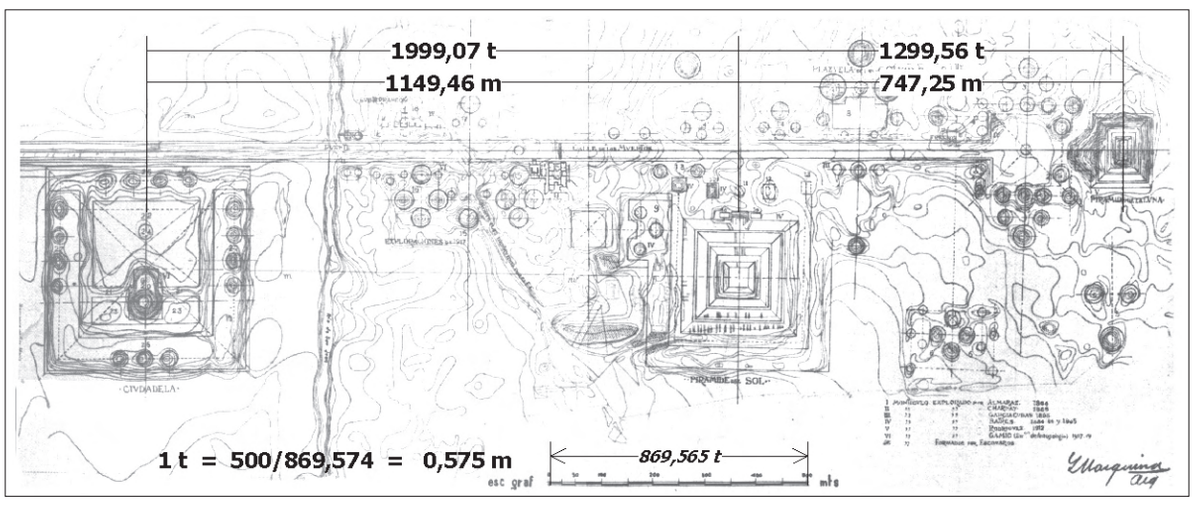

Fig. 5. Teotihuacán: measurements in metres and in **t** units along the Street of the Dead.

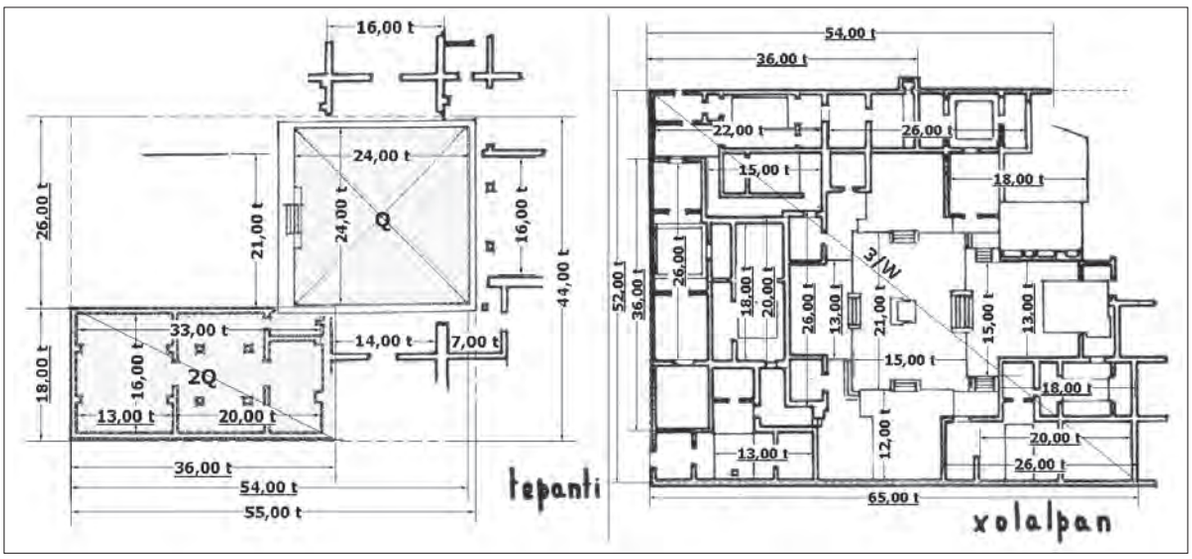

Fig. 6. Teotihuacán: Tepantitla and Xolalpan. Results in **t** units.

Sites in nearby regions

For Cholula, Xochicalco, Tula, Calixtlahuaca, Tenayuca, Tenochtitlan, Teopanzolco and Tzintzuntzan, 21 plans were analysed. Table 1 summarizes the results including Cuicuilco and Teotihuacán for a total of 35 monuments and clearly shows that **t** units allow good fits for the vast majority of the monuments in the region with the average calendrical content a good deal above the expected 27%.

Monte Albán

Monte Albán is another very sacred place in ancient Mesoamerica. The site is structured with its three major monuments aligned along one axis (North-South), much like Teotihuacán, but on a smaller scale. Four plans were eligible: the "Los Danzantes" building, the "Pelota" court, Building M, and the general plan of the site.

The general plan (in the plan the metric scale was in error. The correct one has been derived from Sterling, 1968)

By analogy with Teotihuacán, the first things to be measured were the distances between the major monuments. The CAD-measures (Fig.7) were 201.8 m and 181.6 m. Their ratio is 201.8/181.6 = 1.1112..., which is 20/18 = 1.1111... to within 0.01%. Again, as for Teotihuacán, distances appear to represent calendrical numbers: 18 and 20 of the Haab calendar in this instance. With a multiplier of 10, a length unit **mu** = 1.009 m was obtained and half of it (which is in the cubit-range) was adopted as a "Monte Albán unit" **ma** = 0.504 ±0.007 m.

"Los Danzantes", the "Pelota", and Building M

Of the three analysed plans, two (Rcal <27%) fitted with **ma** units: 0.504 m for "Los Danzantes" and 0.499 m for building M. The "Pelota" fitted instead in **t** units (0.575 m) with Rcal = 60%.

On the west coast of the Gulf of Mexico: Tajin, Cempoala and Misantla

At Tajin, all 9 plans fitted with **ma** units of 0.499 m: The Pyramid (Fig.8), Chico A,B,Q, Buildings 1, 2, 5, and the Los Nichos Pyramid; Chico C 0.509 m. All the Rcal were between 50% and 63%, except at Chico Q (9%).

At Cempoala, 7 plans out of 8 fitted with **ma** units: Las Chimeneas 0.487 m (Rcal 25%), Las Caritas 0.500 m (Rcal 51%), Montecuzuma House 0.499 m (Rcal 36%), Dios Del Aire Temple (Fig.10) 0.499 m (Rcal 40%), The Plaza 0.499 m (Rcal 68%), Las Chimeneas 0.499 m (Rcal 83%), and Dios Del Aire (Substructure) 0.506 m (Rcal 38%). The value for the Grand Pyramid was 0.463 m (close to 4/5 **t**.) (Rcal 42%).

At Misantla there were 2 plans: Building F fitted with **ma** = 0.499 m (Rcal 46%) while Building A fitted with a **t**-like unit of 0.564 m (Rcal 75%).

Summarizing, of 18 monuments from 3 analysed sites, 17 share the same **ma** unit (the exception being Building A at Misantla).

Table 1. Results for sites in regions near Teotihuacán

	Sites and Monuments	grafic (cm)	scale (m)	sc.un. (cm)	sc.un. (%)	Length unit (m)						Rcal
	Cuicuilco (2)											
1	1	±36	50	±24	0.48		0.574					-
2	2	±24	50	±25	0.48				0.576			-
	Teotihuacan(12)											
3	Pyr.Sol	±63	100	±66	0.66		0.574					100%
4	Pyr.Luna	±66	100	±41	0.41			0.575				91%
5	Citadel	±188	100	±65	0.65	0.563						100%
6	Avenue	±97	500	±199	0.40			0,575				100%
7	Tepantiltla	±12	30	±12	0.40			0.575				40%
8	Viking	±16	30	±20	0.67			0.575				43%
9	Tetitla a	±12	30	±11	0.37			0.575				46%
10	Tetitla b	±12	30	±11	0.37			0.575				78%
11	Atatelco	±9	30	±12	0.40			0.575				64%
12	Xolalpan	±10	30	±12	0.40			0.575				73%
13	Quetz.p.	±5	25	±4	0.16			0.575				30%
14	Quetz.p	±5	4	±4	1.00			0.575				32%
	Cholula (1)											
15	Pyramid	±35	100	±45	0.45			0.575				60%
	Xochicalco (2)											
16	Mon. Descub.	±15	10	±15	1.50				0.576			30%
17	Pelota	±18	50	±23	0.46					0.578		62%
	Tula (3)											
18	Ed. de Hidalgo	±12	20	±18	0.90				0.576			90%
19	Edificio 1	±6	10	±7	0.70		0.574					
20	Pelota	±11	20	±25	1.25						0.580	64%
	Tenayuca (7)											
21	Pyr. 1st epoch	±26	30	±35	1.17			0.575				28%
22	Pyr. 2nd epoch	±31	30	±29	0.97			0.575				65%
23	Pyr. 3rd epoch	±30	30	±21	0.70			0.575				47%
24	Pyr. 4th epoch	±30	30	±32	1.07			0.575				32%
25	Pyr. 5th epoch	±12	30	±20	0.67			0.575				39%
26	Pyr. 6th epoch	±16	30	±23	0.77			0.575				33%
27	Pyr. all epochs	±31	30	±15	0.50	0.568						56%
	Tenochtitlan(1)											
28	General plan	±101	130	±97	0.75						0.589	52%
	Tepoztlan (1)											
29	Mon.de Tepozteco	±9	10	±7	0.70			0.575				24%
	Teopanzolco (1)											
30	Pyramid	±15	10	±13	1.30	0.561						35%
	Calixtlahuaca (4)											
31	Circ.Tem.1st epoch	±7	10	±13	1.30			0.575				46%
32	Circ.Tem.2nd epoch	±7	10	±13	1.30			0.575				56%
33	Circ.Tem.3rd epoch	±7	10	±13	1.30			0.575				30%
34	Circ.Tem.4th epoch	±7	10	±13	1.30			0.575				47%
	Tzintzuntzan (1)											
35	Yacata	±26	20	±31	1.55			0.575				70%

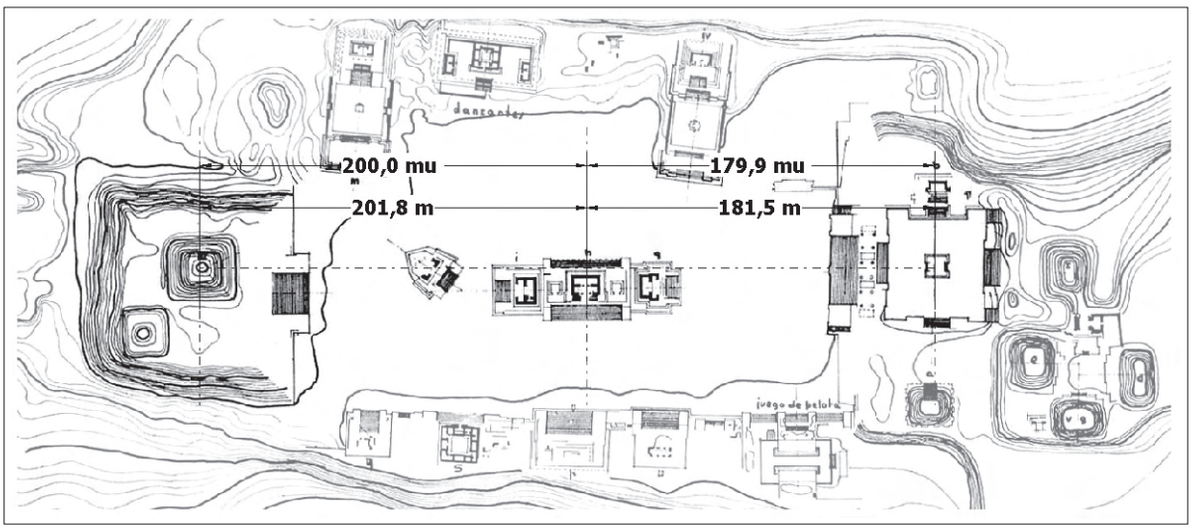

Fig. 7. Monte Albán, CAD measurements in metres and **mu** units.

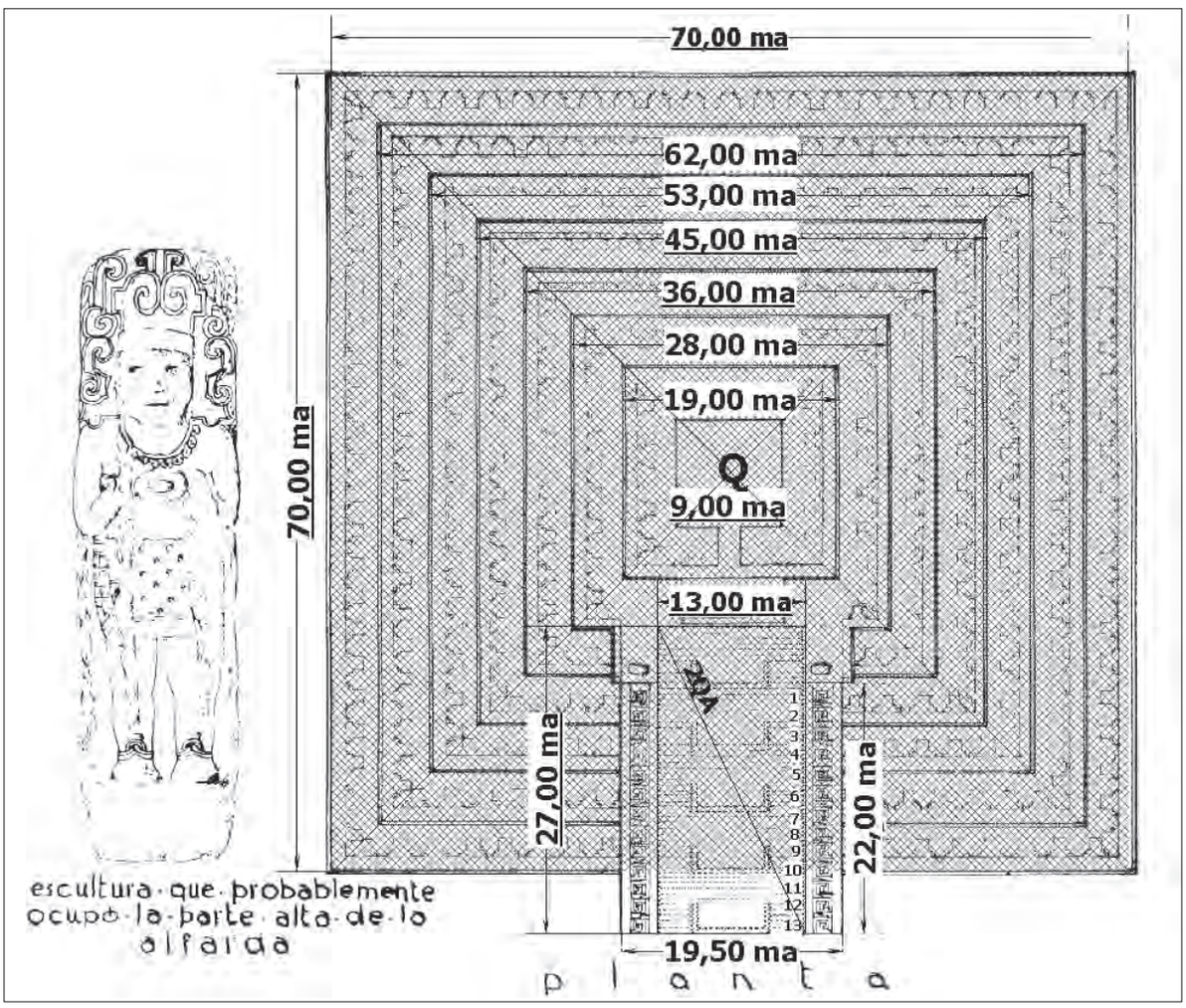

Fig. 8. Tajin Pyramid in **ma**-units of 0.499 m**.**

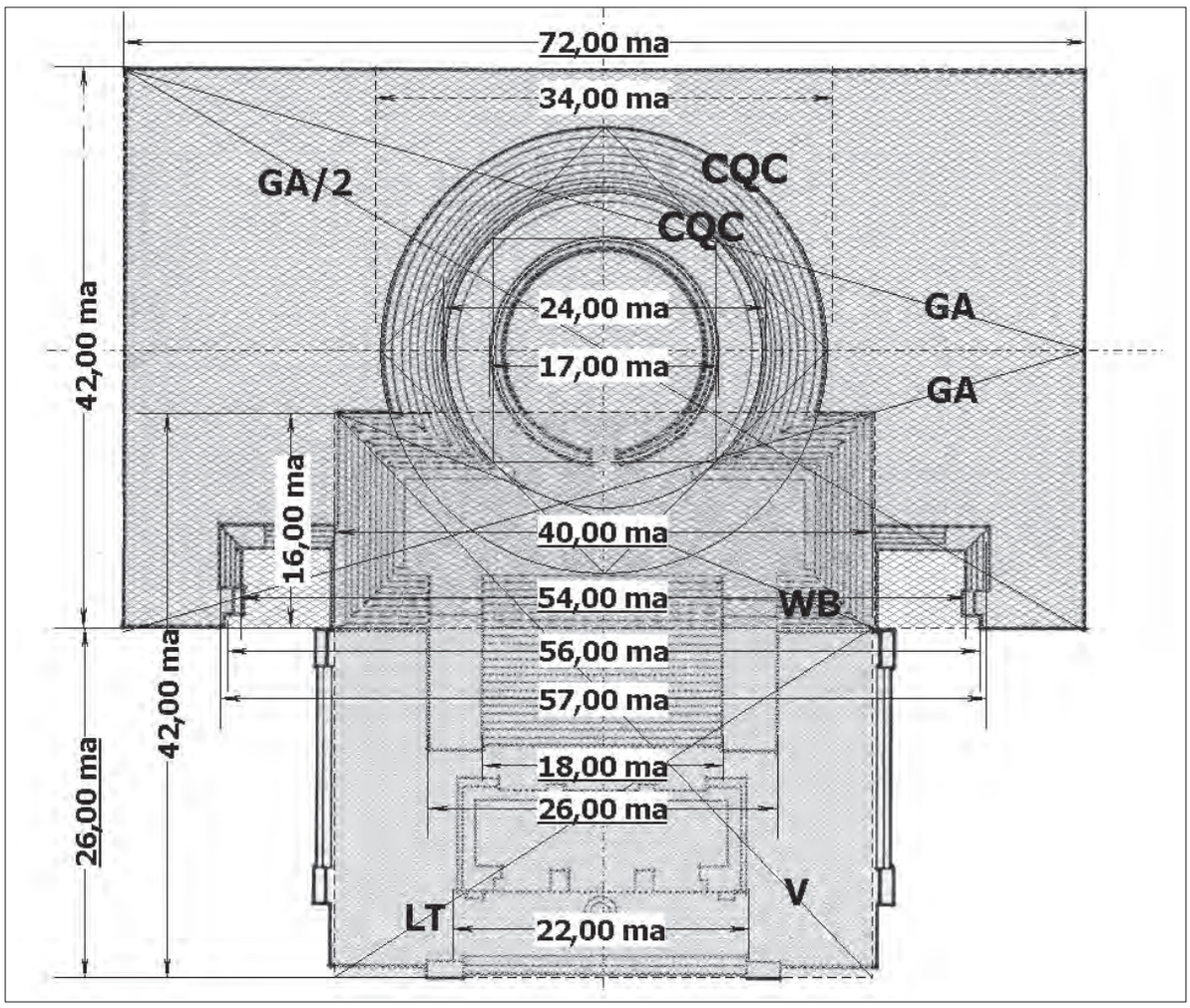

Fig. 9. Cempoala: Geometry of the "Templo del Dios del Aire". Measures in **ma** units of 0.499 m The presence of P-Triads, Q-triads and CQCs is noteworthy.

Other Oaxaca sites: Yucunudahui, Mitla, Montenegro

Five monuments were analysed, and all fitted with **t** = 0.575 m and high Rcal values: Yucunudahui's "Pelota" Rcal 43%, Tlaloch Temple and "Mogote Grande" Temple Rcal 50%; Mitla's "Las Columnas" Rcal 36% and Montenegro's Plan Rcal 60%. The **t** unit appears to be predominant in Oaxaca. This includes Monte Albán, although there, as expected, **ma** units were also found.

Yucatan

49 monuments (at 18 sites) were analysed and the majority gave high Rcal values. Alongside **t** units and **ma** units, in the Yucatan another unit **ci** = 0.665 ±0.015 m appears well documented, at Chichen Itza in particular (possibly two in Xelha and one in Cakacal where a unit of 0.206 m, about 1/3 **ci**, was found).

"Chichen Itza" **ci** unit

20 monuments (from 10 sites) fitted with units in the range 0.65-0.68 m:

Chichen Itza (5)	(2x) 0.660 m, 0.665 m, (2x) 0.656 m
Itzamal (1)	0.681 m
Chacmultun (3)	(3x) 0.660 m
Acanceh (1)	0.666 m
Edzna (1)	0.662 m
Coba (1)	0.660 m
Tulum (2)	0.651 m, 0.660 m
Kucican (1)	0.669 m
Nohoch Mul (2)	0.672 m, 0.677 m
Macancox (3)	0.666 m, 0.672 m, 0.677 m

Another five monuments from Uxmal (2), Chacmultun, Kabah and Coba yielded units in the range 0.62–0.64 m. (0.63 ±0.01), not far from **ci** (-5%).

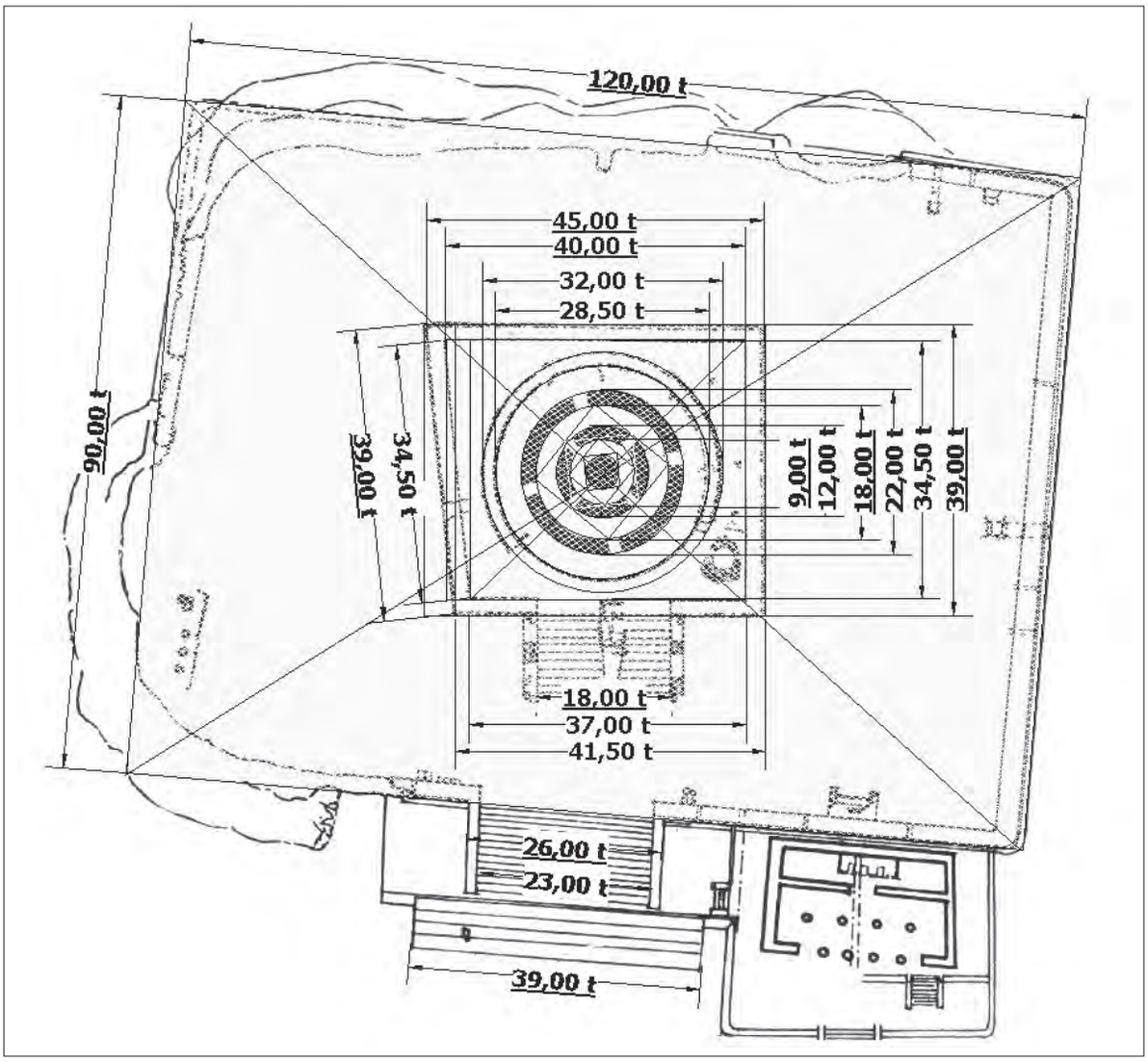

Fig. 10. Chichen Itza: The Caracol in units of 0.57 m, close to Teotihuacán's unit **t** = 0.575 m.

t, **ma** and other units

14 monuments (from 4 sites) fitted with **t**: Uxmal (9), Chichen Itza (3), Acanceh (1), and Kucican (1).

3 fitted with **ma**: Meco 0.496 m, Zayil 0.501 m and Cozumel (3/2 **ma**).

Small units were found in Labna (3) 0.362 m, Tulum 0.391 m, Cacakal and Xelha (2) 0.206 m.

Chiapas

27 plans were analyzed from 7 sites in Chiapas.

25 of these (from 6 sites) fitted in **t**-units (with considerable dispersion): Yaxchilan (Rcal 64-73%): 12 x 0.575 m; Tenam (Rcal 30%): 0.575 m, 3 x 0.575 m; Tonina (Rcal 100%): 2 x 0.575 m; S. Elena Poco Uinic (Rcal 73%): 0.575 m; Agua Escondida (Rcal 50%): 0.575 m; and Palenque (Rcal 45-72%): 0.575 m, 0.573 m, 0.570 m, 0.568 m, 2 x 0.569 m. The other two were Piedras Negras (Rcal 50%): 0.439 m; and Palenque (Rcal.29%): 0.504 m (**ma**).

With only two exceptions out of 27 analyses, it appears that the sites in the Chiapas region share **t** units.

Peten and nearby regions

We analysed 4 sites for a total of 13 monuments, mostly interpretable in terms of **ci**-like units and **t**-like units. Tikal (Rcal 53-76%): 0.578 m, 0.563 m and (2) 0.569 m; Copan (Rcal 50-75%): 2 with 0.541 m and 2 with 0.658 m; San Jose (Rcal 35-100%): 4 with 0,674 m; and Zacpeten (Rcal 50%): 0.638 m.

Table 2. Squaring Triads. From left: Triad symbol; Integers A,B,C; r=B/A; sites where they are found

Q	**5**	**5**	**7**	**1**	Tajin, Acanceh(2), Tikal.
Q	7	7	10	1	Viking. Quetzalpapalotl Palace, Tajin, Cempoala, Macanxoc.
Q	12	12	17	1	Tepantitla, Quetzalpapalotl Palace, Xochicalco, Tajin(2), Cempoala(3), Agua Escondida, Chichen Itza, Nakum(2).
V	**20**	**21**	**29**	**1.05**	Cempoala.
VC1	10	11	15	1.1	Izamal, Tikal.
VC2	18	20	27	1.111	Teotihuacan Citadel. Cempoala, Chichen Itza, Chacmultun, Tulum, Coba, Macanxoc, Xelha+Cacakal(2),
S	**8**	**9**	**12**	**1.125**	Viking. Atatelco, Xochicalco, Yaxchilan, Chacmultun, Cozumel.
SA	13	15	20	1.154	Yaxchilan, S.Elena P.U., Chichen Itza, Acanceh, Coba, Tikal.
SB	19	22	29	1.158	Tulum.
SC	**11**	**13**	**17**	**1.182**	Xelha+Cacakal.
W/2	25	30	39	1.2	Viking, Tenochtitlan(2), Misantla, Uxmal, Izamal, Acanceh, Coba, Tikal, Nakum.
SD2	**17**	**21**	**27**	**1.235**	Cempoala.
3/W	**20**	**25**	**32**	**1.25**	Viking. Xolalpan, Tepoztlan, Yucanudahui, Palenque, Tonina, Chacmultun, Labna(3), Macanxoc(2), Xelha+Cacakal(2), Nakum.
D	**3**	**4**	**5**	**1.333**	Teotihuacan Sun Py. Teotihuacan Moon Py. Xolalpan. Viking, Tula(3), Tenayuca(2), Tenochtitlan(2), Cempoala(3), Palenque(2), Piedras Negras, Agua Escondida(3), Chichen Itza, Chichen Itza, Uxmal(5), Uxmal(3*), Uxmal, Acanceh(2), Labna, Macanxoc(2), Nohoch Mul, Meco, Tikal.
G/2	**13**	**19**	**23**	**1.461**	Mitla.
L	**10**	**15**	**18**	**1.500**	Tetitla, Xochicalco, Tenayuca(2), Teopanzolco, Cempoala(2), Yaxchilan, Chichen Itza, Uxmal, Acanceh,
ΦA	10	16	19	1.600	Agua Escondida.
LVC	14	23	27	1.643	Macanxoc.
4/W	18	30	35	1.667	Tenochtitlan(2), Tajin(2), Chichen Itza, Chacmultun(2), Macanxoc(2).
GA/2	7	12	14	1.714	Cempoala, Macanxoc.
MA	**4**	**7**	**8**	**1.75**	Tzitzuntan, Palenque.
M	**8**	**15**	**17**	**1.875**	Cempoala(?),Palenque, S.Elena P.U., Chichen Itza, Uxmal(5), Labna, Kucikan.
2Q	**4**	**8**	**9**	**2**	Palenque, Piedras Negras, Chichen Itza, Chacmultun, Acanceh.
2Q	9	18	20	2	Tepantitla, Tula, Cempoala, Agua Escondida, Uxmal(4), Uxmal(2*), San Jose.
2Q	13	26	29	2	Tenayuca, Chichen Itza, Acanceh(4), Coba.
2QB	**9**	**19**	**21**	**2.111**	Cempoala, Palenque.
√5	9	20	22	2.222	Misantla, Yaxchilan, Uxmal, Copan.
WA	10	23	25	2.3	Acanceh, Copan.
W	**5**	**12**	**13**	**2.4**	Tenochtitlan(2), Yucanudahui, Misantla(3), Yaxchilan(2), Chacmultun, Copan.
WB	10	25	27	2.5	Yucanudahui, Cempoala, Tonina, Chacmultun, Acanceh, Meco, Zacpeten.
Φ²	**5**	**13**	**14**	**2.6**	Yaxchilan(2), Chichen Itza, Uxmal, Nohoch Mul.
2D	**6**	**16**	**17**	**2.667**	Agua Escondida, Chichen Itza, Uxmal, Chacmultun.
3Q	**6**	**18**	**19**	**3**	Meco.
GA	7	**24**	**25**	**3.429**	Chacmultun, Coba.

Conclusions

A total of 154 plans of Mesoamerican constructions were analysed and the results can be summarized as follows.

Presence of Squaring Triads and CQCs

Triads are present in all regions but, in the absence of evidence of combinations in harmonic schemes, no special role in the design can be attributed to them. Most likely they only served as squaring tools at the building yard. Nonetheless they appear to have been widely used, together with a few (but nonetheless significant) CQCs (Cuicuilco, Cempoala and possibly the Caracol of Chichen Itza). Table 2 contains a résumé.

Numbers

The monuments appear to be rich in calendrical integers, with percentages far beyond the expected 27%. The cultural significance (both cosmological and sociological) of the basic calendrical integers 9, 10, 13 and 20 has already been amply demonstrated, so that city-plans and layouts can be seen as sacred depositories of cosmological space-time connections (Lopez 1984; Sugiyama 1993; Aveni and Hartung 2000; Sprajc 2005 and references therein). This view is strongly confirmed by the numerical relationships found at Teotihuacán and Monte Albán between the spatial distances at the main monuments and the Tzolkin and Haab calendrical numbers.

The sheer number of calendrical integers found makes one wonder whether it was the dimensions of the architecture that were governed by the calendar or whether the numbers governed both calendars and architecture. If the calendars came first, then an undisputed explanation for the 13 x 20 and 18 x 20 structures has not yet been reached, although several reasonable but different putative explanations have been put forward (see e.g. Aveni 1989). If the numbers came first, the reason may possibly have rested on some special peculiarity of the numbers themselves. The only noteworthy numerical circumstance that I could figure out is that $18^2 + 26^2 = 1000$ ($18^2 + 26^2 = 10^3$).

Units of length

Three length-units were found: a "Teotihuacán unit" **t** = 0.575 ±0.002 m; a "Monte Albán unit" **ma** = 0.504 ±0.007 m; and a "Chichen Itza unit" **ci** = 0.665 ±0.015 m. Their geographical distribution is illustrated in Plate VI: Fig. 11.

Other values for length-units have previously been hypothesized. As reviewed in Sugiyama (1993), all are outside the cubit-like range of 40-70 cm. Correspondences with **t** can be found through calendrical multipliers or ratios: the Drewitt value of 57 m is 100 x **t** (to within 1%); his 322 m large unit equals 560(=20x28)**t** while (28/20)**t** equals the 80.5 cm value of Drucker and Drewitt. Séjourné proposed a value of 60 cm, which is close to 104(=13x8)**t** to within 0.3%. Sugiyama's proposed value of 82.3 cm equals (13/9)**t** within 1%. O'Brien and Christiansen's 147-cm unit for the Maya Pooc-style sites equals (20/9)**ci** (1%).

The analysis is in no way exhaustive. The results are intended to be "virtual" and wait to be confirmed (or rejected) on the basis of more accurate measurements. What I have presented is a "progress report": much is left to be done and much more to be understood. Nonetheless, I believe that the calendrical-numbers-to distances connection found at Teotihuacán and Monte Albán is unlikely to be disproved and that, in the years to come, this connection will very possibly indicate the road to take in order to arrive at a coherent comprehension of the length-units, numerical repertories and architectural geometries used by the ancient Mesoamerican builders.

References

ACOSTA, J. R., 1964. *El Palacio del Quetzalpapalotl*, Mexico: I.N.A.H.

AVENI, A. F., 1989. *Empires of Time: Calendars, Clocks, and Culture.* New York: Basic Books Inc.

AVENI, A. F. and HARTUNG, H., 2000. Maya City Planning and the Calendar. *Transactions of the American Philosophical Society,* 72.

LOPEZ, A. R., 1984. *El numero 13 en la vida de los Aztecas*. Mexico D.F.: Costa-Amic Editores, S.A.

MALGORA, S., 2000. *L'uso dei numeri e la Ritualizzazione nelle Strutture Cerimoniali nella Topografia Monumentale di Saqqara.* Thesis. Bologna: Bologna University.

MARQUINA, I., 1951. Arquitectura Prehispanica. *Memorias del I.N.A.H*, I, Mexico.

PATANÈ, A., 2006. *Indagine Archeoastronomica sulla Basilica Sotterranea di Porta Maggiore in Roma.* Thesis. Roma: "La Sapienza" University.

RANIERI, M., 1997. Triads of Integers: How Space Was Squared in Ancient Times. *Journal of Ancient Topography - Rivista di Topografia Antica - JAT,* VII, 209-244.

RANIERI, M., 2002. Geometry at Stonehenge. *Archaeoastronomy: The Journal of Astronomy in Culture*, XVII, 81-93.

RANIERI, M., 2005. La Geometria del Tempio Urbano di Marzabotto (Regio I–Ins.5). In: *Culti, Forma Urbana e Artigianato a Marzabotto. Nuove Prospettive di Ricerca.* Bologna: Dipartimento di Archeologia Università di Bologna N°11, 73-87.

RANIERI, M., 2006. Contenuti geometrici, numerici, metrici e astronomici del tempio nuragico a pozzo "Su Tempiesu" di Orune. *Proc. 6° Convegno Annuale Società Italiana di Archeoastronomia.* Campobasso, Italy.

RANIERI, M., 2007. The Stone Circles of Li Muri. *Proc. 13th SEAC Conference Lights and shadows in cultural astronomy*. Isili, Italy.

RANIERI, M., 2008. The Pythagorean Geometry of the Atreus Tomb at Mycenae. *This volume*.

SPRAJC, I., 2005. More on Mesoamerican Cosmology and City Plans. *Latin American Antiquity*, 16(2), 209-216.

STIERLING, H., 1968. *Ancient Mexican Architecture.* London: Macdonald & Co.

SUGIYAMA, S., 1993. Worldview Materialized in Teotihuacán, Mexico. *Latin American Antiquity*, 4(2), 103-129.

Received: 2 November 2007; Revised: 20 February 2008

GEOMETRINĖ MEZOAMERIKOS IKIKOLONIJINĖS ARCHITEKTŪROS ANALIZĖ: PITAGORO SKAIČIŲ TREJETAI, ILGIO VIENETAI IR KALENDORIUS

Marcello Ranieri

Santrauka

Straipsnis tęsia Mezoamerikos senovinės geometrijos tyrinėjimus, kurie paremti senųjų civilizacijų architektūros analize. Analizuojant duomenis – erdvinius archeologinių brėžinių komponentus – naudota CAD (Computer Aided Design) programinė įranga. Tyrimas pateikė kiekybinę informaciją apie formas, panaudotus skaičius ir ilgio matus.

Tyrimo metu buvo konstatuoti trijų rūšių ilgio matai: Teotihuacán (t ≈ 0,58 m), Monte Albán (ma ≈ 0,50 m) ir Chichen Itza (ci ≈ 0,66 m) ilgio vienetai. Vienetai t ir ma yra akivaizdžiai susiję su atstumais tarp svarbiausių paminklų, o šie savo ruožtu – su Tzolkin kalendoriniais skaičiais 13–20 Teotiuakane ir Haab kalendoriniais skaičiais 18–20 Monte Albanoje.

Vertė VykintasVaitkevičius

AN ARCHAEOASTRONOMICAL STUDY OF THE 'NEO-PYTHAGOREAN BASILICA' AT PORTA MAGGIORE IN ROME

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Abstract

The so-called 'Neo-Pythagorean Basilica' at Porta Maggiore in Rome is one of the most famous and most discussed hypogeal monuments in Rome. It was certainly in use for a short time during the first half of the first century AD, but its purpose is still far from clear. The most probable interpretation is that it was a temple dedicated to Neo-Pythagorean cults. We describe here the preliminary results of a detailed archaeoastronomical study of the Basilica undertaken in order to contribute to the understanding of the role of this fascinating monument.

Key words: archaeoastronomy, mysteric cults, Roman history, hypogeum.

The 'Neo-Pythagorean Basilica' at Porta Maggiore In Rome

The Porta Maggiore underground Basilica (see, e.g. Aurigemma 1974), a very important hypogeum of the first imperial age, was discovered in April 1917 following a ground collapse in the Roma – Cassino railway.

In the Roman epoch, this peripheral urban area, near to Via Prenestina, was called *ad Spem Veterem* and, according to classical sources, the *Gens Statilia* owned most of the plots sited there. The underground family tomb of the *Gens Statilia* is still visible today, 200 m away from the Basilica.

This is a complex consisting (Fig. 1) of a long *dromos*, only partially preserved, with a sloping ramp along the northern side, leading into an atrium, quadrangular in plan, and a vault partially lit by a skylight. From the atrium, we enter the Basilica, a rectangular hall divided into three naves covered by barrel vaults of equal height, separated by two lines of three rectangular pillars each. The wider central nave is distinguished by having an apse to the east and by the wall bordering on the *Vestibulum*, where a window is cut over the entrance: this window was the only entry for external light. Comparable to the complexity of the plan layout are the elaborate decorations: there is a black-and-white mosaic floor and, on the walls and vaults, alternating polychrome frescoes and stucco figures. The three-nave hall is dominated by the white colour of the stuccos: the two main figures, representing Sappho throwing herself from the Rock of Leukas and the kidnapping of Ganymede, are situated in the hemispherical vault of the apse and in the central square of the middle vault (Plate VIII: Fig. 2). On the other surfaces, above a skirting board painted red, moulded frames delineate panels containing a wide variety of representations of classical myths, mystic rituals and scenes of everyday life. In the complex decorations, there are also many representations of female worshippers offering up prayers, as well as objects like vases, candelabra, musical instruments, and tables, clearly having a symbolic meaning. On the side-walls, large panels portray stylized landscapes. In the Vestibule, the decoration is enriched by being in many colours, both on the vault, again divided into square paintings, and on the walls, where painted landscapes depict lively birds and flower garlands. The elegance and stylistic uniformity of the decorations make the Basilica an exceptional masterpiece, securely dated to the first decades of the first Century AD. The discovery of this incomparable building immediately engendered great excitement and interest. Many different interpretations were suggested by scholars as to its intended purpose, but they can basically be divided in two hypotheses: it was a funerary monument or it was the sacred place of a mystery cult. The best analysis was performed by J. Carcopino (1944), who identified the Basilica as a place of worship for the neo-Pythagorean cult. The architecture completely follows the rules of this doctrine, both in its plan and in its decoration. The long access corridor, oriented north-south, prepared initiates for meditation and concentration before entering the Vestibule and participating in sacred rites in the Hall, the

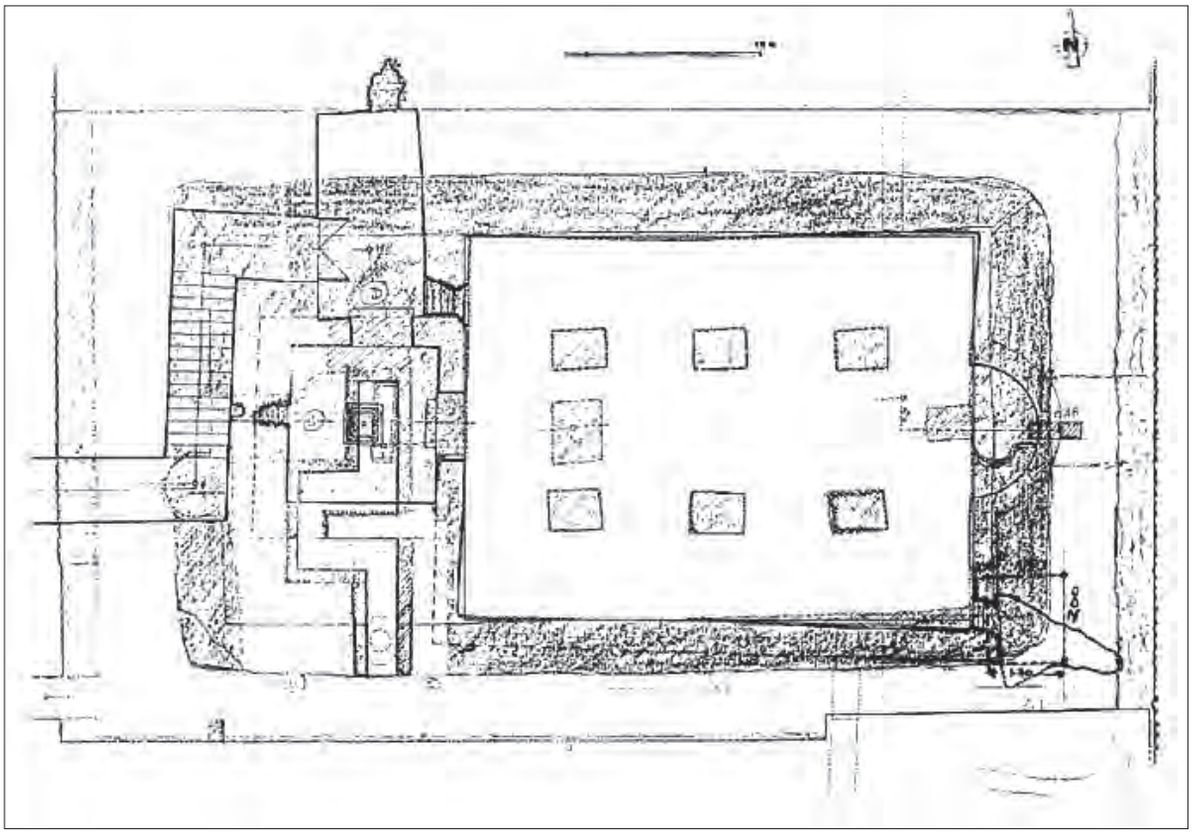

Fig. 1. Plan of the Basilica.

actual core of the temple. The decoration of the central nave emphasizes the colour white, which symbolized the purity of the soul, which was necessary in order to make contact with the divine world. On the vaults, figures create an ideal world where life is directed towards the celestial sphere, while the subject represented in the hemispherical vault of the apse – the focal point for the ceremony – clearly depicts the salvation of the soul after death, something that was only available to the initiates.

Geometrical Study

The analysis is based on the assumption that in the design of the Basilica numerical criteria, and mainly the Triads of Integers, were used to obtain the chosen proportions and to achieve the squarings (Ranieri 1997). Trial-and-error CAD work, at first on the major segment (in yellow in Plate VIII: Fig. 3), has shown that it is best-interpreted as a rectangle with sides in the ratio 4:3, which is the proportional ratio of the Pythagorean triad **D = 3-4-5.**

The second phase of the analysis included all the other most significant geometrical elements (i.e., the shape of the vestibule, the position and shape of the pillars, and the semicircular segment at the apse) following the methodology employed in other cases (such as the Etruscan temple of Marzabotto, Ranieri 2005).

The result is the consistent scheme shown in Plate VIII: Fig. 3.

It describes the Basilica in terms of:

Precise (Pythagorean)

D= 3-4-5 (x17) for the main rectangle.

Precise (Pythagorean)

V= 20-21-29 for the vestibule

Quasi-precise

Q= 12-12-17 (deviation from 90° =11') Circle-Square-Circle scheme

CQC with **Q =17-17-24** (deviation from 90° =11') for the apse.

This interpretation implies a length unit v = 4/22.99 = 0.17399 m = 0.3478/2, i.e. one half of the Greek common foot (0.3476 m).

The axis of symmetry of this geometrical scheme, represented in the figure, was considered the best approximation to the true Basilica axis: we stress that this axis joins the centre of the apse to the centre of the hollow where the altar stood.

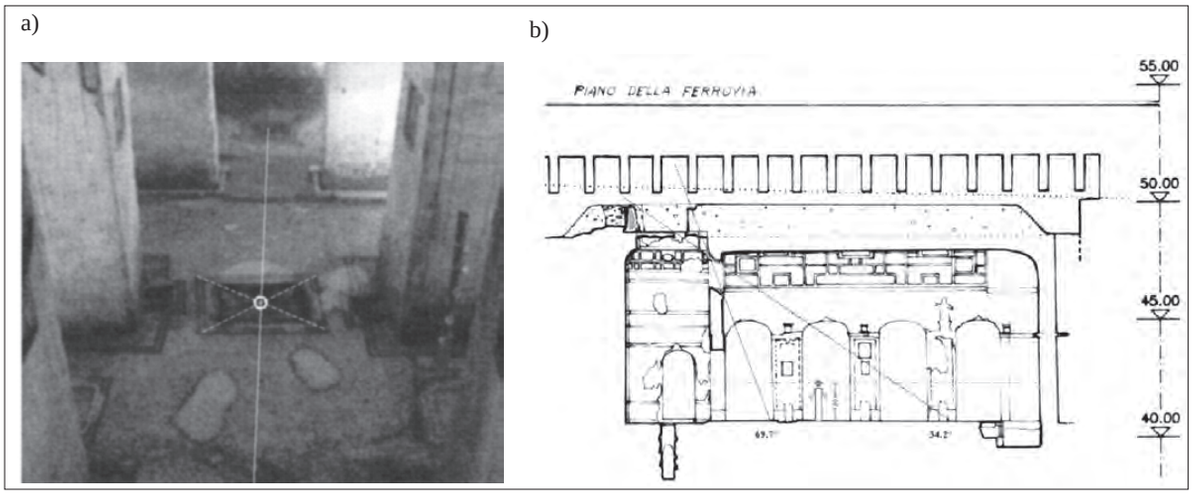

Fig. 4. a) The axis of the Basilica superimposed upon a picture of the floor; b) A vertical section showing the field of view of the window.

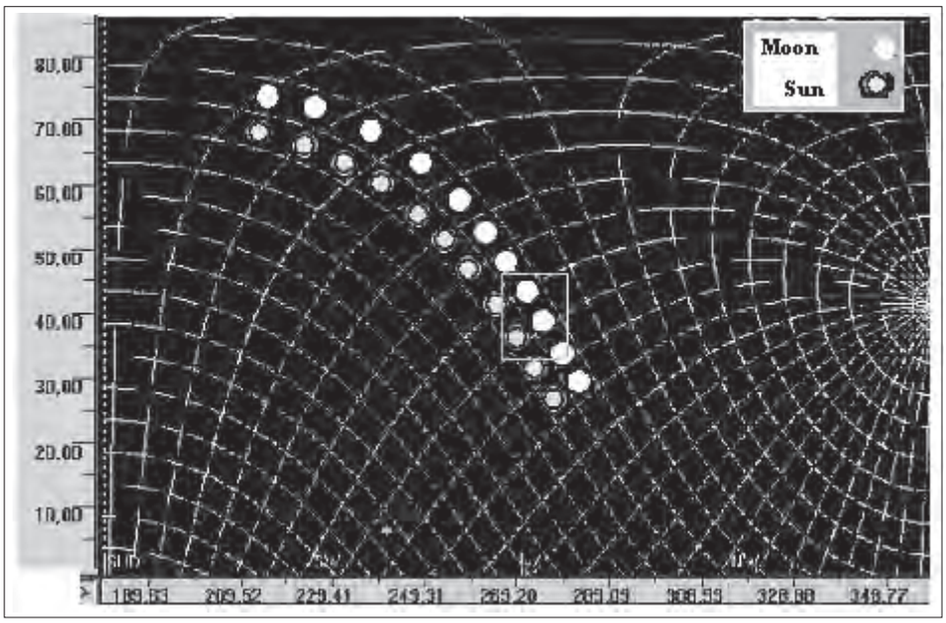

Fig. 5. The path of the Sun at Summer Solstice and of the Moon during the Major Lunistice. The rectangle represents the field of view of the window.

Astronomical Orientations

The Basilica thus shows a definite axis, determined by the centre of the altar hollow and by the geometrical centre of the apse: the centre of the window also lies on the axis. It is therefore the orientation of this axis (Fig. 4a) that should be determined first.

It was no easy matter to make this measurement. The view from the window is presently obscured by engineering work connected with the overlying railway line and by a reinforced concrete slab built during the 1950s in order to preserve the underground structure from mechanical stress and infiltrations of water. Measurements by compass or GPS were both rendered impossible by the overlying railway line. Instead, we laterally shifted the axis of the Basilica to the outside by using laser beams. The orientation of the axis was then determined with respect to a meridian orientation that we had already established by observing the meridian transit of the Sun. The azimuth value obtained was 271.0°±1.5°. In some ways, it is surprising that such an accurate E-W orientation could have been obtained in an underground structure with the technology available in the 1st Century. The field of view of the window was then measured both in elevation and azimuth by using a theodolite. The values obtained range from 266°.6 ± 0°.9 to 280°.0 ± 0°.7 in azimuth and from 34.2°±0.2° to 69.7°±0.1° in elevation (Fig. 4 b).

As a result of the geometry and the axial orientation, direct sunlight can only penetrate inside the Basilica

for a very short time, and on just a few days around the summer solstice. For instance, on the Summer Solstice in 12 AD, sunlight entered the Basilica from 15:56 to 16:28 Local Time. On the other hand, the Moon at this epoch, when near to the major lunistice, passed diagonally across the field of view of the window.

We should take into account that, before and after the transit through the window of the Sun or Moon, sufficiently strong diffuse light from the sky could have created some visibility, even though the environment was in semi-darkness. However, a unique light effect is present inside the Basilica: the shape of the window – a rectangle with rounded ends – becomes a perfect circle corresponding to the altar's position, at a height of 60 cm above ground level. Thus, a reflecting surface (such as a water basin) upon the altar would have projected, by diffuse sky light, a perfectly circular spot on the ceiling of the room: we verified that this spot coincides exactly with the stucco representing the "Kidnapping of Ganymede" at the centre of the nave. This effect is fairly clearly visible when the window is illuminated with a 500 W lamp, which roughly corresponding to the diffuse sky light present when the Sun is 30° above the horizon (Fig. 5).

Of course, many other celestial bodies crossed the window during the night. However, no very bright stars or impressive asterisms did this. The only asterism of interest to the builders of the Basilica might have been Lyra, since the corresponding musical instrument is represented many times in the stuccos.

Conclusions

The interpretation of the Basilica as a place of worship is supported by the lack of archaeological evidence of any funerary use and by the possibility that the building was included in the estates owned by the Statilia family, and in particular T. Statilius Taurus, consul in 44 AD: he committed suicide in 53 AD because of a charge of magical practices. Actually, "mystery cults" – with peculiar and autonomous characteristics – were widespread in the Mediterranean area and in Rome at this time. They offered an alternative to the official religion, where the State authorities controlled all access to the patronizing gods. The new conception, in contrast, was based on the fascinating idea of a personal way to heaven: the subject becomes the individual who, by his personal vocation and choice, comes directly into touch with the divinity, waiting for salvation after death, irrespective of his social position. Individual piety often attracted people to the mystery cults, but an initiation rite was mandatory (in Greek, *mystes* means 'initiated') in order to be accepted among the followers of the god or divinity.

References

AURIGEMMA, S., 1974. *La Basilica sotterranea neopitagorica di Porta Maggiore in Roma.* Rome: Istituto Poligrafico dello Stato.

CARCOPINO, J., 1944. *La basilique pythagoricienne de la Porte Majeure*. Paris: L'Artisan du Livre.

RANIERI, M., 1997. Triads of integers: how space was squared in ancient times. *JAT* , VII 1997, Congedo Ed.

RANIERI., M., 2005. La geometria della pianta del Tempio Urbano di Marzabotto Regio I, Insula 5. In: Atti del Convegno "Culti, forma urbana e artigianato a Marzabotto. Nuove prospettive di ricerca". In: G.SASSATELLI, ed. *Ante Quem, Studi e Scavi*, 11, Rome, Herder, 30-42.

Received: 2 November 2007; Revised: 3 March 2008

ROMOS PORTA MAGGIORE „NEOPITAGORIEČIŲ BAZILIKOS" ARCHEOASTRONOMINĖ STUDIJA

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Santrauka

Vadinamoji „Neopitagoriečių bazilika" atsitiktinai buvo aptikta 1917 m. Porta Maggiore, Romoje. Ji yra vienas iš pačių garsiausių ir daugiausia aptartų požeminių Romos paveldo objektų. Nėra abejonės, kad šis paminklas buvo naudotas labai trumpą laiką, tik I a. pirmojoje pusėje, bet jo paskirtis ir šiandien tebėra neaiški, nors labiausiai tikėtina interpretacija, kad tai galėjo būti neopitagoriečių šventykla. Statinys susideda iš dviejų patalpų, pagrindinės salės ir prieangio, kuris prabangiai dekoruotas gražiais lipdiniais. Pagrindinės salės langas ir anga prieangio stoge yra išdėstyti pagrindinėje pastato ašyje ir, atrodo, galėjo būti naudojami dangui stebėti.

Dėl pastato geometrijos ir jo orientavimo tiesioginiai Saulės spinduliai labai trumpą laiko tarpą prasiskverbdavo į bazilikos vidų, tai trukdavo tik kelias dienas, vidurvasarį saulėgrįžos metu. Pavyzdžiui, 12 m. e. metais vasaros saulėgrįžos dieną tiesioginė Saulės šviesa į baziliką pateko nuo 15.56 iki 16.28 val. vietos laiku. Kita vertus, Mėnuliui esant netoli didžiosios lunisticijos, jo šviesa kirto lango regėjimo lauką įstrižai. Be

to, turėtina omenyje, kad prieš trumpalaikį Saulės ar Mėnulio pasirodymą ir po to per langą krisdama pakankamai smarkiai išsklaidyta dangaus šviesa galėjo sudaryti sąlygas šiokiam tokiam matomumui, nors visa aplinka ir skendėjo prieblandoje. Tačiau ypatingas šviesos efektas pasireiškė pačios bazilikos viduje: keturkampio užapvalintais kampais lango projektuojama išsklaidytos dangaus šviesos dėmė, krisdama į buvusio altoriaus vietą – 60 cm virš grindų lygio, virsdavo idealiai apvalia. Taigi ji galėjo atsispindėti nuo ant altoriaus esančio atspindinčio paviršiaus (pvz., nuo vandens pripildyto indo) ir skleisti šviesos skritulį ant patalpos lubų.

Mes nustatėme, kad atspindėta šviesos dėmė projektavosi tiksliai ant centrinės navos lipdinio „Ganimedo pagrobimas“. Šis efektas buvo pakankamai gerai matomas, langą apšvietus 500 W lempos šviesa apytiksliai atitinkančia išsklaidytą dangaus šviesą, kai Saulė būna pakilusi virš horizonto 30°. Šie pastebėjimai nurodo į galimai ritualinę pastato paskirtį. Nuomonę, jog ši bazilika galėjo būti naudojama ritualinei paskirčiai, netiesiogiai palaiko ir tai, kad joje nėra rasta jokios archeologinės medžiagos, liudijančios jos, kaip laidojimo vietos, paskirtį, kaip ir tai, kad šis statinys galėjo būti dalis Statilia šeimos dvaro ir konkrečiai galėjo priklausyti konsului T. Statilius Taurus (konsulas nuo 44 m. e. m.), kuris nusižudė 53 m. e. m. apkaltintas praktikavus magiją. Iš tikrųjų keistos ir savitos misterijos tuo metu buvo plačiai paplitusios Vidužemio jūros šalyse ir Romoje.

Vertė Jonas Vaiškūnas, Audronė Bliujienė

SOME COSMOLOGICAL ASPECTS OF CATHOLIC CHURCHES IN LITHUANIA

RIMVYDAS LAUŽIKAS

Abstract

This paper presents a preliminary study of the orientation of Lithuanian Catholic churches and interactions between Christian and pagan cosmologies in Lithuanian church architecture. We can state that the Christianization of Lithuania involved an interaction of these two systems. It is already known that models of time and space in Christian Europe were reflected in the architecture of Lithuanian Catholic churches. But pagan cosmology also influenced Lithuanian Christian architecture.

Keywords: church orientations, Christian cosmology, canonical orientation, non-canonical orientation, orientation upon sacred places, Vilnius, Tauragnai, Sodeliai, Skudutiškis.

Introduction

Baltic tribes only became acquainted with Christianity at a relatively late date, around the end of the 12th century and in the first half of the 13th century. (The earlier missions of Anscharius, St. Adalbert and St. Brunon, between the 9th and 12th centuries, were temporary and unsuccessful). The Orthodox version of Christianity did not spread in from the east, although Orthodox churches were built in Pollock and Grodno in the 11th and 12th centuries. The beginning of the Christianization of neighbouring countries such as Poland and Kievan Rus in the 10th century did not have any deep influence either.

By the 13th century, western Christian culture had already survived its tempestuous period of formation (the end of which can be considered to be the great split in 1054). It manifested itself in the obdurate tradition of using Latin script as well as in a world-view and a system of artistic images, supported by Roman Catholicism, that was orientated not to a temporary (earthly, present) reality, but to an exclusively spiritual (divine, pursued) one. On the other hand Baltic paganism had also developed, over a considerable period, into a fairly solid system which not only had a clear world-view and customs but also cult buildings with distinctive architectural features, and even a separate institution of priests (*Kriviai*).

The Christianization of Lithuania, then, was on the whole an interaction of two systems. (In saying this, we are ignoring the orders of knight-monks whose way of life and purpose were rather more knightly than religious). This interaction was not affected by the official stance of Popes, who recommended slow changes in the lands of neophytes, nor by that of the Lithuanian rulers, who were religiously indifferent and quite tolerant provided that the various conversions of their citizens resulted in political submission. Christianity, which had existed and developed in the Roman Empire for more than a millennium, had already incorporated significant aspects of paganism, especially among the Germanic tribes, and thus it conformed to Indo-European cultural traditions, something that also contributed to the Christian-pagan interaction. In the period from the 13th to the 16th centuries we can see signs of both Christianity and paganism in may fields of Lithuanian culture, and the architecture of cult is of no exception.

Some cosmological aspects of the construction of Lithuanian Catholic churches are considered in this article. Its aims are to define the ideological attitudes of the temple builders, and to find out

(i) how the ideas of Christian cosmology of the time are reflected in the exterior architecture of some cult buildings in Lithuania,

(ii) how much these ideas were adapted to local (Lithuanian) conditions, and

(iii) how much pagan cosmology influenced Christian architecture.

Most of the temples we have investigated are in rural areas. Up until the end of the 19th century there was enough space in the thoughts of a Lithuanian both for Christ and for the pagan god of thunder Perkūnas. From the written sources we know that in the 16th to 18th centuries there were many relics of pagan world-view and even rituals (BRMŠ 2005). We shall not try in this article to decide which pagan cosmological images were taken from the Roman and Teutonic nations and brought to Lithuania by Christianity and which were adapted in Lithuania. Instead, we shall limit ourselves

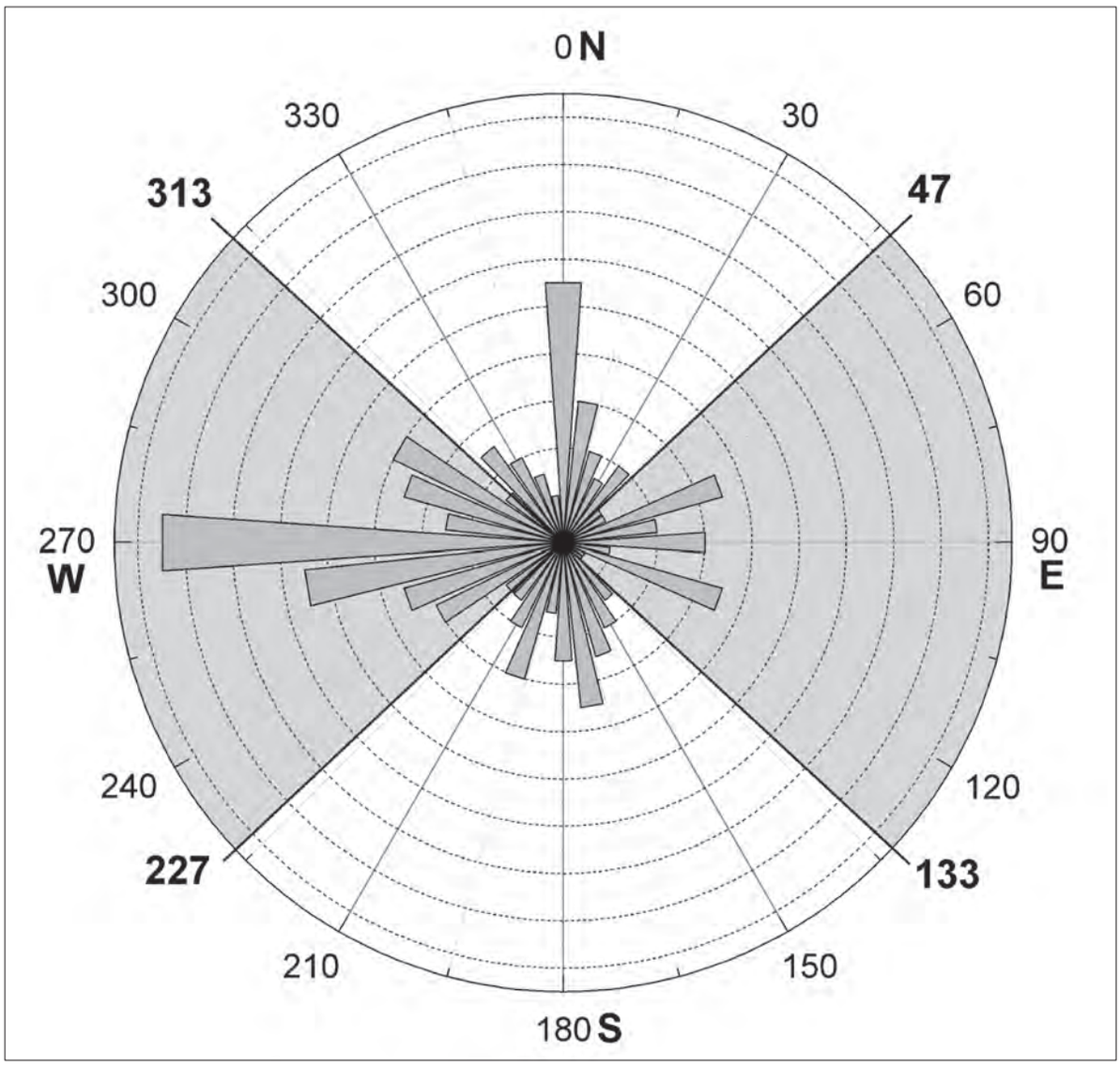

Fig. 1. The orientation of the main entrance door.

to interpreting the architecture of Lithuanian Catholic temples, based on the available written sources. We have also used data on the orientation of the main entrance door in 326 churches, built in the 14th–20th centuries. 223 of them have been measured at first hand, while the orientation of the remaining 103 buildings is known from the written sources. This number permits us to make generalizations, because the cult buildings examined make up 45.6% of all Lithuanian churches. The validity of the generalization is confirmed by the fact that the percentage of the distribution of different buildings' orientations is practically the same.

The main door of the church faces west, to the sunset point, between Christmas and. St. John, 227-313 degrees

The traditional orientation of the church

A statistical analysis of the data indicates the prevailing orientation in the canonical buildings in Lithuania: they have the entrance in the west and the great altar in the east. In all, 139 Catholic cult buildings in Lithuania are orientated with their doors facing west (42.36% of all buildings examined). In early buildings (dating to the 14th–16th centuries) such orientation prevails in up

to 88% of the buildings examined, while in the buildings built later (19th century) the proportion is only 35%.

This practice of church orientation emerged in the early period of Christianity. It emphasizes the importance of the east (sunrise) as a sacred part of the world. The way from west to east is the way from sin to salvation. According to the Imago Mundo and the Mapa Mundi, which practically corresponded to the Imago Mundo before the age of the great geographical discoveries, paradise is in the east, and Jerusalem is also to the east from western Europe. This motivates the belief that Christians should pray facing east-facing the great altar (Dinzelbacher 1998, p. 248-254; Eliade 1997, p. 42-45; Tatarkiewicz 1976). The east-west axis was relevant in the pagan tradition as well. It was supposed to join the points of sunrise (birth, beginning) and sunset (death, end). It is particularly conspicuous in burial monuments. A tradition of placing the dead in an east-west orientation has been traced back to the Iron Age in Lithuania (Jovaiša 1998). The azimuths of sunrise or sunset are emphasized in practically all of the locations used for pagan calendrical observation that have been traced in Lithuania. The example that has been examined most thoroughly can be found on Birutė Hill in Palanga (Klimka 1986, p. 36-43; Daugudis 1995, p. 68-81). However, it was of greater importance in a pagan temple to have a sacred point where divine symbols contacted earthly ones. On the whole, Christianity and paganism agree on the semantic meaning of these two parts of the world. The east is identified with life (goodness?) and the west is identified with decline (evil?). However, the symbolic meaning of the way was more relevant to Christianity in the middle ages, while paganism emphasized the symbolic meaning of the point.

We can suggest that the decline of canonical orientation in Lithuania began in the 16th century**,** with the onset of the Reformation and the Catholic post-Tridentine counter-reformation, and progressed in the Baroque period that followed. This process was sustained not only by the relative liberalization of the Catholic church, but by the fact that most of the churches built in the 16th and 17th centuries (to say nothing of the 18th to 20th centuries) were planned to correspond to an urban city structure that had already been formed.

Exceptions (hypothetical approach)

As we have already mentioned, the symbolic meaning of the way is more relevant to the Christian church, while the symbolic meaning of the point is more relevant to the pagan temple. The interaction of these two ideas made it easy to take the step of building an oblong church with the door facing a particular point in the western (sunset) horizon. The point in question could, for example, be that of sunset on the day of the patron saint of the church. In this case the Christian tradition remains unblemished while at the same time coming closer to the pagan cosmology. This principle is revealed most clearly by the orientation of the church of St. Nicolas (14th century) in Vilnius. The orientation of the main door is 235°, only 4 degrees away from the direction of sunset on St. Nicolas' day. The discrepancy may have occurred because of the difference between the mathematical horizon and the real one, as well as magnetic declination and deviation. However, it remains unclear how the rays of the setting sun entered the temple. Did they pass through the main door, or through the window above the door, or through a small round window? At present there is only a blind niche, though it seems very likely that there was originally an opening. Added to this, we do not know which object in the temple was illuminated by the rays of the setting sun. We can hypothesize that it was the great altar.

There are other similarly orientated churches in Lithuania, in Klovainiai (Pakruojis region, 18th -19th century), Tryškiai (Telšiai region, 16th-18th century), Janapolė (Telšiai region, 18th-19th century), and Žemaičių Naumiestis (Šilutė region, 18th century).

The main door of the church faces east, to the sunrise point, between Christmas and St. John, 47-133 degrees

Contrary to the traditional orientation - main door faces east

The statistical analysis also drew our attention to a significant group of buildings that were orientated in the opposite direction to the traditional, canonical one. The entrances of these churches were in the east while the great altars were in the west. The main door in 63 Catholic cult buildings in Lithuania faces east. Such churches comprise 19.32% of all the buildings examined. This orientation practice emerged in the early Christian period (Filarska 1983p. 214) and highlights the importance of the east (sunrise) as a particularly sacred part of the world. The east, as well as the importance of the orientation of the churches, is also emphasized in the written sources of Christian authors (Eusebius 1993, p.125-127; Gulielmus 2008). Similarly orientated churches also exist in other European countries (Barlai 1997, p. 149-155; Erdmanis 1984, p. 58-60; Heilbron 2001; Surdin 1999, p. 65-70; Koberl 1984, p. 24-28). The east (the sunrise point) is

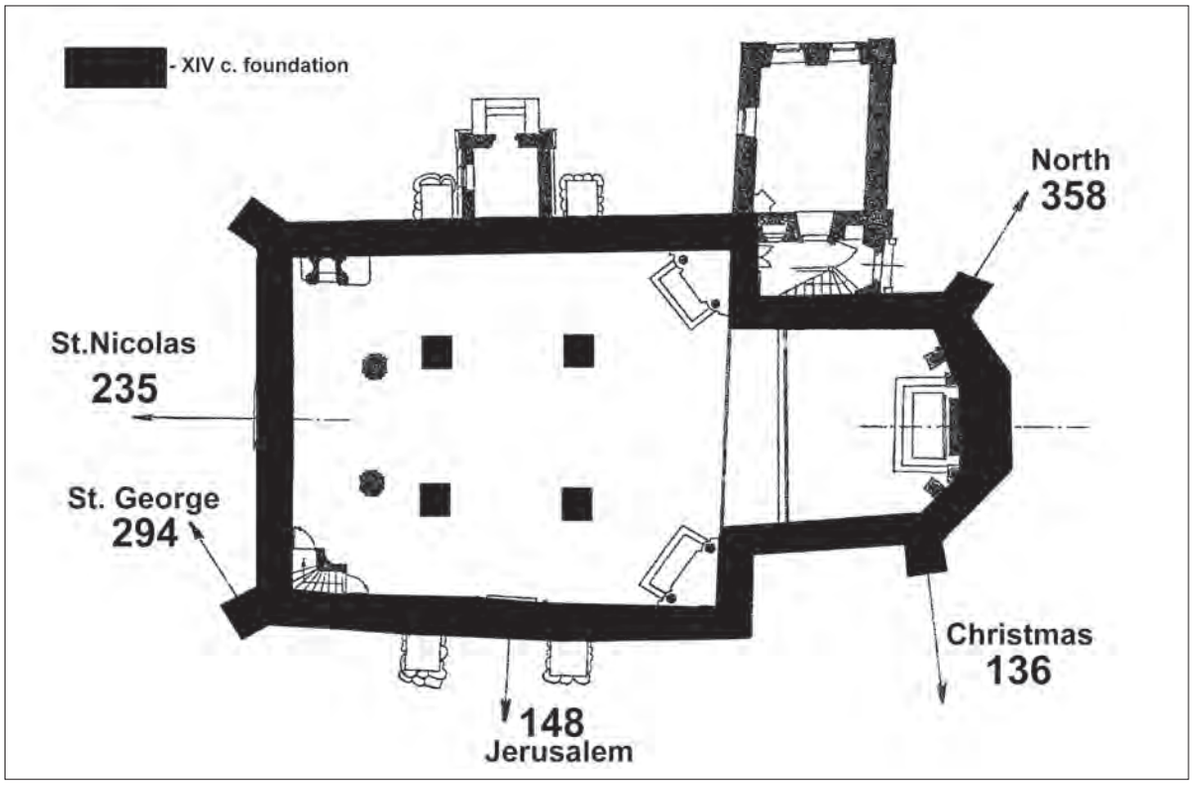

Fig. 2. The orientations of St. Nicolas church in Vilnius.

equally important in the Lithuanian pagan tradition, where solar cults were particularly significant. So here again we see a perfect basis for the interaction of both world-views. One possible variant of this interaction is the orientation of the main door of the church to sunrise on the day of the patron saint of the church. This might have had huge symbolic significance, with the first rays of the rising Sun touching the great altar and blessing the patron of the church on his festival day. The idea is not just that art is presenting the Gospel for illiterates; it is also possible that a deeper semantic meaning existed, with the Sun (the light), the highest deity of the pagan religion, welcoming the Christian saint.

This orientation practice in a Lithuanian church has been revealed most successfully in Tauragnai (Utena region). The church of St. George was built in the first half of the 15th century and its main door faces an azimuth of 71°. This is only 1 degree away from the direction of sunrise in Tauragnai on St. George's day.

Other similarly orientated churches

There are more churches in Lithuania whose main door faces east (sunrise) on their patron saint's day. These are the chapel of the Holy Spirit in Sodeliai (Panevežys region, 18th century), Vaiguva church (Kelmė region, 16th-19th century), and Buivydžiai church (Vilnius region, 18th century). The orientation of Sodeliai chapel is particularly interesting. The day when the Holy Spirit descended, Pentecost, is a variable festival whose date is related to that of Easter. The door of Sodeliai chapel was orientated towards sunrise on Pentecost in 1746 when the chapel was being built. St. George's church in Buivydžiai was orientated in a similar way. On the other hand, at St. John's church in Vaiguva an apse faced the point of sunset on the feast of St. John the Baptist.

The changing tradition in church orientation from the 18th century onwards was led by two factors, neither of which was related to the perception of deep symbolic meaning. On the one hand, conservative thinking led people to orientate a new cult building in the same direction as the previous one. This is clearly observable in Tauragnai where a series of four churches built between the 15th and 19th centuries are all orientated in the same direction. On the other hand, purely technical considerations arose since new sanctuaries most often stood on the foundations of previous ones. A new and bigger church was often required to be built around an existing smaller one without destroying it. Only after the new building had been finished was the old one dissembled. The new building usually had to follow the townscape tradition.

Speaking of technical considerations, we should mention a group of cult buildings with their main door orientated towards sunrise. These buildings are orientated upon azimuths between 47° and 90° degrees, a range

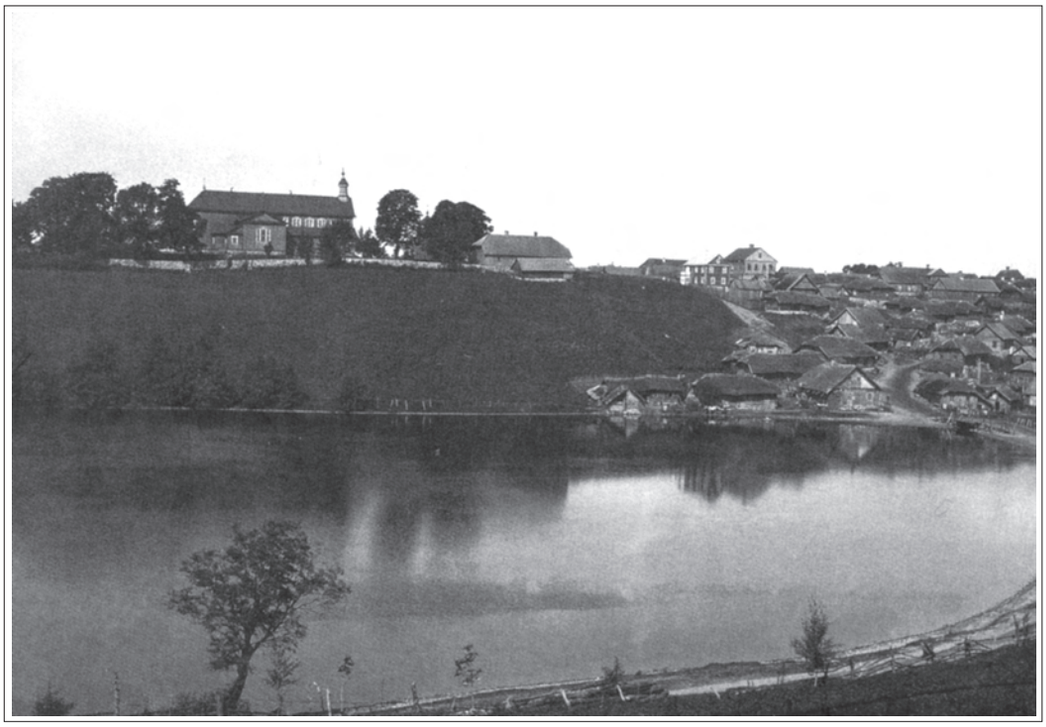

Fig. 3. Tauragnai (Utena region) church of St. George, 1939.

that corresponds to the positions of sunrise from the spring to the autumn equinoxes. Forty-nine such buildings constitute 15.03% of all those examined and as much as 77.77% of all those whose main door faces east. We might guess that there was a custom of placing the keystone of a building so that the door faced sunrise on the first day of construction. Latvian examples (Erdmanis 1984, p. 58-60) and certain Lithuanian customs of construction have implicitly proved this. Such a practice could easily explain the range of orientations upon sunrise during the warm half of the year, which would be the most suitable time for construction work.

The main door of a church faces other sacred points

The door faces south

Praying Europeans turned their heads towards the east, using their geographical knowledge to face the direction of Jerusalem. This fact might have engendered an interesting orientation tradition in Lithuania. Historians of architecture have noticed that most of the Gothic churches in Lithuania have south-facing entrances (Minkevičius 1989). While examining church orientations we found that 124 examples (38.03% of all the buildings examined) were orientated in the north–south direction. Let us try to find reasons for such an orientation. On the whole, the spatial model would not be sufficient if two important parts of the world, the north and the south, were not reflected in it. The importance of these parts of the world in pagan solar cults is beyond doubt. The south is where the Sun reaches its highest point above the horizon and the north is where there is no Sun at all. These azimuths are emphasized in the orientation of Iron Age tombs, in the observatory on Birutė Hill in Palanga, in the arrangement of stones near the castle hill in Purmaliai (Klaipėda region), and in other pagan calendar and astronomical observation sites in Lithuania (Klimka 1986, p. 36-43; Jovaiša 1999; Žiemys 1981, p. 5-26), as well as Vilnius Perkūnas temple which is described in Rivijus' chronicle (Rivius 1637). The south direction is important in Christian cosmology as well. The actual geographical situation of a country can result in a particular spatial model being adjusted. Returning to the sacred image of Jerusalem and the Imago (Mapa) Mundi, we see that in reality this city is not eastward from Lithuania, but southward; and this was of course known to the people of the time. However, it is difficult to say whether it was this that motivated the builders of Lithuanian Gothic churches to install southern entrances. Moreover, the observation of other heavenly bodies and their reflection in the cosmology might have also motivated particular corrections: thus, the north is important as the direction of the Pole Star (Polaris), the only star in the sky that does not "rotate".

St. Nicolas' church in Vilnius, already mentioned, makes sense in the context of the north–south cosmology. It was built in the second half of the 14th century.

Fig. 4. The orientation of Skudutiškis church.

In the foundation plan of the church we can clearly see that the brick wall is somewhat lopsided. Perhaps an attempt was made to orientate the entrance door to the south in the direction of Jerusalem. If so, then the builders' error was very small. The azimuth of Jerusalem from Vilnius is approximately 160° and the orientation of the entrance door of the church is 148°. What is more, the wooden churches found in rural areas are orientated in the north-south direction. One of the oldest buildings of this type was discovered in Kernavė during archaeological excavations: it dates back to the beginning of the 15th century (Jankauskas 1990). It seems likely that south-facing buildings reflected a need to pray facing Jerusalem.

Orientation to local sacred sites

In some cases a church may have been built to face nearby sacred places. Near Skudutiškis in Molėtai region there are a sacred spring and sacred stones apparently of pagan origin. According to a local legend, during the years of the plague St. Mary appeared on these stones (there are traces of her feet on one of them) and stopped the disease. Everyone who was on Skudutiškis Hill was saved. After that miracle, a church was built on the hill. Historical evidence shows that all the surviving temples built from the 17th century onwards in Skudutiškis are orientated in the same way, with their main door facing the sacred spring (the place where St. Mary manifested herself).

Conclusions

1. In summary: the architecture of Lithuanian Catholic churches in the 14th–16th centuries reflected models of time and space that prevailed in Christian Europe at the time. However, in pursuit of wider Christian missionary aims, Christian sacred architecture also incorporated aspects of pagan cosmology, reflecting the particular beliefs held in a local area (in this case Lithuania).
2. The general (canonical) orientation model for Lithuanian churches is traditional, with the main entrance door to the west (42.36% of all buildings examined).
3. Some interesting alternatives are orientation of the main entrance door (i) to the point of sunset on the feast day of the patron of the church (e.g. St. Nicolas' church in Vilnius); (ii) to the point of sunrise on the feast day of the patron of the church (e.g. St. George's church in Tauragnai and the Holy Spirit chapel in Sodeliai); (iii) to the south – the direction of Jerusalem from geographical locations within Lithuania (e.g Kernavė church); and (iv) to local sacred places (e.g. Skudutiškis church).

References

BARLAI, K., 1997. Archaeoastronomia "Ancilla" monumentorum. In: C. JASCHEK and A. BARANDELA, eds. *Actas del IV congreso de la SEAC "Astronomia en la cultura"*. Salamanca: Universidad de Salamanca, 149-155.

BRMŠ – VĖLIUS, N., compil., 2005. *Baltų religijos ir mitologijos šaltiniai*. IV: XVIII amžius. Vilnius: Mokslo ir enciklopedijų leidyklos institutas.

DAUGUDIS, V., 1995. Die Eisenzeitlichen Kultstatten in Litauen. In: V. KAZAKEVIČIUS, general ed. *Archaeologia Baltica,* Vilnius, 68-81.

DINZELBACHER, P., 1998. *Europos mentaliteto istorija* (orig. *Europäische Mentalitätsgeschichte*). Vilnius: Aidai, 248-254.

DURANDUS, G., 2008. *The Rationale Divinorum Officiorum*. Louisville: Fons Vitae.
ELIADE, M., 1997. *Šventenybė ir pasaulietiškumas* (orig. *Sacrum i profanum*). Vilnius: Mintis, 42-45.
ERDMANIS, G., JANSONS, A., 1984. Seno celtnu orientacija. *Zvaigžnota debess,* 4, 58-60.
EUSEBIUS CAESARIENSIS, 1993. *Bažnyčios istorija* (orig. *Historia ecclesiastica*). Vilnius: Lumen, 125-127.
FILARSKA, B., 1983. *Początki architektury chrześcijańskiej*. Warzsawa: TN KUL, 214.
HEILBRON, J.L., 2001. *The sun in the church*. Harward: Harward university press.
JANKAUSKAS, A., 1990. *Senųjų Kernavės bažnyčių 1989 m. archeologinių tyrimų ataskaita. Senųjų Kernavės bažnyčių 1990 m. archeologinių tyrimų ataskaita*. Handwriting documents. Library of Institute of Lithuanian history. N. 1661, 1804 A,B.
JOVAIŠA, E., 1999. *Lietuva iki Mindaugo.* CD-ROM, Vilnius: Elektroninės leidybos namai.
JOVAIŠA, E., 1998. *Žvilgsnis į "Aukso amžių".* CD-ROM, Vilnius: Elektroninės leidybos namai.
KLIMKA, L., 1986. Apie astronominę Palangos alko statinio paskirtį. *Lietuvos istorijos metraštis 1985*, 36-43.
KOBERL, L., 1984. On the astronomical orientation of St.Vitus cathedral. *Bulletin of the Astronomical Institutes of Czechoslovakia,* 24-28.
MINKEVIČIUS, J., ed., 1989. *Lietuvos architektūros istorija*. T.1. Vilnius: Mokslas.
RIVIUS, J., 1637. *Cronika ist aus einer anderer Cronicer ausgezogen und alter Geschichte ausgeschrieben*. Handwriting document. Library of Lithuanian Academy of Sciences, F.9, b.3156.
SURDIN, V.G., 1999. Gotičeskij chram kak solnečnaja observatorija. *Zemlia i Vselennaia*,5, 65-70.
TATARKIEWICZ, W., 1976. *Historia estetyki*. Krakow: Zakl. narod. im Ossolińskich.
ŽIEMYS, E., 1981. Astronominis užtemimų kalendorius Zapyškyje. *Mokslas ir gyvenimas,* 12, 25-26.

Received: 1 November 2007; Revised: 5 March 2008

KAI KURIE KOSMOLOGINIAI LIETUVOS KATALIKŲ BAŽNYČIŲ ASPEKTAI

Rimvydas Laužikas

Santrauka

Šiame straipsnyje nagrinėjami kai kurie kosmologiniai Lietuvos katalikų bažnyčių pastatų aspektai. Disponuojama duomenimis apie 326 bažnyčių, statytų XIV–XX a., didžiųjų durų (pagrindinio įėjimo) orientaciją. Iš jų 223 dabar tebestovinčių pastatų orientacijos matuotos vietoje; kitų 103 – žinomos iš rašytinių šaltinių.

Kanoniškai durimis į vakarus yra orientuoti 139 Lietuvos katalikų kulto pastatai (42,63 proc. visų tirtų pastatų). Kanoninėje orientacijoje taip pat galime ieškoti vienokių ar kitokių krikščionybės inkultūracijos aspektų ir gilesnių nei vien „kelio nuo nuodėmės link išganymo“ idėjų išraiškų. Krikščioniškojoje bažnyčioje aktualesnė kelio, o pagonių šventykloje – taško simbolinė reikšmė. Sąveikaujant šioms idėjoms visiškai nesudėtingas tampa tolesnis žingsnis – pailgą bažnyčią durimis pastatyti į ypatingą tašką vakariniame (saulėlydžio) horizonte. Tas ypatingas taškas galėtų būti saulėlydžio azimutas per bažnyčios šventojo globėjo dieną. Tokios orientacijos pavyzdžiai gali būti Šv. Mikalojaus bažnyčia Vilniuje (XIV–XVI a.), Klovainių (Pakruojo raj., XVII–XIX a.), Tryškių (Telšių raj., XVI–XVIII a.), Janapolės (Telšių raj., XVIII–XIX a.), Žemaičių Naumiesčio (Šilutės raj., XVIII a.), Vaiguvos (Kelmės raj., XVI–XIX a.) bažnyčios.

Statistinė duomenų analizė taip pat išryškino gana didelę pastatų grupę, orientuotą priešingai, nei reikalavo kanonas. Šių pastatų įėjimai buvo rytuose, o didieji altoriai – vakaruose. Durimis į rytus yra orientuoti 63 Lietuvos katalikų kulto pastatai, tai sudaro 19,32 proc. visų tirtų pastatų. Tokia bažnyčių orientacija atsirado jau ankstyvojoje krikščionybėje. Rytai, kaip bažnyčių orientavimo kryptis, akcentuojami taip pat krikščionių autorių raštuose. Rytai (saulėtekio taškas) ne mažiau svarbūs ir lietuvių pagoniškajai tradicijai, kurioje soliariniai kultai užėmė ypatingą vietą. Vienas galimų tos sąveikos variantų – bažnyčios orientavimas didžiosiomis durimis į saulėtekį šventojo globėjo dienos rytą. Tokios orientacijos pavyzdžiai gali būti Tauragnų (Utenos raj., XV–XIX a.), Buivydžių (Vilniaus raj., XVIII a.) bažnyčios, Sodelių (Panevėžio raj., XVIII a.) Šv. Dvasios koplyčia.

Geografinės žinios ne tik nukreipė besimeldžiančiųjų Vakarų europiečių veidus į rytus, Jeruzalės link, bet ir galėjo paskatinti įdomią orientacijos tradiciją Lietuvoje. Architektūros istorikų yra pastebėta, kad daugelis gotikinių mūrinių Lietuvos bažnyčių turi pietinius įėjimus. Tiriant bažnyčių orientacijas, nustatyta, kad net 124 bažnyčios (38,03 proc. tirtų pastatų) orientuotos šiaurės–pietų kryptimi. Kiekvienos šalies reali geografinė padėtis gali atitinkamai pakoreguoti kiekvieną konkretų erdvinį modelį. Realiai žiūrint iš Lietuvos Jeruzalė yra ne į rytus, kaip Vakarų Europoje, o į pietus. Tai, be abejo, nebuvo naujiena to meto žmonėms.

Pavieniais atvejais bažnyčios galėjo būti orientuojamos į sakralius artimesnės aplinkos objektus. Tokios orientacijos pavyzdys gali būti Skudutiškio (Molėtų raj., XVIII–XX a.) bažnyčia.

BASATANYA REVISITED: TWO PERIODS OF A COPPER AGE CEMETERY IN THE CARPATHIAN BASIN

KATALIN BARLAI

Abstract

In Eastern Hungary, we find many cemeteries from the Copper Age over an extensive area. One of them, Basatanya, represents the Tiszapolgár culture (Early Copper Age) in its period I, and in period II the Bodrogkeresztúr culture (Middle Copper Age). The directions of the graves fill the angle span of the solar arc, thus the graves point towards where the Sun can rise or set. Westerly orientation (the skull points West) is almost universal in Period I. In Period II, easterly orientation also appears. The cemetery contains 156 graves and may have been used for two centuries.

Key words: Copper Age, grave orientation, physical anthropology.

An Outlook

During the Early Copper Age (approximately 6000 years ago) dramatic changes took place in mortuary practice in the Carpathian Basin and in East/South Europe. Large formal cemeteries were established. These cemeteries were usually isolated in the landscape and entirely separate from settlement sites; they replaced the Neolithic pattern of burying the dead in and around settlement sites. Ida Bognár-Kutzián characterizes the Copper Age cemeteries this way in her exhaustive work on Tiszapolgár – Basatanya (Bognár-Kutzián 1963).

The orientation of the graves in these cemeteries has been connected to the annual path of the Sun. The distribution of the grave directions fills the solar arc, the segments of the horizon where the sun can rise or set. The amplitude of the local solar arc depends on the geographical latitude (Barlai 1980; Barlai, Bognár-Kutzián, Zsoldos 1992).

The Basatanya cemetery in Eastern Hungary is one of the best excavated and best studied cemeteries. Its "lifetime" covers about two hundred years – about 8-9 generations. The cemetery's first and second periods represent the Early Copper Age Tiszapolgár and the Middle Copper Age Bodrogkeresztúr cultures respectively. It contains 156 thoroughly documented graves: 60 of them belong to period I, a further 7 to a transition phase, and the remainder (89 graves) to period II. The transition phase lasted about 15 years.

In Fig. 1 we can see all the three phases of the Basatanya cemetery. Along the "rectified" horizon each histogram shows the number of graves with this angle of orientation (i.e. pointing this direction). East is at 90°, South at 180° and west at 270°. The average geographical latitude of the Carpathian Basin is 47.5° and the corresponding solar arc is 72°. This means that sunrise takes place 36° to the north of equinoctial East at the summer solstice and 36° to the south of it at the winter solstice. Outside this part of the horizon, sunrise cannot be experienced. The same holds for the sunsets. Sunset takes place within a 72° span centred upon the direction of equinoctial West.

The Figure clearly shows that the population of period I strictly followed the rule of orienting their deceased in a westerly direction, with the skull pointing towards the west in the direction of the setting sun.

The only exception is a man about 35 years old. His grave goods are not exceptional. The direction of the grave is 114°, which is inside the arc of the rising sun. This value corresponds to a 24° southward deviation from equinoctial East. Period I of the cemetery has been analysed in detail at the SEAC Conference held in Tartu (Barlai 2002). Nonetheless the main results should be mentioned here briefly.

The conclusion was reached that a group of the population whose graves are oriented inside a narrow central part of the histogram – within a narrow range around the equinoctial East – West direction – probably enjoyed a privileged position within this community.

This statement was supported by the fact that the members of this group – mostly men – were outfitted with rich grave goods, e.g. numerous ceramics, flint, quartzite, obsidian blades and scrapers, axe-hammers made of red deer and roe deer antlers, scapulae and shoulder blades of aurochs, mussel shell, silurid vertebrae, one mace head, mandibles of wild boars and domestic sows, tusks, and further different bones of domestic and wild animals. The clustered orientations represent

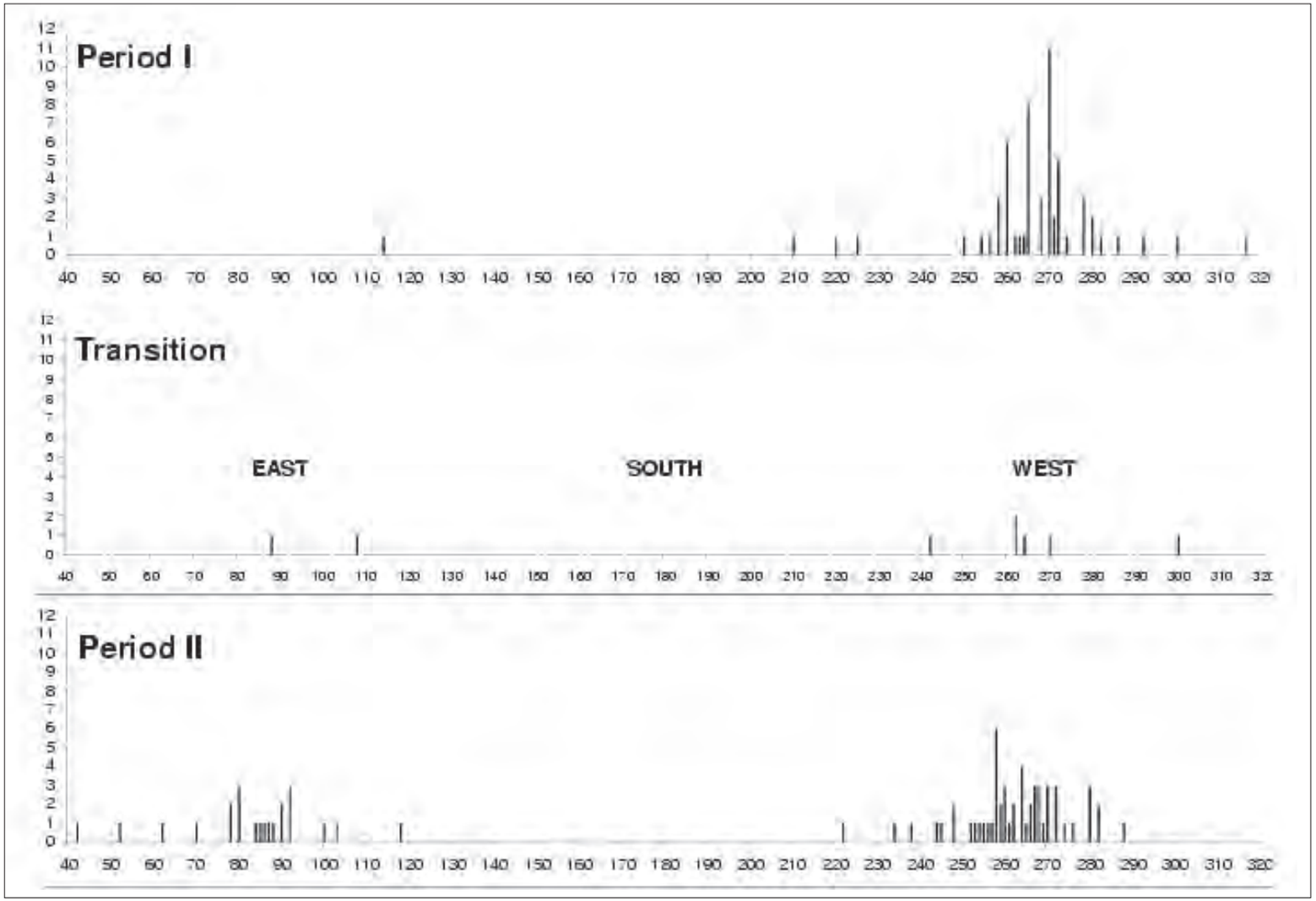

Fig. 1. Distribution of the graves' orientation in the different periods.

a link between them from the archaeoastronomical point of view. We do not know what kind of events brought the first period to an end. Something serious or tragic must have happened.

The next phase of the cemetery, the transition phase, presents a desperate picture. Seven individuals were buried here, two men and five elderly women (40-45 years in age), one of them with a child. The grave goods were mostly modest: several ceramics and domestic animal bones. Exceptionally, one of the men has a flint blade, an axe-hammer of antler, mandibles of wild boar and of a sow, bones of young sheep and numerous ceramics. One woman, apart from some ceramics, has two bone awls, a mussel shell, a pebble, and six pots. There are two eastward and five westward orientations.

In period II, the most conspicuous feature is that a group appeared which followed the rule of orientation towards the east. This group, consisting of 22 deceased, represents one quarter of the total adult population in this period. Were these easterly oriented people newcomers in the Carpathian Basin or does this opposite practice of orientation reflect an ideological split within the community?

There is no difference between the grave goods in the easterly and westerly oriented graves.

None of the period II graves contained exceptional deposits. In particular, while three axe hammers made of deer antler were found in period I graves – all of men – none could be found in period II graves. Neither could any mace heads or arrow heads made of deer antler, although these are common in men's graves in period I. Tusks of wild boars or pigs – very common in period I – were few and far between in period II. This short comparison, incomplete as it is, sheds light on the fact that the dead were much better provided with grave goods in period I.

The Period I graves seem to be the product of a wealthy hunting (but also agricultural) society while period II represents a poorer, and perhaps more peaceful, agricultural one.

Some remarks on period I

Finally it is worth returning to the first period of the cemetery. Bognár-Kutzián's monograph on Basatanya – apart from the descriptions of the excavation and the graves, and the inventory of the finds – contains as an Appendix a spectrochemical analysis of the copper artefacts and, included in the volume, a typological study of the human burials by a physical anthropologist. Interdisciplinary attitudes like this were not widespread in the middle of the last century.

The study in question was undertaken by J. Nemeskéri, a well-known anthropologist of that time.

A descriptive typology was obtained using contemporary methods of physical anthropology. This resulted in different anthropological types being identified among the deceased. So-called "Protoeuropid" and different "Mediterranean" types were found. It was possible to determine the type of about 80% of the period I skeletons.

To me, the combination of orientation and anthropological type seemed promising. In fact, those who were buried facing a direction within the cluster in the central part of the histogram (i.e., in a narrow range around due west), and who had exceptionally rich grave goods, turned out to be mostly Protoeuropid (or a mixture of Protoeuropid and other types), and were almost exclusively men (Barlai 2002).[1]

No such method could be applied in period II. Here, no more than 50% of the skeletons were suitable for anthropological analysis, and no firm conclusions could be drawn.

The classification used in my former paper has been strongly criticised at the present conference, partly for being old fashioned and obsolete, and partly for being apt to be misused by harmful and discriminating ideologies, as has already happened in the past.

I will try to formulate my personal response to all these objections. I definitely reject any form of racism. The entity represented by all features that could be called (for example) a Mediterranean type could be expressed using the concepts of modern molecular genetics, DNS research or population genetics in an equivalent way. Being an astronomer I am not able even to venture an opinion.

This old-fashioned database included in the Basatanya volume nonetheless carries a piece of information. We should not throw out the baby with the bathwater. Reversing the argument: it may be a challenge for these new methods to determine if there exists any correlation between their results and the statements obtained using the old ones.

Acknowledgement

Thanks are due to Dr A. Soltysiak and Dr K. Jakubiak for their comments.

[1] Sadly the details of this analysis have become almost incomprehensible owing to a printing (or possibly an editorial) error.

References

BARLAI, K., 1980. On the Orientation of Graves in Prehistoric cemeteries. *Archaeoastronomy*, III(4), 29-32.

BARLAI, K., 2002. Microhistory at Basatanya I Copper Age Cemetery. In: M.KOIVA, I.PUSTYLNIK, L.VESIK, eds. *Cosmic Catastrophies (SEAC 2002 Proceedings).* Tartu, 5-8.

BARLAI, K., BOGNÁR-KUTZIÁN, I., ZSOLDOS, E., 1992. Rays of Prehistoric Sun. In: S. IWANISZEWSKI, ed. *Readings in Archaeoastronomy.* Warsaw University Cooperative, 11-19.

BOGNÁR-KUTZIÁN, I., 1963. *The Copper Age Cemetery of Tiszapolgár-Basatanya.* Archaeologia Hungarica, series Nova XLII. Budapest: Akademiai Kiado, Publishing house of the Hungarian Academy of Sciences.

Received: 16 October 2007; Revised: 20 November 2008

NAUJAS ŽVILGSNIS Į BASATANIJĄ: DU VARIO AMŽIAUS KAPINYNO PANONIJOS LYGUMOJE LAIKOTARPIAI

Katalin Barlai

Santrauka

Prasidedant senajam vario amžiui, maždaug prieš 6000 metų, kapinynai buvo kuriami atskirai nuo gyvenviečių. Šiuose kapinynuose kapai buvo orientuojami, atsižvelgiant į vietovės horizonte esančius taškus, kuriuose Saulė teka ir leidžiasi.

Basatanijos kapinynas yra Panonijos lygumoje, Tisos upės pakrantėje. 156 kapai priklauso dviem laikotarpiams, kuriuos sieja trumpa, apie 15 metų, pereinamoji fazė. Iš viso kapinynas galėjo būti naudojamas apie 200 metų, arba 8–9 gyventojų kartų. Pirmuoju laikotarpiu, senajame vario amžiuje, mirusieji buvo laidojami galvomis į vakarus. Šių mirusiųjų (o jų daugumą sudarė vyrai, kurie bendruomenėje veikiausiai užėmė priveligijuotą padėtį) kapai buvo išdėstyti rytų–vakarų ašimi su nedideliais nukrypimais. Rastos įkapės yra būdingos medžiotojams ar net kariams. (Tiesa, ankstesnis pirmojo laikotarpio tyrimas (Barlai, 2002), pagrįstas antropologinių tipų analize, ateityje turėtų būti kritiškai peržiūrėtas.)

Analogiškas tyrimas buvo atliktas ir analizuojant antrąjį kapinyno naudojimo laikotarpį. Laidosena pakito. Maždaug ketvirtis mirusiųjų buvo palaidota ne galvomis į vakarus, o priešingai – į rytus. Jų įkapės byloja apie neturtingą taikių žemdirbių pobūdžio bendruomenę.

Vertė Vykintas Vaitkevičius

THE PYTHAGOREAN GEOMETRY OF THE ATREUS TOMB AT MYCENAE

MARCELLO RANIERI

Abstract

A geometrical analysis was performed using CAD (Computer Aided Design) tools on the plans of the nine Tholos Tombs of Mycenae and of the "Treasury of Atreus" in particular. Dedicated parameters were established in order to classify the main common geometrical features of the tombs. The analyses were based on a comparison between the geometrical proportions found on the plans and those of the Squaring Triads. It appears that Mycenaean architects made use of both Perfect (Pythagorean) and Quasi-Perfect combinations of integers. The Treasury of Atreus stands out by exhibiting all the major geometric proportions identifiable with those belonging to a series of Pythagorean Triads reported by Diophantus and known to the Mesopotamians. The unit of length for the Atreus Tholos Tomb coincides with the Lagash Gudea cubit of 0.496 m.

Key words: geometry, Pythagorean Triads, cubit, Mycenae, Dyophantus.

Introduction

The nine Tholos Tombs of Mycenae constitute a homogeneous group in terms of their spatial disposition (all are located on the western side near the Mycenae citadel), function (all are funerary) and architectonic typology (all have corbelled vault domes accessed from a Dromos). In addition, they were all built within the relatively short time span of two centuries. In the History of Architecture, the Treasury of Atreus represents the archetype of large corbelled vault domes and was the biggest in antiquity until the construction of Rome's Pantheon (1st century AD, 1½ millennia later).

To achieve the squaring (Ranieri 1997, 2002, 2005, 2006, 2007; Malgora 2000; Patanè 2006), three integers (a Squaring Triad) can be used, defining the lengths of sides and diagonals in terms of length-units. A reduced repertory for the present analysis is shown in Table 1. (For a wider repertory see Ranieri 1997).

Analyses and Results

The analyses were based on the association of the orthogonal forms as drawn on the plans with the proportions of the Squaring Triads (all plans are from Pelon 1976).

Three parameters were defined in order to classify the main orthogonal geometrical features:

- VA (Vault): the ratio of height to radius. VA= h/r.

- CH (Chamber): the ratio (Diameter+Stomion)/Diameter. CH=(F+s)/F

- DR (Dromos): the ratio of Dromos length to Diameter. DR = d/F

The results for the nine Tholoi are briefly summarized in table 2.

As shown in Fig.2 (with the exception of the Aegisthus Tomb for which CH = 3/W), parameter CH classifies the Tholoi into two groups:

a "√2-Group" (Cyclopean, Epano Phournos, Panagia, Clytemnestra) and

a "D-Group" (Kato Phournos, Lion, Genii, Atreus).

In each group, there is modularity despite the diversity of sizes.

Table 2 also suggests that the vault heights were all established following the proportion 15/8 of the P-triad M=8-15-17.

For the Treasury of Atreus, as can be seen in Fig.3, all the most significant geometrical proportions appear to have been governed by Pythagorean Triads, namely D (CH), W (DR), M (VA), and GA. This is of special interest, because these triads are the first four terms of a series of P-triads that can be generated using the numerical algorithm reported by Diophantus (3rd century AD) in Book II, Problem 8 of his Arithmetica[1]. This algorithm was known to the Mesopotamians[2] in Mycenaean times long before Diophantus.

Units of length can be derived from the analyses. For the Treasury of Atreus, a "cubit-like" length-unit of 0.496 m ± 0.004 resulted. This value corresponds (well within the ± 0.004) to the values of known Mesopota-

[1] Given M and N mutually prime with M >N of different parities, if $A = M^2 - N^2$, $B = 2\,M\,N$, $C = M^2 + N^2$ then $A^2 + B^2 = C^2$.

[2] Mesopotamians were highly acquainted with P-triads, as demonstrated by the clay tablet N° 322 in the Plimpton collection at Columbia University (Neugebauer 1957).

Table 1. Triads related to the nine Tholoi
From left: Symbol, Integers, proportion r = B/A

Symbol	A	B	C	r=B/A	Symbol	A	B	C	r=B/A	Symbol	A	B	C	r=B/A
Q	7	7	10	1	4/W	24	28	37	1.6667	W	5	12	13	2.4
Q	12	12	17	1	MA	4	7	8	1.75	WB	10	25	27	2.5
3/W	20	25	32	1.25	M	8	15	17	1.875	2D	6	16	17	2.6667
D	3	4	5	1.3333	MC	12	23	26	1.9167	G	12	35	37	2.9167
√2	12	17	21	1.4167	2Q	12	24	27	2	3Q	6	18	19	3
L	10	15	18	1.5	2Q	13	26	29	2	GA	7	24	25	3.4287

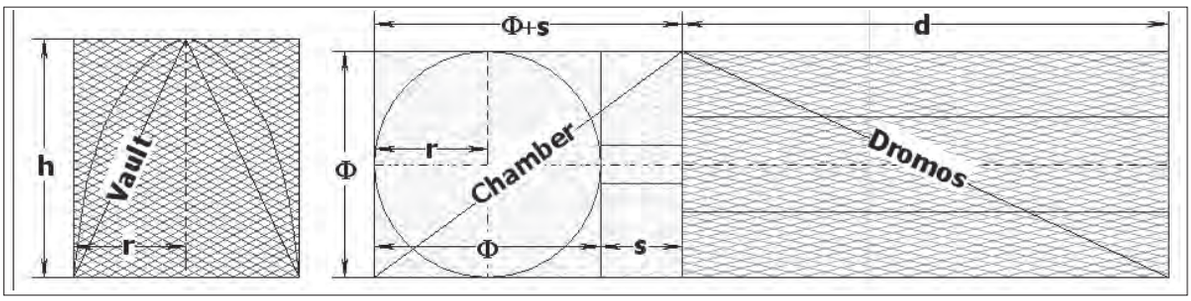

Fig. 1. Rectangular Parameters for a geometrical classification of Mycenaean Tholos Tombs.

Table 2. The resulting association of the Geometrical Parameters with Squaring Triads

THOLOS	VA	CH	DR	Other Triads
Cyclopean	?	√2	MC	Q, W
Epano Phournos	M	√2	2Q	Q, W
Panagia	M	√2	MA	Q, W, MC,G, L
Clytemnestra	M	√2	2D	Q, W, D
Kato Phournos	?	D	4/W	Q, 3Q, √2, WB, 2D, MC
Lion	?	D	19/12	Q, 3Q, M, G
Genii	M	D	2Q	Q, 3Q, 2D, L
Atreus	M	D	W	Q, 3Q, 2D, GA
Aegisthus	M	3/W	4/W	3Q, 3/W, M, MA

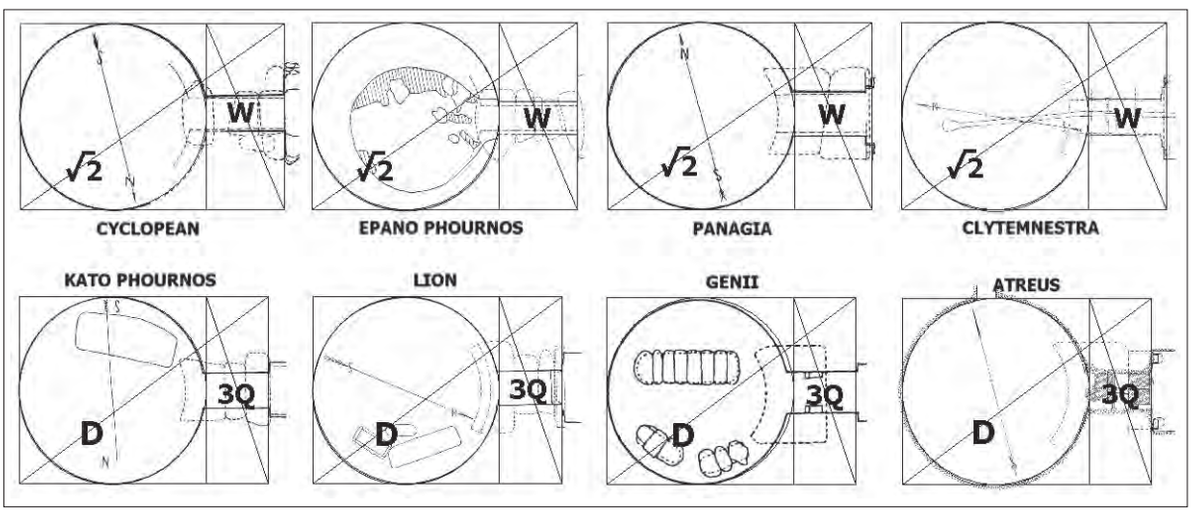

Fig. 2. The tholoi as classified using the CH "Chamber" geometrical parameter.

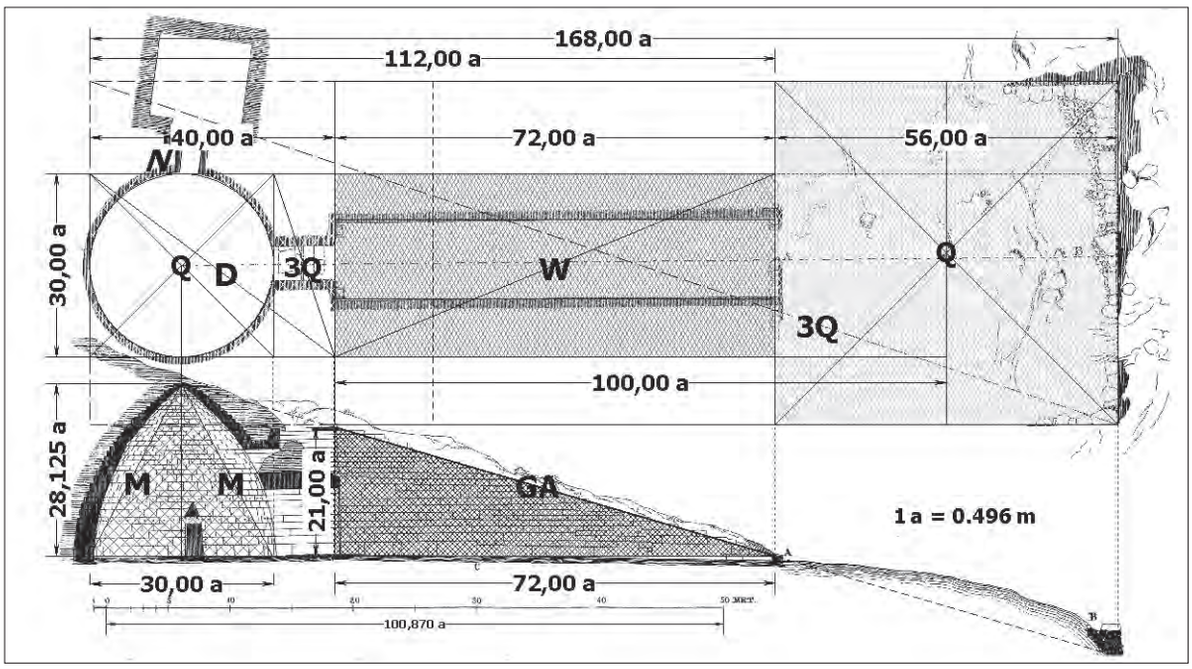

Fig. 3. The Pythagorean geometry of the Treasury of Atreus.

mian cubits: the Assyrian cubit of 0.494 m; the Sumerian cubit of 0.500 m; and the Gudea of Lagash statue cubit of 0.496 m.

Conclusions

It appears that Mycenaean architects made use of both Perfect (Pythagorean) and Quasi-Perfect combinations of integers. The Treasury of Atreus stands out by having all the major geometric proportions identifiable with those of the series of Pythagorean Triads reported by Diophantus and known to the Mesopotamians. The length-unit for the Atreus Tholos Tomb coincides with the Lagash Gudea cubit of 0.496 m.

References

NEUGEBAUER, O., 1957. *The Exact Sciences in Antiquity.* Providence, Rhode Island: Brown University Press.

MALGORA, S., 2000. *L'uso dei numeri e la Ritualizzazione nelle Strutture Cerimoniali nella Topografia Monumentale di Saqqara.* Thesis. Bologna: Bologna University.

PATANÈ, A., 2006, *Indagine Archeoastronomica sulla Basilica Sotterranea di Porta Maggiore in Roma.* Thesis. Roma: "La Sapienza" University.

PELON, O., 1976. *Tholoi, Tumuli et Cercles Funéraire*s. Athens: Échole Française D'athénes.

RANIERI, M., 1997. Triads of Integers: How Space Was Squared in Ancient Times. *Journal of Ancient Topography - Rivista di Topografia Antica - JAT,* VII, 209-244.

RANIERI, M., 2002. Geometry at Stonehenge. *Archaeoastronomy: The Journal of Astronomy in Culture,* XVII, 81-93.

RANIERI, M., 2005. La Geometria del Tempio Urbano di Marzabotto (Regio I–Ins.5). In: *Culti, Forma Urbana e Artigianato a Marzabotto. Nuove Prospettive di Ricerca.* Bologna: Dipartimento di Archeologia Università di Bologna N°11, 73-87.

RANIERI, M., 2006. Contenuti geometrici, numerici, metrici e astronomici del tempio nuragico a pozzo "Su Tempiesu" di Orune. *Proc. 6° Convegno Annuale Società Italiana di Archeoastronomia.* Campobasso, Italy.

RANIERI, M., 2007. The Stone Circles of Li Muri: geometry, alignments and numbers In: M.P. ZEDDA, J.A. BELMONTE, eds. *Lights and Shadows in Cultural Astronomy.* Isili, Sardinia: Asssociazione Archeofilia Sarda, 58-67.

Received: 2 November 2007; Revised: 28 February 2008

ATRĖJO TOLAS MIKĖNUOSE IR PITAGORIEČIŲ GEOMETRIJA

Marcello Ranieri

Santrauka

Naudojant kompiuterinę automatizuoto projektavimo sistemą CAD (Computer Aided Design) buvo atlikta devynių laidojimo rūsių – tolų ir atskirai kapavietės, vadinamos „Atrėjo lobynu", geometrinė analizė. Siekiant klasifikuoti tyrinėjamas kapavietes, buvo išskirti bendri geometriniai tyrinėjamų laidojimo rūsių parametrai. Analizės pagrindas buvo geometrinių laidojimo rūsių proporcijų lyginimas pagal kompiuterine analize sudarytus planus su Pitagoro skaičių trejetais. Atrodo, kad Mikėnų architektai statiems kampams nustatyti naudojo tiek tikslius Pitagoro skaičių trejetus, tiek jų

artinius. „Atrėjo lobynas“ turi visas svarbiausias aiškiai atpažįstamas geometrines proporcijas, aprašytas Diofanto bei žinotas Mesopotamijoje ir būdingas Pitagoro skaičių trejetų geometrijai. „Atrėjo lobyno“ laidojimo rūsyje naudotas ilgio matas sutampa su Lagašo valdovo Gudėjo (Gudea) uolektimi – 0,496 m.

Vertė Audronė Bliujienė

MEASUREMENT SYSTEMS FOR MATHEMATICS AND ASTRONOMY IN ANTIQUITY: PTOLEMY'S CHORD CALCULATION AND NEW CONSIDERATIONS CONCERNING THE "DISCUS IN PLANITIA" ASCRIBED TO ARISTARCHUS. PART I

FLORIN STANESCU

Abstract

The aim of this work is to present new hypotheses concerning a great disk of andesite – approximately 7 m in diameter – which was discovered in Meridional Carpathians in Romania on the sacred terrace of the capital of the ancient kingdom of the Dacians. Having included in this structure all the specific features of a sun dial, the place's latitude **φ**, the obliquity of the ecliptic in epoch **ε**, as well as a north–south orientation, is possible and probable that this is the "discus in planitia" that Vitruvius ascribed to Aristarchus.

Key words: sundial, Andesite Sun, Soarele de Andesit, Sarmizegetusa Regia, sacred terrace, Dacian, astronomy in antiquity, discus in planitia.

Introduction

The ancient capital of the Dacian kingdom, Sarmizegetuza Regia, lies in the Orastie Mountains, Romania. Eleven round and rectangular sanctuaries have been discovered so far in this impressive complex of ruins called the Sacred Terrace.

Astronomical knowledge

Several ancient sources report on the astronomical activities of the Dacians. The beginnings of Dacian astronomy are connected to **Zalmoxis** (also known as Zamolxis), a legendary social and religious leader, regarded as a god by the Dacians. According to Herodotus (History, IV, 93-96) Zalmoxis was a slave or disciple of Pythagoras who taught him at Samos. After obtaining his freedom, Zalmoxis returned to his country, where he built a chamber and taught his countrymen of the doctrine of the immortality of the soul. **Strabo's** later report (*Geography* VII, 3,5) adds that Zalmoxis has learnt not only from Pythagoras, but also from the Egyptians, and gives him an ability to "report the will of the gods". Strabo is the first author who maintains that Zalmoxis learnt the science of the skies from Pythagoras:

"*He* [*i.e. Herodotus*] *tells us that one of the Getes named Zamolxis was the slave of Pythagoras and,* during this time, *he had learned from the philosopher the sciences of the sky*. A*fterwards he had assimilated other* knowledge *from the Egyptians, because he also wandered about in those places of the world"*. All later authors stated that Zalmoxis brought back to the Dacians, from Egypt and from Pythagoras, a mystic doctrine regarding the immortality of the soul together with the arts of civilization."

Saint Hippolytus of Rome (in the so-called *Philosophoumena*, II, 2, 22 known also as the *Refutation of All Heresies*) says that Zalmoxis " is said to have taught the Celtic Druids to cultivate the philosophy of Pythagoras" and **Porphyry of Tyre** (in *The Life of Pythagoras***)** narrates that "*... Also …Pythagoras taught him to study the celestial phenomena...".*

But the most conclusive report about Dacian astronomy is to be found in a description by **Iordanes, a 6th-century historian, in** Getica (V, 39, 69-71), of the early history of the Goths (Dacians). His work, in turn, was a summary of the now lost Cassiodorus' much

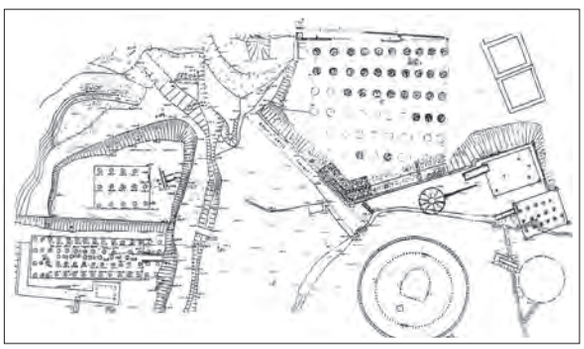

Fig. 1. Map of the zone of the sanctuaries at Sarmizegetusa-Regia, Romania.

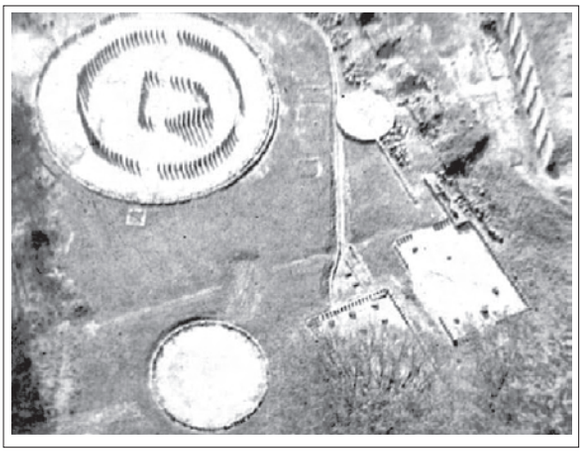

Fig. 2. The Great Round Sanctuary with the Central Apse, with a diameter of almost 30m and oriented towards sunrise at the winter solstice; the Small Round Sanctuary with a diameter of almost 13m; two other rectangular andesite sanctuaries with north-south orientation; the altar-sundial known as the "The Andesite Sun", and the "stone-ray" indicating the north-south direction.

longer treatment of the history of the Goths (Gaeto-Dacians): "By demonstrating theoretical knowledge he urged them to contemplate the twelve signs and the courses of the planets passing through them, and the whole of astronomy. He told them how the disk of the moon gains increase or suffers loss, and showed them how much the fiery globe of the sun exceeds in size our earthly planet. He explained the names of the three hundred and forty-six stars and told through what signs in the arching vault of the heavens they glide swiftly from their rising to their setting (70). You might have seen one scanning the position of the heavens and another investigating the nature of plants and bushes. Here stood one who studied the waxing and waning of the moon, while still another regarded the labors of the sun and observed how those bodies which were hastening to go toward the east are whirled around and borne back to the west by the rotation of the heavens".

Ancient Instruments

Numerous compasses made of iron and used for marking circles or measuring small distances have been found at Dacian sites. They are all typical of the epoch (first two centuries AD) and similar to the types known in the Graeco-Roman World (see Fig. 3). It has been observed that while the fastening mechanism for the arms of these compasses is the same as is found generally, its ends allow other arms or tips to be attached, making it different from all other known instruments (cf. Fig. 3A and B; and Fig. 4).

Description of the Research Goals

Following Vitruvius, Ptolemy provided a geometrical means of calculating the sun's position at any date and observer location by the use of constructions called analemmas. An important application of analemmas was the design of **Ptolemy's Coordinate System which** involved the orthogonal projection of the celestial sphere onto three mutually perpendicular planes: the "horizon", the "vertical" and the "meridian" (Fig. 5). Their intersections are called, respectively, the "Meridian line" (M-axis), the "Equinoctial line" (E-axis) and the "Gnomon line" (Z-axis). In order to define spheri-

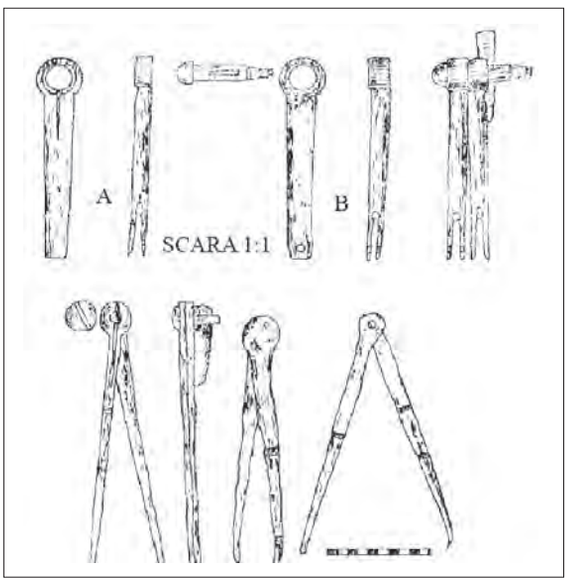

Fig.3. Dacian compasses of the "pantographical" type (A and B).

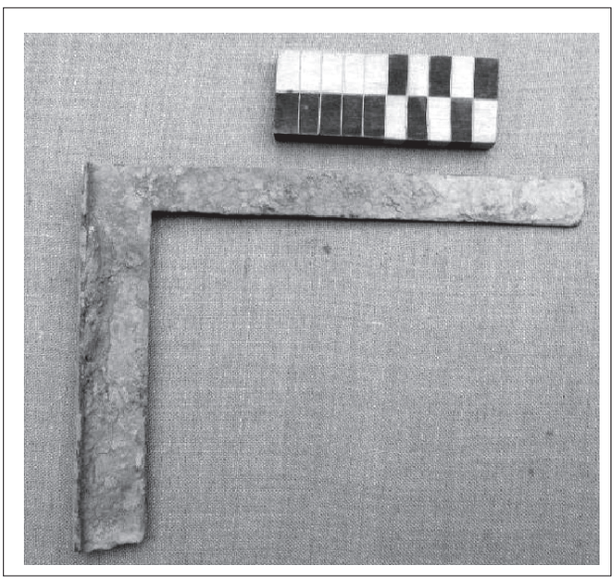

Fig. 4. A Dacian bronze square (triangle).

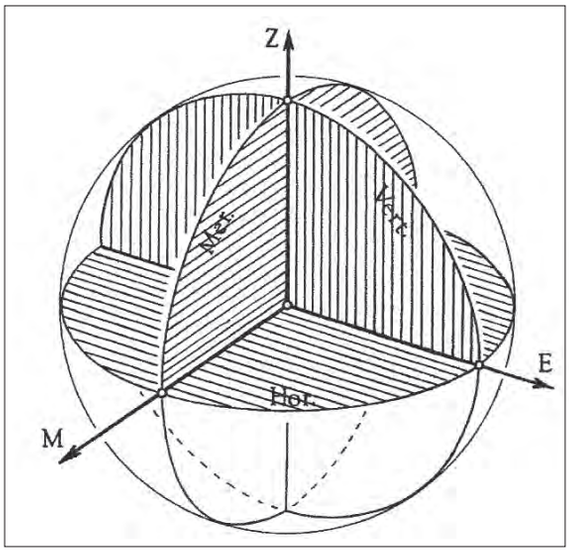

Fig. 5. Ptolemy's Coordinate System: three orthogonal planes.

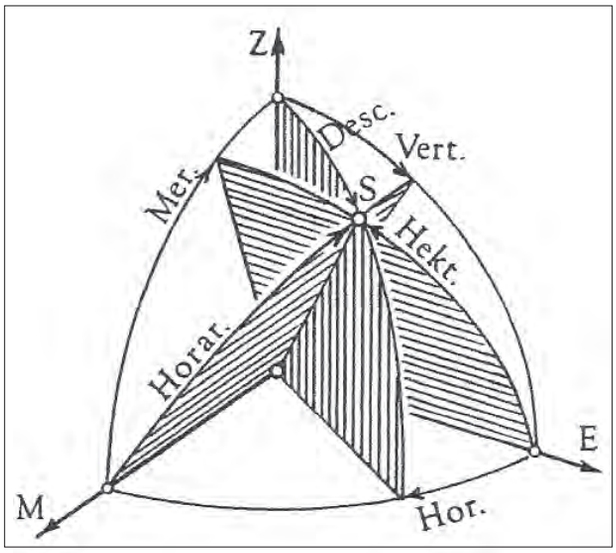

Fig. 6. Ptolemy's Coordinate System: three moveable great circles.

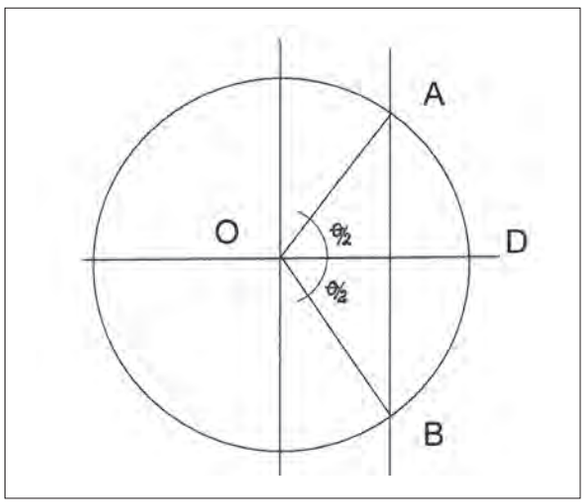

Fig. 7. „Crd θ" is the length of the chord AB.

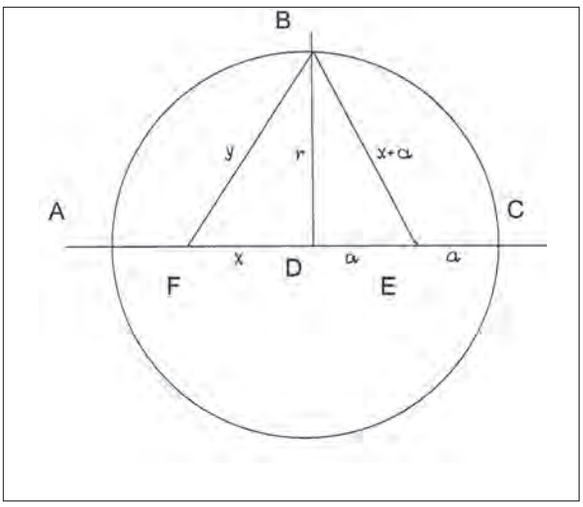

Fig. 8. Chord lengths for the central angles corresponding to the sides of a decagon, hexagon, and pentagon.

cal coordinates for an arbitrary point "S" (this point representing the Sun), Ptolemy (Figure 6) replaced the lines with moveable circles called the hectemoros (the circle that passes through the east and west points and the sun), the horarius (the circle that passes through the meridian circle and the sun) and the descensivus (the circle that passes through the zenith and nadir points and the sun). Analemmas served to construct accurate sundials for any location.

Hellenistic trigonometry

As is known, the first recorded use of trigonometry is derived from the works of Hipparchus, while later in his *Almagest* Ptolemy developed extended trigonometric calculations. Among other things, Ptolemy transformed Hipparchus's table of chords. First, since the length of the chord depends on (is proportional to) the radius of the circle, Ptolemy constructed a more complete table of chords using a different large fixed radius. Second, his table had chords for angles increasing from 1/2 degree to 180 degrees in steps of 1/2 degree. Ptolemy had chosen a circle whose diameter and circumference were divided into 120 and 360 parts, respectively. Then, he calculated the chord length for every central angle up to 180 degrees in half-degree steps (Fig. 7).

This, in turn, enabled Ptolemy to calculate the chord lengths for the central angles that correspond to the equilateral and equiangular figures of the decagon (internal angles of 144°), hexagon (internal angles of 120°), pentagon (internal angles of 108°), square (internal angles of 90°), and triangle (internal angles of 120°).

Fig. 9. The Andesite Sun with the stone arrow discovered in 1978. Photograph by Daniel Baltat.

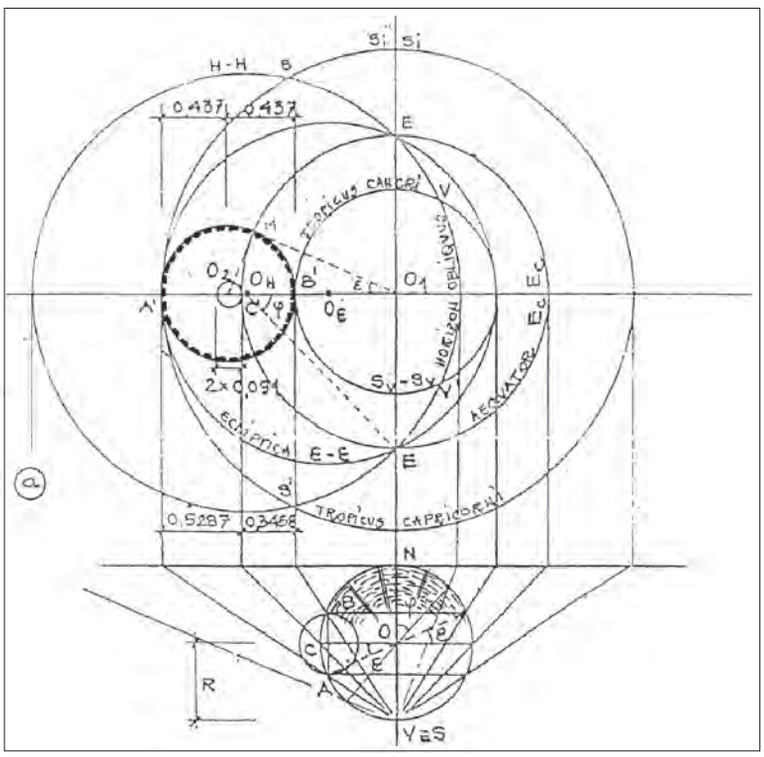

Fig. 10. The reconstruction of the supposed Hipparchus planispheric astrolabe.

Using the data in Figure 8 it can be proved that the chord lengths for the central angles are: 37° 4' 55" for a decagon, 60° for a hexagon and 70° 32' 3" for a pentagon.

"The Andesite Sun" at Sarmizegetusa Regia, Romania

Also placed on the Sacred Terrace, west of the Great Round Sanctuary (diam. = 30 m), is the Andesite Sun, a huge circular disk (diam. = 6.98 m), divided into ten slices of 36 degrees each. At 0.45 m from its edge there are rectangular groves, some of them being "T" shaped.

Connected to one side of the disk is a long "arrow" made of limestone, reaching a total length of 9.55 m. The arrow of the Andesite Sun indicates the north. The idea is to consider the Andesite Sun to be a type of sundial.

The stereographic projection and the planispheric astrolabe

Attempts to project a sphere onto a plane resulted in the stereographic projection. Hipparchus (180-125 BC) is said to have formalized the projection as a method for solving complex astronomical problems without using spherical trigonometry. Although he refined projection theory and systematically used the 360° circle, he probably did not invent the astrolabe. The earliest evidence of the use of the stereographic projection in an artifact is due to Vitruvius (ca. 88 – ca. 26 BC). However, Hipparchus may have invented the planispheric astrolabe, used to define stellar (and solar) positions. The planispheric astrolabe is a two-dimensional model of the celestial sphere in relation to the earth, based on the assumption that the earth is at the centre of the universe. One side of the disk usually displays circles divided by different kinds of gradations, such as 360 degrees. It is only in Late Antiquity, when the zodiac was divided into twelve "signs" or thirty-six "decans", that a seasonal cycle of roughly 360 days could have corresponded to the signs and/or decans of the zodiac by subdividing each sign into thirty equal parts, or each decan into ten parts (Fig. 10).

The Results Obtained So Far, Including AN Interpretation

In the second part of the paper we will present some new hypotheses concerning the sundial called the "discus in planitia", ascribed by Vitruvius to Aristarchus, and the properties of the altar-sundial ("The Andesite Sun") at Sarmizegetusa Regia, Romania.

References

CLAUDIUS PTOLEMAEUS, 1952. *The Almagest*. Great Books of the Western World, 16, Encyclopaedia Britannica, Inc. Chicago, London: Toronto.

ELERT, G., 1994. *Ptolemy's Table of Chords.* Electronic document, http://hypertextbook.com/eworld/chords.shtml

NEUGEBAUER, O., 1975. *A History of Ancient Mathematical Astronomy*. In three volumes. London: Springer-Verlag.

HEATH, T., 1913. *Aristarchus of Samos*. Oxford: Clarendon Press.

DELAMBRE, J., 1965. *Histoire de l'Astronomie Ancienne.* Volume 2. New York: Johnson Reprint Co.

STANESCU, FL., C., 1993. Archaeoastronomical Researches at Sarmizegetusa Regia, Romania. *PACT*,45, VIII.1, Bruxelles.

Received: 2 November 2007; Revised: 30 November 2008

SENOVĖS MATEMATINIŲ IR ASTRONOMINIŲ MATAVIMŲ SISTEMOS: PTOLEMĖJO SKAIČIAVIMAI STYGOMIS IR NAUJAS POŽIŪRIS Į „DISCUS IN PLANITIA“ PRISKIRIAMĄ ARISTARCHUI. I DALIS

Florin Stanescu

Santrauka

Straipsnio tikslas – pristatyti naują hipotezę apie žymųjį andezitinį 7 m skersmens diską, kuris buvo rastas Pietų Karpatų kalnų regione, Rumunijoje, Senovės Dakų karalystės sostinėje, ant šventa laikytos terasos. Šiai konstrukcijai yra būdingi visi Saulės disko specifiniai bruožai: vietovės platuma φ, ekliptikos pasvirimas epochoje ε, šiaurės – pietų orientacija, todėl yra tikėtina, kad šis diskas yra tas pats „Discus in Planitia“, kurį Vitruvijus priskyrė Aristarchui.

Vertė Audronė Bliujienė

VI. LANDSCAPE ARCHAEOLOGY AND ARCHAEOASTRONOMY

INTEGRATING ARCHAEOASTRONOMY WITH LANDSCAPE ARCHAEOLOGY: SILBURY HILL – A CASE STUDY

LIONEL SIMS

Abstract

Weaknesses in both archaeoastronomy and landscape archaeology can be overcome by their combination. This is demonstrated through a new interpretation of Silbury Hill in Avebury, Wiltshire. If monuments in their local landscape are considered as one choice in a system of alternatives, tests can be devised to intepret the prehistoric builders' intentions. This exercise finds that the builders chose a prescriptive arrangement of views of Silbury Hill to simulate a facsimile of the moon entering and returning from the underworld.

Key words: dark moon, crescent moon, paired alignments, Silbury Hill, West Kennet Avenue, Beckhampton Avenue, Avebury, underworld.

Introduction

Archaeoastronomy has to move on from the legacy of the Thom paradigm if it is to prove its relevance to science (Sims 2006). Over the last three decades the discipline has established robust field methods procedures and, in so doing, falsified Thom's claim for a prehistoric precision astronomy (Thom 1971; Ruggles 1999; Hoskin 2001, Belmonte 2006; Schaefer 1993; North 1996). It is now standard fare for archaeoastronomers to demonstrate whether ancient monuments have non-random alignments on the sun's solstices, the moon's standstills or astral alignments, all accurate at best to one-third of one degree. The question is: so what? Is it to be left to other disciplines like archaeology and anthropology to then interpret the meaning of such alignments (see Lankford 2007, p.1-19)? This paper suggests that an inter-disciplinary approach could achieve the breakthroughs that have so far eluded archaeology.

Silbury Hill

The archaeology of Silbury Hill

Silbury Hill (SH), one part of the Avebury monument complex in Wiltshire, England, is the largest prehistoric man-made mound in Europe. It is 37 metres high and designed in the shape of a regular truncated cone with a level circular summit platform.To date, no convincing explanation as to its meaning has been offered. Archaeologists have long expected that excavating the interior of the hill would reveal burials or deposited artefacts that would provide the clues to its decoding. In spite of the many tunnels that have been dug, so much so that the Hill has now to be rescued from imminent collapse, no burials have been found nor interpretive breakthroughs made. Barrett suggested that SH, seen from other structures in the Avebury monument complex, is an elevated platform upon which a select few can observe and be observed (Barrett 1994, p.31). This would not explain why steps cut into the chalk from the causeway entrance travel *down* into the seasonal moat rather than up to the summit platform, nor why the Hill was built in the *lowest* part of the local landscape, or why some smaller structure might not have been built on the top of the equally high and adjacent Waden Hill.

The archaeoastronomy of Silbury Hill

Three different claims have been made for the astronomy of SH, all of which are found wanting by modern archaeoastronomical methods. Dames suggested that the west-east axial alignment Venus figurine shaped moat surrounding SH provided an agricultural calendar when, at the equinoxes, the sun and moon alternately rose and set from her moat vulva and into her

moat head. Dames further claims that a summer sunrise and winter sunset line doubled for the mid-winter and mid-summer mid-swing full moonrises and moonsets at inter-standstill years, and traced a line of azimuth through the base of the figurines spine towards the womb-head (Dames 1976, p.117-176). All of these claims are made to fit a plan diagram which conflates a viewing platform at 187 metres above sea level with a moat level at 149 metres beyond to distant horizons with no contemporaneous foresights. While lines on a plan diagram may be made to intersect anthropomorphic qualities invested in a watery figurine, no such line exists for an observer nearly 40 metres above the level of the winter fosse which surrounds SH. All of these claims are better explained as the *post festum* findings of a problemmatical mother-goddess model. North (1996) has suggested that from the base and final summit of SH, astral alignments on the risings of Sirius and Rigel respectively would have been seen over the nearby East Kennet Long Mound. This may be so, but then SH is surrounded by one of the greatest concentrations of mid-Neolithic long mounds and Early Bronze Age burial mounds in the world, and it would not be a surprise if just one of them could be found by chance to have a horizon alignment from SH on a single asterism. Lastly, Devereux (1991) has claimed that the terrace feature 4-5 metres below the level of the summit platform allowed a repeat viewing of summer solstice sunrise over the adjacent Waden Hill. But since the terrace is most elaborated to the north of the summit surround, not to the north-east, and since no markers exist either as backsight on SH or as foresight on Waden Hill, then it is simpler to assume that the terrace had some other function. Beside these three claims, archaeoastronomy has not been able to find any significant solar or lunar alignment upon SH from any of the three main circular enclosures that make up the monunent complex (West Kennet Palisades, the Sanctuary or the Avebury Circle).

The landscape archaeology of Silbury Hill

Neither archaeology nor archaeoastronomy have so far succeeded in interpreting SH. It offers a further paradox – it is placed roughly in the middle of a monument complex from which views of SH are intermittently obscured by intervening hills (Fig. 1). It‘s location is especially curious when considered against the landscape just north of the Avebury circle, which offers an almost perfectly level plain and which leads to the flanks of the ancient venerated site of the Windmill Hill causewayed enclosure. Central place theory would predict that this would be an ideal location for an elevated viewing platform, upon which local ritual specialists could out-pomp visitors from the nearby Marden, Stonehenge and other monument complexes. If we put this paradoxical property at the centre of our inquiry this constrains both archaeoastronomy and landscape archaeology to operate on a higher level than when each is used in isolation.

Archaeoastronomy has mainly adopted a statistical approach in dealing with the problem of intentionality – are alignments in prehistoric structures random or by design? By aggregating regional groups of monuments with identical design, and using rigorous scaling procedures for identifying sightlines, the distribution of deviations from these grouped alignments against randomly generated lines of sight provides statistical tests to guard against the over-interpretation common to the discipline in the 60‘s and early 70‘s. This methodology has established that not only did five regional groups of monuments in late Neolithic and Early Bronze Age British Isles have solar and lunar alignments, albeit at levels of precision of at best one-third of one degree rather than Thom‘s claim of one second of arc, but that 322 of them had paired alignments which bracketed the winter solstice sun with the southern standstill moons (Ruggles 1999). However, this method cannot begin to deal with the unique and outstanding monuments that represent the culmination of this megalith building culture, like Newgrange in Ireland, and Avebury and Stonehenge in Wiltshire, each of which are one of a kind. Landscape archaeology, on the contrary, specialises in studying in great detail the landscape context of an individual monument in their intimate association. The work of Tilley, in particular, sensitises us to the embodied experience of walking around and through the monuments, and how this experience is sublty manipulated by views and perceptions which are modified by our landscape location as we move through them (Tilley 1994). However, unlike in archaeoastronomy, which has developed rigorous selection critieria for what can and can‘t be admitted as data, Tilleys phenomenological approach has been severely criticised for „...a version of landscape archaeology which is much more dependent on rhetoric, speculation, argument by assertion, and observation not always replicable when checked“ (Flemming 2005, p.930). If we can devise a method that combines the particularity of Tilley‘s landscape archaeology, but combines it with the rigour of robust selection critieria now standard in archaeoastronomy, then the combined methodology should assist a decoding of unique monuments like SH.

The Avebury monument complex assists such an enterprise, since it prescribes through its two avenues of parallel rows of stones (West Kennet Avenue and Beckhampton Avenue, marked 3 & 5 respectively in Fig. 1) the ritual routes processionists would have

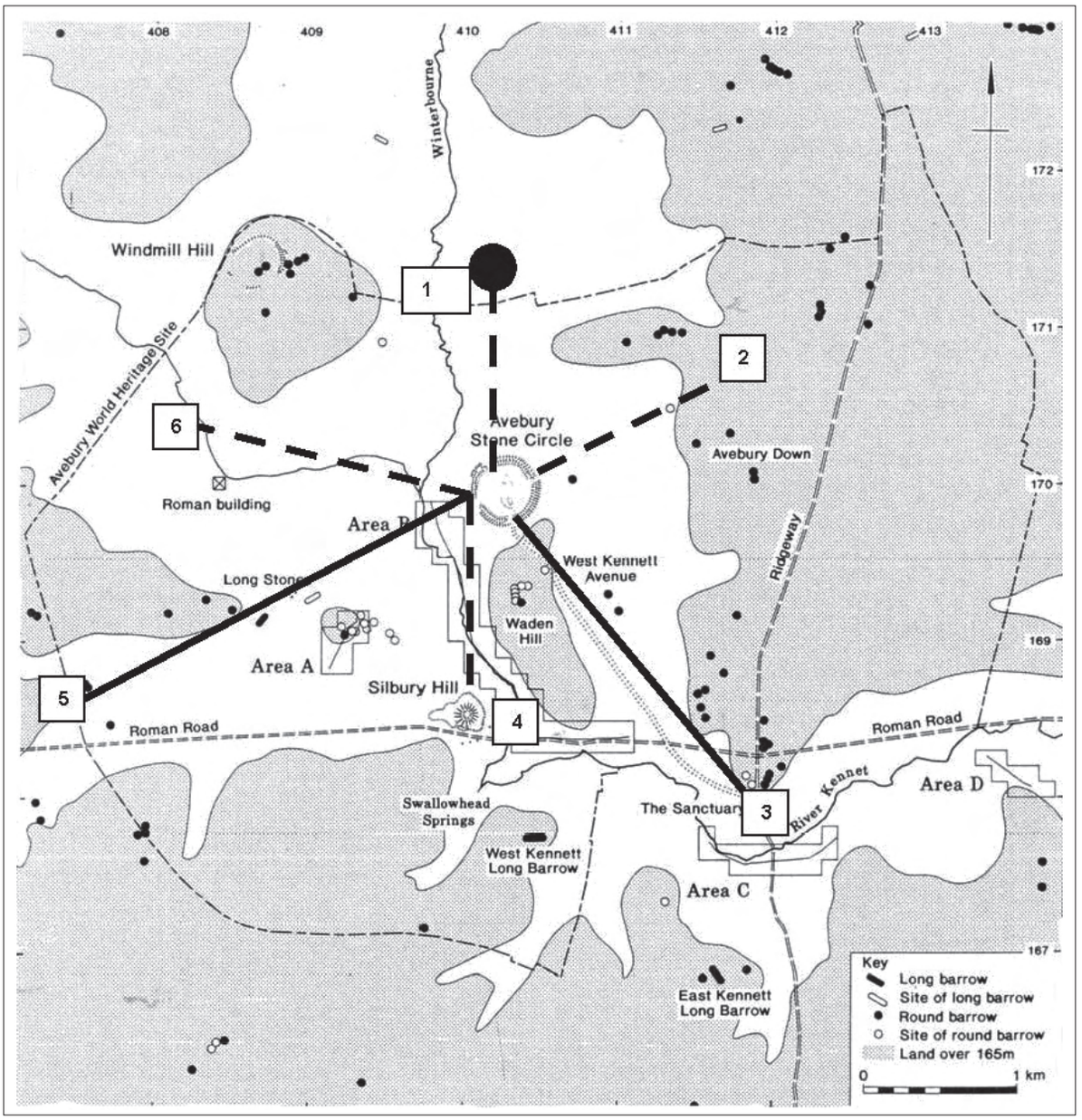

Fig. 1. Avebury Complex with schematic Avenues, including other possible Avenues and SH location given (a) the position of Avebury circle and (b) landscape variation. (Adapted from Powell 1996, p. 11).

travelled in the late Neolithic and Early Bronze Age. But to guard against the limited interpretations these actually chosen routes might suggest to our subjective experience, we can consider the landscape as a region of variability, in which many other opportunities were simultaneously available but actually not taken by the monument builders. For this procedure we assume that the level of technological expertise, amount of labour power available, architectural design, landscape and, in this case, Avebury Circle, are all held constant. We introduce variability by considering all of the logical possible alternative routes for the two Avenues and location for SH which would exhaust the properties of the local landscape which participants could embody. This is not an arbitrary procedure. For example, it is not the case that there could be as many alternative Avenues as degrees to a circle emanating from Avebury Circle. We choose only, but all, of those alternative routes that offer a *qualiatively* different aspect of SH when walking towards or away from Avebury circle (1,2,4 & 6 in Fig.1). If this procedure is fruitful, then our expectation is that the chosen routes for the two avenues at Avebury were selected against all of the logical alternative routes precisely because they offered a unique suite of views required for the ritual practiced at this site. If we cannot find a unique portfolio of views which are also consistent with known properties of the monument, then this exercise will have severely qualified the phenomenological approach in landscape archaeology.

Landscape as a region of alternatives

It can be shown (Sims 2009) that the chosen combination of Avenues offer more and systematically different views of SH compared to all other logically possible pairs of avenues, and for whether SH is located on the flat plain north of Avebury Circle (at end of avenue 1 in Fig. 1) or in its actual location near to the southern end of Waden Hill. This exercise reveals that the monument builders wanted a pair of avenues that skirted SH at a roughly constant distance, and for which for over 70% of their length all views of the hill were completely obscured by two intervening hills (Waden Hill, and a ridge centred on Area A on Fig. 1). The builders would have had no difficulty in locating either SH or the avenues on the flat plain north of Avebury Circle, or to have routed the avenues directly towards or away from a SH built in either location. The only conclusion to be drawn is that the builders *intended* viewing SH not in analogue mode, in constant view and growing or diminishing in size with directly approaching avenues, but in digital mode as carefully selected views at a distance from five key positions in the monument complex separated by long sections of the Avenues in which all views were obscured. At the start of Beckhampton Avenue (5 in Fig. 1) SH can be seen with its summit platform protruding above the background eastern horizon; from where the Beckhampton Avenue crosses the River Winterbourne just to the west of the Avebury Circle, the level summit platform exactly coincides with the level of the background horizon to the south; from stone i of the D feature in the centre of the inner southern circle within Avebury Circle, looking to the south-south-west the cropped top of SH protrudes above Waden Hill; processing around the rest of the stones of the D feature, this cropped top gradually slips below the lip of Waden Hill; at the Obelisk stone, at the apex of the D feature, and the largest stone in the Avebury complex, the top of SH is obscured by the large blocking stone 102 of the southern inner circle; and finally, from the Sanctuary the top of SH is again exactly in line with the background western horizon. These are the only seven views, from five positions, prescribed by the architecture of the late Neolithic and EBA Avebury complex. For the rest of their lengths SH cannot be seen from the Avenues.

Integrating archaeoastronomy and the phenomenology of landscape

Davies and Robb (2004) have suggested that behind the many particularistic references archaeologists have made to an underworld lies a more general theme. They demonstrate that features such as caves, rock fissures, sink holes, flint mines, shafts, tree-throw hollows, ditches, pits, springs, bogs, rivers, lakes and post and stone holes have been interpreted as portals to the underworld. In their exploration of archaeologist's underinterpretation of this verticality dimension, that show that many of these features, and others such as burial mounds and ditch banks, can be seen as designed as if they were being viewed from the underworld. Surprisingly they do not extend the dimension of verticality to the above world. Most of the astronomical alignments found by modern archaeoastronomy are to the western horizon, on the settings of stars, moon and sun (North 1996; Ruggles 1999). This is counterintuitive to the expectation of observational astronomy, but entirely consistent with the religious reqirement to mark the horizon portals to the underworld. Extending this insight to the seven prescribed views of SH seen from the Avenues and southern inner circle at Avebury, there is only one empirical entity that fits the condition of a chalk white crescent scarp that to the east is proud of the horizon, to the south and west is level with the horizon, and from the Avebury circle sinks on the south-south-west horizon and is occulted by a blocking stone. That entity is the moon in its waning crescent before sunrise, its dark moon occultation, and its waxing crescent sets – namely those phases before, during and after dark moon. Since the Avebury circle has been shown by North (1996) to have a paired alignment on the winter solstice sunset and the southern major moonset, Ruggles (1999) has shown that the same combination of alignments can be found at over 322 other stone structures of the period, and as these combinations always generates dark moon at winter solstice (Sims 2006, 2007), then this model of SH is an extension of the concept of the underworld consistent with other known properties of the Avebury monument complex.

One final comment needs to be made. Davies and Robb imply that monument structures can be visualised as membranes not just *to* the underworld, but *from* the underworld. The specific design properties of a monument might then also be perceived as if it were being viewed *from* the underworld. We can extend this insight when we consider the seven views prescribed by the Avenue routes and Avebury Circle. If our hypothesis that the scraped clean chalk wall of the upper terrace on SH is a representation of the rising and setting crescent moon is correct, and if from two places along the Avenues we see this crescent of chalk to be level with the background horizon – then we are witnesses to a moon that *is in the underworld*. More than that, if we as ritual participants can observe the moon in the underworld, then this representation immediately places us along with the moon in the underworld. *As an embodied experience, it shifts us from this world to the underworld.*

Seen this way, one function of the Avebury monument complex is, by interaction with the local landscape, to simulate a journey into, through and back from the underworld by building a facsimile of the moon entering and returning from the underworld.

References

BARRETT, J., 1994. *Fragments from Antiquity.* Oxford: Blackwell.

BELMONTE, J. A., GASPAR, A. T., BETANCORT, A.P. and MARRERO, R., 2006. On the orientation of pre-islamic temples of north Africa: a re-appraisal. *Mediterranean Archaeology and Archaeometry*, 6(3), 77-85.

DAMES, M., 1976. *The Silbury Treasure*. London: Thames and Hudson.

DAVIES, P. and ROBB, J. G., 2004. Scratches in the Earth: The underworld as a theme in British Prehistory. *Landscape Research*, 29 (2), 141-151.

DEVEREUX, P., 1991. 3-Dimensional aspects of apparent relationships between selected natural and artificial features within the topography of the Avebury complex. *Antiquity,* 65, 894-989.

FLEMMING, A., 2005. Megaliths and post-modernism: the case of Wales. *Antiquity,* 79, 921-932.

HOSKIN, M., 2001. *Tombs, Temples And Their Orientations: A New Perspective on Mediterranean Prehistory*. Oxford: Ocarina.

LANKFORD, G.E., 2007. *Reachable Stars*. Tuscaloosa: Alabama UP.

NORTH, J., 1996. *Stonehenge: Neolithic Man and the Cosmos.* London: Harper Collins.

POWELL, A.B., ALLEN, M.J. and BARNES, I., 1996. *Archaeology in the Avebury Area.* Salisbury: Harper Collins.

RUGGLES, C.L.N., 1999. *Astronomy in Prehistoric Britain and Ireland*. London: Yale UP.

SCHAEFER, B., 1993. Basic research in astronomy and its applications to archaeoastronomy. In: C.L.N. RUGGLES, ed. *Archaeoastronomy in the 1990's*. Loughborough: Group D Publications LTD.

SIMS, L.D., 2006. The Solarization of the Moon: Manipulated Knowledge at Stonehenge. *Cambridge Archaeological Journal,* 16(2), 191-207.

SIMS, L.D., 2007. What is a lunar standstill? Problems of Accuary and Validity in the Thom paradigm. *Mediterranean Archaeology and Archaeometry,* Special Issue 6(3), 161-168.

SIMS, L.D., 2009. Entering, and returning from, the underworld:reconstituting Silbury Hill by combining a quantified landscape phenomenologywith Archaeoastronomy. *Journal of the Royal Anthropological Institute*,15, 386-408.

THOM, A., 1971. *Megalithic Lunar Observatories*. Oxford: UP.

TILLEY, C., 1994. *A Phenomenology of Landscape*. Oxford: Berg.

Received: 30 October 2007; Revised: 17 September 2008

ARCHEOASTRONOMIJOS IR KRAŠTOVAIZDŽIO ARCHEOLOGIJOS JUNGTIS: SILBURY HILL ATVEJO ANALIZĖ

Lionel Sims

Santrauka

Priešistorinių paminklų archeoastronominė interpretacija patiria daugiau sunkumų, kai susiduriama labiau su išskirtiniais vietos kraštovaizdžio ypatumais nei su astronominėmis orientacijomis. Vyraujanti regioninių paminklų grupių statistinio apdorojimo metodologija netinka tokiems unikaliems paminklams kaip, pvz., Avebury Viltšyro (Wiltshire) grafystėje. Tilley (1994) kraštovaizdžio fenomenologija tiksliai apibrėžia konkretaus paminklo interpretacijas to paminklo kraštovaizdžio kontekste. Vis dėlto Tilley buvo smarkiai kritikuojamas dėl kraštovaizdžio ypatumų atrankos ir iš to išplaukiančių metaforinių prielaidų (Flemming 2005). Straipsnyje pateikiama detali Silbury Hill analizė kraštovaizdžio ir vėlyvojo neolito – ankstyvojo bronzos amžiaus paminklų kontekstuose atskleidžia, kad su abiejų metodų problemomis gali būti susidorota pasitelkus antropologinį Saulės ir Mėnulio jungties modelį.

Siekiant išvengti interpretacijų apie išlikusias kiekvieno paminklo struktūras ribotumo, tam tikrą kraštovaizdį galime laikyti kintančiu ir kartu teikiančiu daugybę įmanomų galimybių, kuriomis tų paminklų kūrėjai nepasinaudojo. Laikėmės prielaidos, kad technologinės kompetencijos lygis, prieinamos darbo jėgos kiekis, architektūrinis stilius, kraštovaizdis ir – šiuo atveju – Avebury ratas buvo pastovūs. Kintamumą įvertinome, nagrinėdami visas logiškai įmanomas alternatyvias dviejų alėjų kryptis ir Silbury Hill vietas, susijusias su tam tikromis landšafto detalėmis, kurios galėjo būti panaudotos įkūnijant tam tikras ritualams svarbias idėjas. Iš alternatyvių krypčių nagrinėti pasirinkome tik tas, kurios teikė kokybiškai kitokį Silbury Hill aspektą einant link arba iš Avebury rato. Jei šis metodas pasiteisintų, būtų patvirtinta mūsų idėja, kad dviejų Avebury alėjų kryptys buvo tikslingai pasirinktos iš įvairių galimų, nes atitiko kompleksą vaizdų, reikalingų šioje vietovėje atliekamiems ritualams.

Bandymai atskleidė, kad iš šių alėjų buvo matoma tik Silbury Hill viršutinė terasa, kuri taip įrengta tam, kad nurodytų į besileidžiančio Mėnulio pjautuvą. Dviejose alėjų vietose antrojo plano horizonte yra matomas kreidinis pjautuvas – meninė priemonė, kuri liudija mums Mėnulio nusileidimą ir jo buvimą požeminiame

pasaulyje. Manome, kad šia prasme viena iš Avebury paminklų komplekso ritualinių funkcijų galėjo būti kelionės į požeminį pasaulį ir sugrįžimo iš jo imitavimas, derinant vietos kraštovaizdį ir Mėnulio pozicijas.

Vertė Jurgita Žukauskaitė

FROM UMM AL QAB TO BIBAN AL MULUK: THE ORIENTATION OF ROYAL TOMBS IN ANCIENT EGYPT

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Abstract

This paper presents a preliminary approach to the problem of royal tomb orientation in ancient Egypt from the early dynastic mausoleums at the necropolis of Umm al Qab to the impressive subterranean chambers of the tombs at the Valley of the Kings (Biban al Muluk). This clearly shows that the correct orientation of the monuments, from the earlier mastabas to the later hypogea, was mandatory and that the sky plays a key role in understanding ancient Egyptian funerary monuments.

Key words: archaeoastronomy, Umm al Qab, pyramids, Valley of the Kings, orientations.

Introduction

Since November 2003, we have been working for the "Egyptian-Spanish Mission on the Archaeoastronomy of ancient Egypt" under the auspices of the Supreme Council of Antiquities and with the financial support of the Spanish Ministry of Education and Science under the project *Orientatio ad Sidera*. So far, we have undertaken five field campaigns all over the country performing systematic, statistically significant, studies on Egyptian archaeoastronomy. This is the first study of this type ever performed in Egypt.[1]

One of the main objectives of the project was to provide a definitive answer to the question: were ancient Egyptian sacred buildings astronomically orientated? This had been a very controversial topic between Egyptologists and archaeoastronomers for decades (see, for example, Lockyer 1993; Hawkins 1973; Krupp 1988; Lehner 1997 and Lull 2004). Most of the Egyptologists supported the idea that the sacred buildings (and especially the temples) were topographically orientated in accordance with the course of the Nile, but this had never been proven. Our preliminary results on the temples of Upper Egypt (Paper 1) have demonstrated statistically that this was indeed the case. However, we have also shown that certain astronomical phenomena were also of concern to the ancient Egyptians temple builders. In fact, we are discovering that landscape, in its broader sense that includes both terrestrial and celestial aspects, played a key role in the location and the orientation of different sorts of sacred buildings in ancient Egypt throughout all of its history (for the temples, see Papers 1 to 4).

One of the most interesting groups of monuments we have studied is that of the royal necropolises of ancient Egypt. Fieldwork was undertaken at Umm al Qab near Abydos, where the royal necropolis of the proto-Dynastic period is located; in the extensive area near Cairo, where the huge fields of pyramids of the Old and Middle Kingdoms can be found; and at Biban al Muluk (the Valley of the Kings) at Thebes, where the underground tombs of the kings of the New Kingdom were excavated. In addition, we visited the sites of Tanis and Mendes and took measurements at the royal necropolises of the 21st–22nd and 29th Dynasties, respectively.

Discussion

The necropolis of Umm al Qab, close to the sacred city of Abydos, covers a wide area of several hectares running from the base of the desert cliffs, where the tombs themselves are located, to the limit of cultivated land where the funerary precincts were built. It includes the tombs of all the kings of the 1st Dynasty, a few of the 2nd Dynasty and several of the pre-Dynastic period (the so-called 0 Dynasty). The area has been extensively excavated on several occasions but most of the tombs, excluded that of Den, have been covered over again (mostly for protection) using sand from the desert. However, there are detailed plans of the site and the perimeter of various tombs has been carefully marked by rows of small stones so that the orientation can be

[1] The results of these campaigns on the temples have been published in a series of papers: Shaltout and Belmonte (2005), Belmonte and Shaltout (2006), Shaltout, Belmonte and Fekri (2007, Part I and II) and Belmonte, Shaltout and Fekri (2008), hereinafter Papers 1, 2 ,3 and 4 respectively.

Fig. 1. The area of Umm el Qab where the necropolis of the first kings of Egypt is located. A series of stones marking the outline of the chambers of the tomb of King Narmer can be seen in the foreground. The chamber axis is orientated with an azimuth of 314¾º similar to the other monuments of the necropolis, making Umm al Qab an early example of the intercardinal family of orientations as defined in Paper 3.

Fig. 2. The entrance to the underground chambers of the tomb of Hotepsekhemuy, the first king of the 2nd Dynasty, in Saqqara. Orientated with an azimuth of 1½º, it is one of the first monuments in Egypt to be oriented close to the Meridian line. Photographs by Juan A. Belmonte.

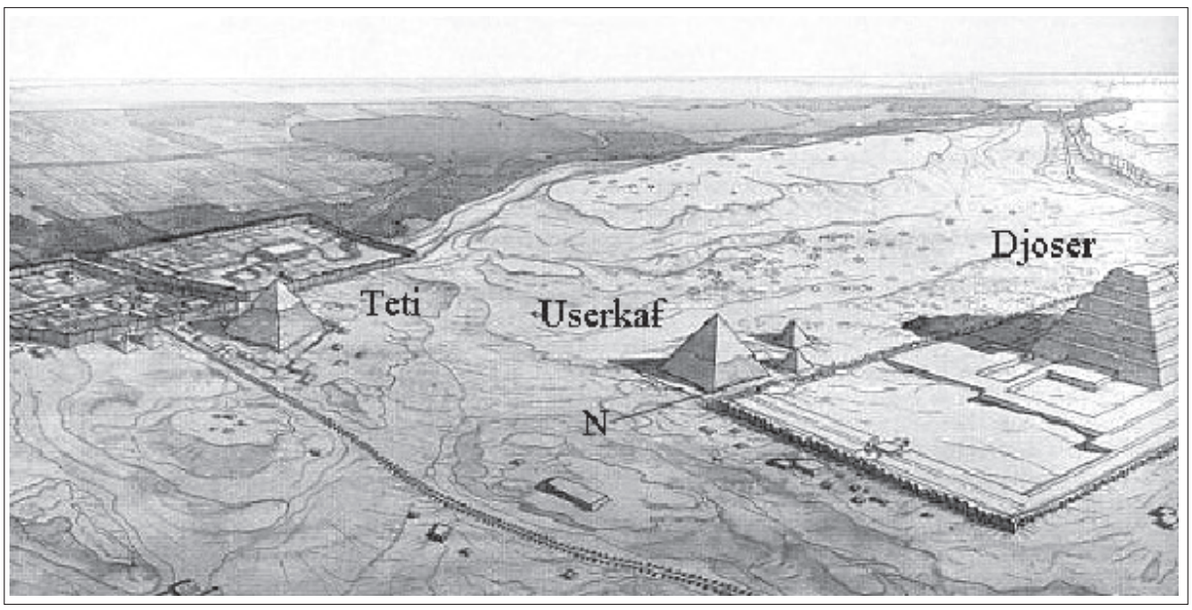

Fig. 3. The central area of the northern sector of the necropolis of Saqqara in the Late Period. The ruins of the pyramids of Djoser, Userkaf and Teti dominate the landscape. The picture is quite precise and shows that the pyramid complex of Teti is the worst orientated of the burial complexes of the Old and Middle Kingdoms. Skewed round to face an azimuth of 80¾º, the anomalous orientation of the temple of the pyramid could have interesting topographic and time-keeping connotations. See the text for further discussion. (Adapted from Aufrère and Golvin 1997).

Fig. 4. The mountains of Thebes in the vicinity of the Valley of the Kings. The latter is located at the centre of the image, at the bottom of the impressive pyramid-shape peak of El Qorn. In such a place, it would be logical that tomb orientations would be dictated by the local topography. Photograph by Juan A. Belmonte.

measured with a reasonable degree of confidence. Figure 1 illustrates one of those cases, showing the tomb of King Narmer, the founder of the 1st Dynasty. The axes of the two chambers of the tomb are oriented with an azimuth of 314¾º.

Indeed, this is the general pattern of orientation for the axes of most of the 1st Dynasty tombs. In Paper 4, we have argued that a good many of the temples in Abydos would be paradigmatic examples of the intercardinal family of orientations as defined in Paper 3 (see also, Miranda, Belmonte and Molinero 2008), where a north-south line was determined astronomically and the axis of the monuments was then obtained by rotating the meridian or quasi-meridian line by 45º clockwise or anti-clockwise. Our results at Umm al Qab (including Narmer´s tomb) suggest that this custom can be traced back to the earliest phases of Egyptian history and was followed not only at the earliest kings' tombs but also in nearby funerary cult enclosures. The complex of Khasekhemuy, last king of the 2nd Dynasty, at Shunet el-Zebit is another good example (see Paper 4).

The first kings of the 2nd Dynasty (notably Hotepsekhemuy, Ninetjer and Raneb) were not buried at Abydos, but rather in a new royal cemetery at Saqqara, to the SW of the huge mud-brick mastabas of nobles and members of the royal family of the 1st Dynasty. These mastabas had an axis orientated in a not very precise north-south direction, possibly dictated by the local topography of the cliff overlooking the Nile Valley. However, a substantial change was introduced at the beginning of the new dynasty when the kings started to construct large complexes of underground chambers that would presumably have been covered by superstructures of the corresponding type. However, these superstructures were later dismantled to make space for new constructions (notably Unas' pyramid complex) and only the subterranean chambers and the entrance corridors have survived.

Figure 2 shows the entrance to such substructures at the tomb of Hotepsekhemuy. It has an orientation of 1½º degrees and is perhaps the first structure built in Egypt with the intention of facing due north, towards the realm of the imperishable stars, as defined in the Pyramid Texts (Faulkner 1969; Krauss 1997). The stars in question were probably *Meskhetyu* (equivalent to the Plough). This practice of northern (cardinal) orientation was followed, with a greater or lesser degree of success, at the other royal monuments of the 3rd Dynasty in Saqqara (see Paper 3, Part II), and finally perfected at the beginning of the 4th Dynasty: the first monuments of Snefru, and particularly his minor step

Table 1.
Information on the orientation of the royal tombs of the 18th, 19th and 20th Dynasties in the Valley of the Kings in chronological order. For each tomb, the table provides its azimuth (data from Weeks, 2003), the gradient of the main corridor leading to the main chamber of the tomb and the corresponding declination (in *italics*), the altitude of the horizon as viewed from the entrance of the tomb (our own measurements on site, in boldface) and the corresponding declination, and, finally, suggested celestial targets for the corresponding orientation. See the text for further discussion

Name	**Azimuth**	**h(1c)**	**d(1c)**	**h(h)**	**d(h)**	**Remarks**
Amenhotep I (18th Dyn.)	69	-----	-----	7½	22	Solar ?
Tuthmosis I	104	-----	-----	**34¾**	**3¾**	Solar ?
Hatshepsut	274	*20½*	*12¼*	**14**	**9½**	Solar ?
Tuthmosis III	341½	*22*	*72¾*	**41**	**68¼**	Meskhetyu
Meritre Hatshepsut	358¼	-----	-----	3¼	67¾	Meskhetyu
Amenhotep II	109	-----	-----	**12**	**−11½**	Solar ?
Tiaa	83½	-----	-----	10¼	10¼	Solar ?
Tuthmosis IV	17	*16¼*	*71¾*	**4½**	**63½**	Meskhetyu ?
Amenhotep III	275¾	*16½*	*12¼*	10½	9¾	Solar ?
Tiye/Akhnaton	272¼	-----	-----	9¼	6	Solar ?
Tutankhamon	91¾	-----	-----	**14½**	**4¾**	Solar ?
Ay	116½	*16*	*−15½*	12.60	−17½	Solar ?
Horemheb	177¾	-----	-----	**6½**	**−58**	Due South
Ramses I (19th Dyn.)	60½	-----	-----	**28**	**36½**	
Seti I	38¾	-----	-----	**37¼**	**55¼**	
Ramses II	144¾	*13*	*−38½*	**15**	**−37**	
Merenptah	100¾	*15¾*	*−2¾*	**11**	**−5**	Solar ?
Amenmesses	11¼	*8*	*69½*	**8¾**	**70¼**	Meskhetyu
Seti II	43¾	*0*	*40¾*	**5¾**	**43¾**	
Siptah	352	*10¾*	*73½*	**38¼**	**75½**	Meskhetyu
Twosret & Setnakht	84	*8*	*8¾*	**8¾**	**9¼**	Solar ?
Ramses III (20th Dyn.)	358¾	*10½*	*75*	**18**	**82½**	Due North
Ramses IV	111½	*5½*	*−16¾*	**14¼**	**−12½**	Sah
Ramses V-VI	110¼	*3¾*	*−16½*	**12¼**	**−12½**	Sah
Ramses VII	147¾	*6*	*−45¾*	**8¼**	**−44**	
Ramses IX	303	*4¾*	*31¾*	**20**	**37½**	
Ramses X	6	*5½*	*69¼*	**20¼**	**82½**	
Ramses XI	248¼	*2½*	*−18¼*	**15¼**	**−12¼**	Sah ?

pyramid at Seila (Belmonte, Shaltout and Fekri 2007), would yield the first perfect cardinal alignments, accurate to a quarter of a degree.

The practice of northern (cardinal) orientation was brought to an apex in the pyramids of Giza (Haack 1984; Isler 1989; Spence 2000; Belmonte 2001), and would be followed, with a similar degree of precision and accuracy, by all the large-pyramid builders of the 4th, 5th, 6th and 12th Dynasties, with just one exception (see Paper 3, Part II). Figure 3 shows a reconstruction of the central area of the northern sector of the necropolis of Saqqara and clearly illustrates the skewed axis of the pyramid of Teti, the first king of the 6th Dynasty. With an azimuth of 80¾º, instead of the standard ~90º, his pyramid temple faced a notch in the otherwise flat eastern horizon of Saqqara. However, there is another possible explanation since the sun of the movable Egyptian New Year's Eve, *Wepet Renpet* (Belmonte 2003), would have been setting at an azimuth ~260¾º at the beginning of the reign of Teti. Actually, astronomical and topographical connections such as these are also possible at many other pyramid complexes of the Old Kingdom, the second of which has already been argued by Jeffreys (1998).

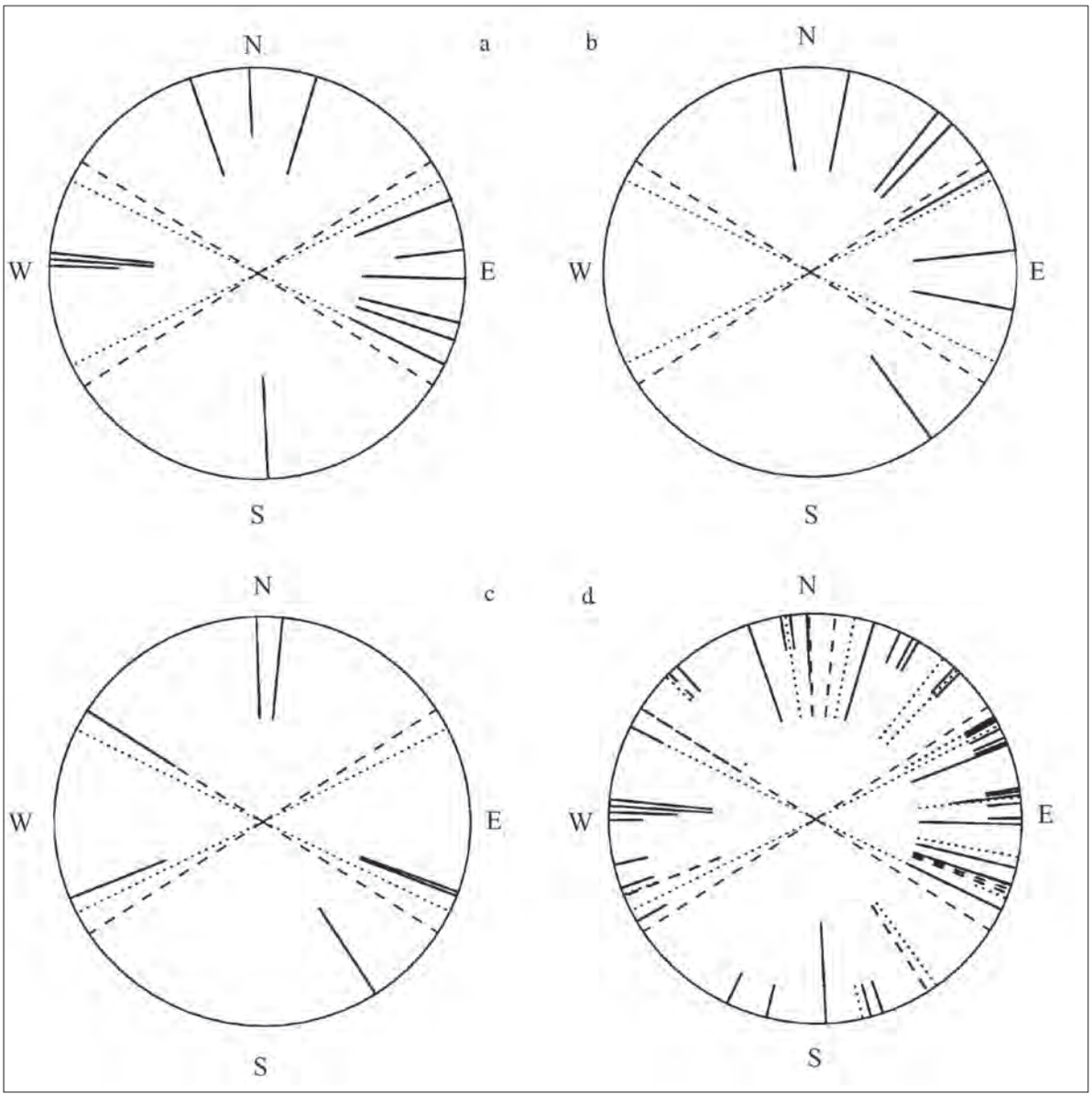

Fig. 5. Orientation diagrams of different sets of tombs of the Valley of the Kings: royal hypogea of the 18th Dynasty **(a)**; royal hypogea of the 19th Dynasty **(b)**; royal hypogea of the 20th Dynasty **(c)**; and the complete set of tombs discovered in the Valley, including those of the nobles and secondary members of the royal family **(d)**. The dotted and dashed lines completely crossing the diagrams represent the extreme rising and setting positions of the sun and the moon, respectively. See the text for further discussion.

The Pyramid Age ended with the fall of the Middle Kingdom[2] and when a new generation of pharaohs, coming from Thebes, were governing the entire country, a completely new method of burial was developed, possibly for safety reasons. A well protected valley within the western hills of Thebes was chosen in the shadow of a gigantic natural "pyramid", the mountain of El Qorn (see Fig. 4). This fact probably influenced the selection of the site.

When one first enters the Valley of the Kings (or Biban al Muluk, the Gates of the Kings in Arabic) the impression gained is that the tombs are randomly located in suitable empty spaces and, consequently, that the local topography should have determined their orientations. However, our study shows that the answer is not always as simple as one would expect. On the one hand, Table 1 shows the orientation data for the royal tombs of the Valley of the Kings, combining topographic data from the Theban Mapping Project (Weeks 2003) with our own data taken on site. On the other hand, Figures 5(a), (b) and (c) show the corresponding orientation diagrams for the 18th, 19th and 20th Dynasties, respectively. Figure 5(d) shows the orientation of every single tomb excavated in the valley so far and this clearly shows the apparently random nature of the distribu-

[2] With the possible exception of the swansong represented by the funerary complex of Ahmose in south Abydos (see Paper 4).

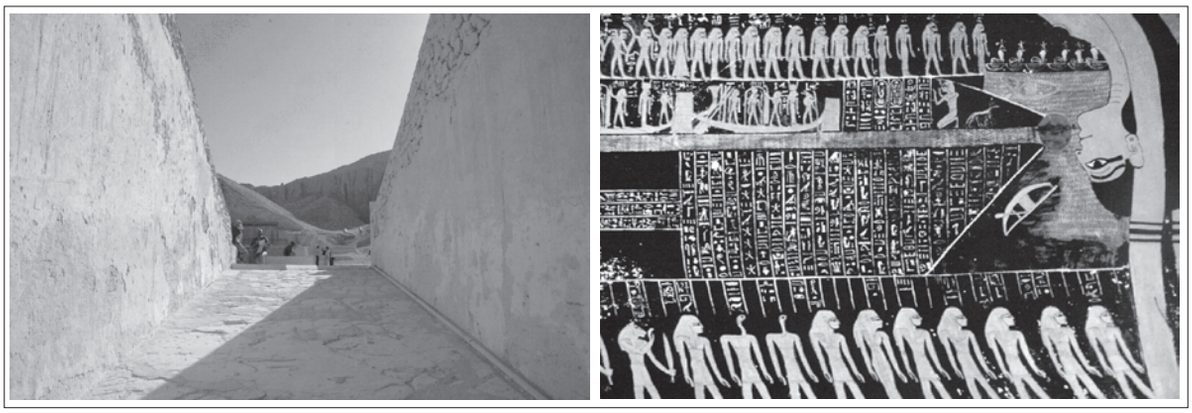

Fig. 6. (a, left) The dromos of access to the tomb of Ramses VI, fifth king of the 20th Dynasty. The horizon, far from being open, is actually obscured by the cliffs of the hills over Deir el Bahari. This precludes its possible orientation upon the rising of Sirius at the time of construction. However, the central asterism of the constellation of Sah (Orion´s Belt) would have been visible in that area of the sky in the correct epoch. (b, right) A section of the Book of the Day and Night on the ceiling of the burial chamber of the same king. This mentions, among others, the constellations of Meskhetyu and Sah as most conspicuous celestial bodies in the northern and southern parts of the sky, respectively. See the text for further discussion. Photographs by Juan A. Belmonte.

Fig. 7. The sarcophagus of King Neferites I at the royal necropolis of the 29th Dynasty at Mendes, in the Eastern Delta. Either by design or by chance, the monument is orientated upon a declination of −17¼º±¾º, which roughly corresponds to the contemporary value of Sirius, the Harbinger of the Flooding. Photograph by Juan A. Belmonte.

tion. Yet we will demonstrate that we can find order in apparent chaos.

Table 1 and Fig. 5(a) seem to indicate that in the first stages of the use of the Valley during the 18th Dynasty, astronomical orientations were indeed intended. When construction began, the vast majority of the tombs were facing either sunrise or sunset, with three exceptions facing north that, surprisingly, correspond to the reigns of kings called Thutmosis. All these tombs followed a similar design that has been interpreted as an imitation of the journey of the sun through the underworld (Baqué and Costa 2007). This design was abruptly abandoned at the end of the dynasty by the "reformer" king Horemheb, who orientated his tomb with its extended axis almost S–N. This new longitudinal axis would be the norm for the remainder of the occupation of the Valley and most of the tombs, despite their real orientation, showed clear "cardinal" patterns in the design and decoration of their interiors (Wilkinson 1993). However, the tombs of the 19th and 20th Dynasties apparently lacked a commanding pattern and one would tend to suggest that the orientations were dictated by other practicalities (proximity, empty spaces) rather than by astronomical concerns. Nonetheless, there are a few examples that make us think that this was not always the case.

First, there are a couple of tombs of the 19th Dynasty, notably Merenptah's and perhaps also Twosret's, that were constructed in such a way that the light of the rising sun on a couple of particular days of the year could pass right through the burial chamber and strike the sarcophagus of the king. Whether or not this could be connected to any symbolic aspect of the burial ritual will be the subject of future studies.[3]

Second, there are another two tombs, in this case of the 20th Dynasty, Ramses IV´s and Ramses VI´s, whose orientation is so similar, despite the distance between them within the Valley, that it is difficult to attribute this to mere chance. When we first analyzed the data, using the information provided by the Theban Mapping Project (see Table 1), we were puzzled by the possibility that both tombs could have been orientated to Sirius (*Sopdet*), the brightest star of the sky and the leader of the decans. However, once more we were convinced of the necessity of performing actual fieldwork on site when detecting that this orientation was precluded by the presence of a nearby horizon, as demonstrated in Figure 6(a). Curiously, our corrected data (see Table 1) still showed that both tombs could have been oriented upon exactly the same celestial object: perhaps this was the important constellation of *Sah*, often mentioned in Egyptian astronomical texts (Maravelia 2006; Lull and Belmonte 2006), and indeed featured in the astronomical ceilings of the tombs of both Ramses IV and Ramses VI (see for example Fig. 6(b)). Significantly, a majority of the royal tombs of the Valley of the Kings did show astronomical patterns of orientation as opposed to mere topographic dictates.

Few royal burial monuments of the Late Period and none of the Ptolemaic Era have survived. Consequently, it is difficult to extend our analysis further in time. Perhaps we should just mention that, on the one hand, the tombs at the royal necropolis of Tanis apparently follow the general pattern of orientation of the city and likely follow similar rules (see Paper 3, Part II). On the other hand, in Fig. 7 we show the scant remains of the royal necropolis of the pharaohs of the 29th Dynasty at Mendes, in the Delta. An astronomical intention could perhaps be inferred from our data, but at the present state of our knowledge, it would be unwise to carry our conclusions any further.

[3] A very prosaic interpretation is that this design would have permitted direct sunlight to enter the deep interior of the tomb to facilitate its decoration.

Acknowledgements

We wish to express our thanks to our colleague Dr Zahi Hawass for his support of the Archaeoastronomy Mission as Director of the Supreme Council of Antiquities. We also express our gratitude to the various inspectors, guides and escorts who joined us during the fieldwork; they were very kind and helpful. This work is partially financed under the framework of the projects P310793 "Arqueoastronomía" of the *Instituto de Astrofísica de Canarias*, and AYA2004-01010 "Orientatio ad Sidera" of the Spanish Ministry of Education and Science.

References

AUFRÈRE, S. and GOLVIN, J. CL., 1997. *L'Égypte restituée*, Tome 3, *Sites, temples et pyramides de Moyenne et Basse Égypte*. Paris: Errance.

BAQUÉ MANZANO, L. and COSTA LLERDA, S., 2007. El sistema de orientación de las tumbas reales de la Dinastía XVIII en el Valle de los Reyes. In: J. CERVELLÓ AUTOURI, ed. *Proc. II Congreso Ibérico de Egiptología*. Barcelona, 33-40.

BELMONTE, J. A., 2001. On the orientation of the Old Kingdom pyramids. *Archaeoastronomy*, 26, 1-20.

BELMONTE, J. A., 2003. Some open questions on the Egyptian calendar: an astronomer´s view. *TdE*, 2, 7-56.

BELMONTE, J. A., SHALTOUT, M. and FEKRI, M., 2005. Astronomy and landscape in ancient Egypt: challenging the enigma of the minor step pyramids. *TdE (Papers on ancient Egypt)*, 4, 7-18.

BELMONTE, J. A. and SHALTOUT, M., 2006. On the orientation of ancient Egyptian temples: (2) New experiments at the oases of the Western Desert. *Journal for the History of Astronomy*, 37, Part 2, No. 127, 173-192.

BELMONTE, J. A., SHALTOUT, M. and FEKRI, M., 2008. On the orientation of ancient Egyptian temples: (4) epilogue in Serabit el Khadim and overview, *Journal for the History of Astronomy* 39, Part. 2, No. 135, 181-211.
FAULKNER, R. O., 1969. *The Ancient Egyptian Pyramid Texts*. Oxford University Press.
HAACK, S. C., 1984. The Astronomical orientation of the Egyptian Pyramids. *Archaeoastronomy*
7, 119-122.
HAWKINS, G. S., 1973. *Beyond Stonehenge*. New York: Harper & Row.
ISLER, M., 1989. An ancient method of finding and extending direction. *JARCE* 26, 191-206.
JEFFREYS, D., 1998. The topography of Heliopolis and Memphis: some cognitive aspects. In: *Stationen Beitrage zur Kulturgeschichte Ägyptens, Rainer Stadelman gewidmet*, Mainz, 63-71.
KRAUSS, R., 1997. Astronomische konzepte und jenseitsvorstellungen in den pyramidentexten. *Ägyptologische Abhandlung*, Band 59, Wiesbaben.
KRUPP, E. C., 1988. Light in the temples. In: C.L.N. RUGGLES, ed. *Records in Stone: Papers in memory of Alexander Thom*, Cambridge, New York, New Rochelle, Melbourne, Sydney: Cambridge University Press, 473-99.
LEHNER, M., 1997. *The Complete Pyramids.* London: Thames and Hudson.
LOCKYER, J. N., 1993. *The Dawn of Astronomy*. New York: Kessinger Co.
LULL, J., 2004. *La astronomía en el antiguo Egipto*. Valencia: Polytechnic University of Valencia.
LULL, J. AND BELMONTE J. A., 2006. A firmament above Thebes: uncovering the constellations of ancient Egyptians. *Journal for the History of Astronomy*, 37, 373-392.
MARAVELIA, A. A., 2006. *Les Astres dans les Textes Religieux en Égypte Antique et dans les Hymnes Orphiques.* BAR International Series, 1527, Oxford.
MIRANDA, N., BELMONTE, J. A. and MOLINERO M. A., 2008. Uncovering Seshat: new insights into the stretching of the cord ceremony. *This volume*.
SHALTOUT, M. and BELMONTE, J. A., 2005. On the orientation of ancient Egyptian temples: (1) Upper Egypt and Lower Nubia. *Journal for the History of Astronomy*, 36, Part 1, 273-298.
SHALTOUT, M., BELMONTE, J. A. and FEKRI, M., 2007. On the orientation of ancient Egyptian temples: (3) key points in Lower Egypt and Siwa Oasis. (Part I). *Journal for the History of Astronomy*, 38, Part 2, No. 131, 141-60; and On the orientation of ancient Egyptian temples: (3) key points in Lower Egypt and Siwa Oasis. (Part II). *Journal for the History of Astronomy*, 38, Part 4, No. 133, 413-442.
SPENCE, K., 2000. Ancient Egyptian chronology and the astronomical orientation of pyramids. *Nature*, 408, 320-324.
WEEKS, K. R., ed., 2003. *Atlas of the Valley of the Kings.* Cairo: The American University of Cairo Press.
WILKINSON, R. H., 1993. The paths of Re, symbolism in the royal tombs of wadi Biban el Moluk, *KMT*, 4, 42-51.

Received: 26 October 2007; Revised: 29 Jun 2008

NUO UMM AL QAB IKI BIBAN AL MULUK: SENOVĖS EGIPTO KARALIŠKŲJŲ KAPŲ ORIENTAVIMAS

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Santrauka

Nuo 2003 m. lapkričio mėn. vykdoma Egipto–Ispanijos archeoastronomijos misija Senovės Egipte, globojama Vyriausiosios senienų tarybos ir finansuojama Ispanijos švietimo ir mokslo ministerijos pagal *Orientatio ad Sidera* projektą. Iki šiol visoje šalyje įgyvendinamos keturios kampanijos, kurių metu buvo vykdomos sistemingos, statistiškai reikšmingos Egipto archeoastronomijos studijos. Tai pirmas tokio pobūdžio tyrimas Egipte.

Vienas pagrindinių projekto tikslų – pateikti galutinį atsakymą į klausimą, ar Senovės Egipto kulto pastatai buvo astronomiškai orientuoti. Ši tema egiptologų ilgą laiką buvo traktuojama labai prieštaringai. Daugelis jų palaikė nuomonę, kad kulto pastatai, ypač šventyklos, buvo topografiškai orientuotos pagal Nilo tėkmę, tačiau tai nebuvo įrodyta. Mūsų preliminarūs šventyklų tyrimų rezultatai (Shaltout, Belmonte 2005, p. 273–298; Belmonte, Shaltout 2006, p. 173–192) statistiškai tai įrodė. Taip pat tyrimas parodė, kad Senovės Egipto šventyklų statytojai kreipė dėmesį ir į tam tikrus astronominius reiškinius. Mes atskleidėme, kad kraštovaizdis plačiąja prasme, apimant žemės ir dangaus aspektus, vaidino ypač svarbų vaidmenį parenkant Senovės Egipto kulto pastatų vietą ir orientavimą.

Viena įdomiausių mūsų tyrinėtų paminklų grupių – Senovės Egipto karališkieji nekropoliai. Kasinėjimai buvo vykdomi Umm al Qab vietovėje, netoli Abydos, kur yra karališkasis ikidinastinio periodo kapinynas, didelė teritorija netoli Kairo, kurioje stovi Senosios ir Vidurinės karalystės piramidės, ir Biban el Muluk (Karalių slėnis) Tebuose, kur buvo tyrinėjami požeminiai Naujosios karalystės karalių kapai.

Straipsnyje pristatomi preliminarūs šių vietovių tyrimų rezultatai. Paaiškėjo, kad teisingas statinių orientavimas nuo ankstyvųjų *mastabų* iki vėlyvųjų *hypogėjų* buvo būtinas, ir dangus čia vaidino labai svarbų vaidmenį. Nuodugni šių rezultatų analizė padės geriau suprasti Senovės Egipto pasaulį.

Vertė Jurgita Žukauskaitė

THE ORIENTATIONS OF CENTRAL ALENTEJO MEGALITHIC ENCLOSURES

FERNANDO PIMENTA, LUÍS TIRAPICOS

Abstract

In this work we conduct a study of the orientations of 12 megalithic enclosures in the Alentejo (southern Portugal). Some of these sites date back to the sixth or fifth millennia B.C., and so are among the oldest stone enclosures in Europe. The results of the survey show a pattern of easterly (rising) orientations. In particular, we relate our results to previous studies by Michael Hoskin and colleagues, on the orientations of the seven-stone dolmens in this area, which have shown the existence of a possible sun rising orientation custom.

Key words: megalithic, enclosures, orientations, archaeoastronomy, Portuguese archaeology.

Introduction

This paper discusses the orientations of 12 megalithic enclosures in the Alentejo province of southern Portugal. Despite various attempts to address this question (Alvim 1996-97, 2004; da Silva 2000), there lacked a comprehensive orientation enquiry (Cardoso 2002, p.235) grouping together all enclosures, including those that are completely dismantled.

The Alentejo extends, roughly, southwards from the Tejo river to the northern part of the Algarve, a southern coastal province. The scattering of enclosures is located in the Évora district, mostly in the western part. The landscape here, between the Tejo and Sado river basins, is largely flat with just modest rises.

Today archaeologists believe that the megalithic enclosures of central Alentejo were built during the Early/Middle Neolithic, i.e. in the sixth to fifth millennium B.C., pre-dating the communal seven- and nine-stone megalithic tombs in the same area (Calado 2004). There is no direct radiocarbon dating evidence available from these sites. The established chronology arises mainly from materials found in excavations or from associations with nearby settlements or surface remains.

According to Portuguese archaeologist Manuel Calado (Calado 2004, p.72, 82) the basic structure of the enclosures was a modified horseshoe shape, open to the east. In most of the monuments the largest menhir is located outside the line of the horseshoe, in one "focus" of the (broadly elliptical) enclosure.

Today only 12 sites are known, ranging from the smallest (but perfectly horseshoe-shaped) Vale d'el Rei, with 12 menhirs, to the monumental Almendres with 94 standing stones and a much more complex structure. Also included in this group are sites where the menhirs are completely dismantled and no information was found concerning their original positions.

Excluding cup-marks, all the engraved menhirs are found in the large enclosures of Almendres, Portela de Mogos and Vale Maria do Meio. The most common motifs are crescents, circles, horseshoes and crosiers. Many of the decorations show an apparent anthropomorphised composition (Vale Maria do Meio menhirs n. 10 and 18, for example). Despite the obvious ambiguity in interpreting them, some authors (Gomes 1989, p.264; Calado 2004, p.130-138) have sustained the notion that the circles and crescents may be representations of the sun and moon.

In order that our study can include different types of monument in different states of preservation, we will not focus upon any particular features of each enclosure but consider only the common characteristics. In this way we will also try to avoid problems of biased selection.

One of the initial group of monuments, Xarez, was excluded from this study. It was excavated in 1972 and its menhirs re-erected, but this work generated a heated controversy within the archaeological community (Calado 2004, p.149). The rebuilt monument had a very anomalous square shape. Although a few other examples of quadrilateral enclosures do exist in Brittany and England (Burl 1999, p.337, 339) the archaeological uncertainty about Xarez suggested its exclusion from the data set. Recently Xarez was dismantled and rebuilt again in a different place, owing to the construction of a dam. Prior to its removal, a second excavation revealed the socket of the large central menhir, complete with

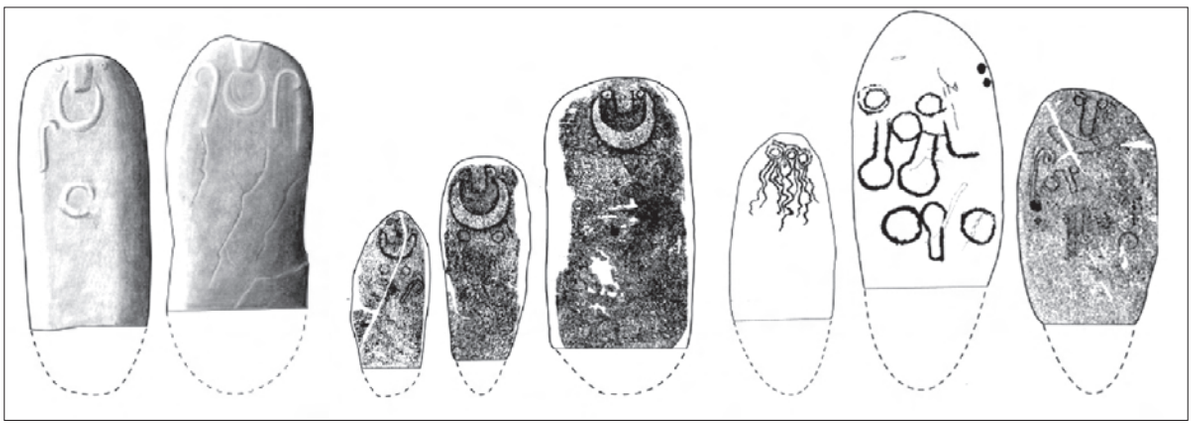


Fig. 1. Left: engraved menhirs n. 10 and n. 18 at Vale Maria do Meio (Calado 2004, II, p.27). Middle: engraved menhirs n. 2, n. 25 and n. 33 at Portela de Mogos (Gomes 1997). Right: engraved menhirs n. 58, n. 64 and n. 65 at Almendres (Gomes 2002).

a) With 94 standing stones, the complex enclosure of Almendres is the largest in Iberia. Photo mosaic courtesy of Pedro Ré.

b) Cuncos is one of the dismantled enclosures where some menhirs are still near their original positions. Photograph by Luís Tirapicos.

c) Vale d'el Rei is a perfect horseshoe and the only one on level ground. Photograph by Fernando Pimenta.

Fig. 2. The different forms and states of preservation of the Alentejo enclosures.

chocking stones, but no other structures were found, thus sustaining the pessimism regarding the initial reconstruction.

In the Cuncos and Sideral enclosures, all the menhirs are recumbent. In the case of Cuncos, no stone-holes were found during excavations and four menhirs identified in the excavation plans have been moved since the excavation. Both enclosures were in a highly dilapidated state. At Tojal, all the menhirs are also lying down but the archaeologist who briefly investigated the site believes that they are approximately in their original positions (Calado 2004, p.72-73), since a small excavation revealed what appear to have been stone sockets by two of the menhirs. In Casas de Baixo and Monte da Ribeira the menhirs were all displaced from their original positions and it was not possible, at this point, to reconstruct a plan for these enclosures.

At all the other monuments, excavations were able to locate the original sockets of most of the fallen menhirs, which were then re-erected in their original positions. Where no trace of a stone-hole could be found, the menhir in question was left lying down.

Survey and Data Reduction

Topographic Survey

At each of the sites, we started by undertaking a topographic survey with a theodolite in order to build a Digital Terrain Model (DTM). Sun azimuth readings were used in order to determine geographical north. The data, after reduction, was exported to Surfer software[1] for the kriging interpolation that produced the DTM grid.

During the course of each topographic survey the menhirs were also measured and subsequently placed on the relevant DTM grid. The results were then compared to the topographic plans available for some of the enclosures that have been made by Pedro Alvim[2] and published by Manuel Calado (Calado 2004) or Varela Gomes[3] (Gomes 1986).

In order to determine the azimuth of the steepest slope we used two procedures.

1) The closed triangulation coming directly from the topographic survey was used to manually calculate the azimuth of the steepest slope and the maximum slope for each triangle, using the plane equation:

$$H=ax+by+c,\ \theta_{max}=\arctan(a/b) \quad (1),$$

for the azimuth and

$$\delta_{max}=a*\sin(\theta_{max})+b*\cos(\theta_{max}) \quad (2),$$

for the slope.

2) The tools provided by Surfer software were used to determine the magnitude and direction of the steepest slope (in the downhill direction) at each grid node.

In order that our statistics should be robust against outliers we used the median from each set of calculated data. The results were essentially the same with the two methods. For our statistical uncertainty we used the inter-quartile distance divided by 0.6745, which can be interpreted roughly as a $\pm 2\sigma$ interval. The results are represented in Figure 3.

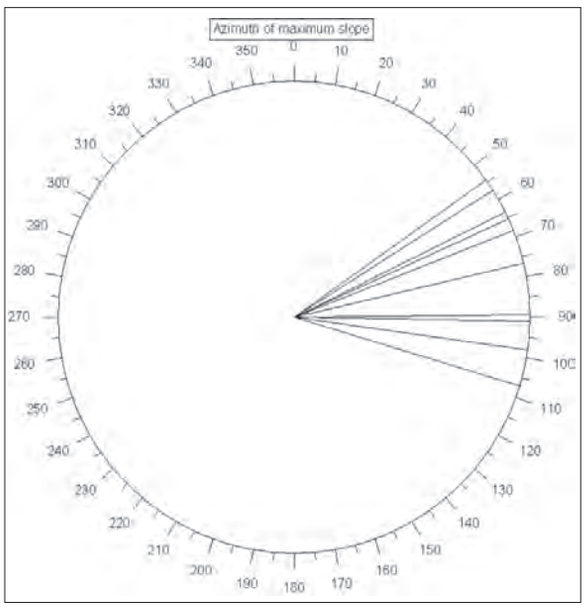


Fig. 3. Azimuths of the steepest slope (downhill) for 10 sites.

Horizon Profile

At each site we undertook a horizon survey in order to build a profile in distance and elevation, checking for features of possible significance such as hills and depressions. To fill in parts obstructed by vegetation, we used mosaics of 1:25000 maps extending for 20-25 km around each site, with the true elevation corrected to apparent elevation in order to account for the effects of the earth's curvature and terrestrial refraction. We used the following simplified correction factor (taking the speed of red light at an average level of 250 m above

[1] Surfer software is available from *www.goldensoftware.com*

[2] Topographic plans made by Pedro Alvim for some of the enclosures can be found at www.crookscape.org

[3] We found that the north indication in the Cuncos excavation plan must correspond to magnetic north. The 3 southern menhirs represented in that plan are now lying against the central menhir and the westernmost menhir is now located in a different position. This last menhir was discarded for the symmetry axis calculation.

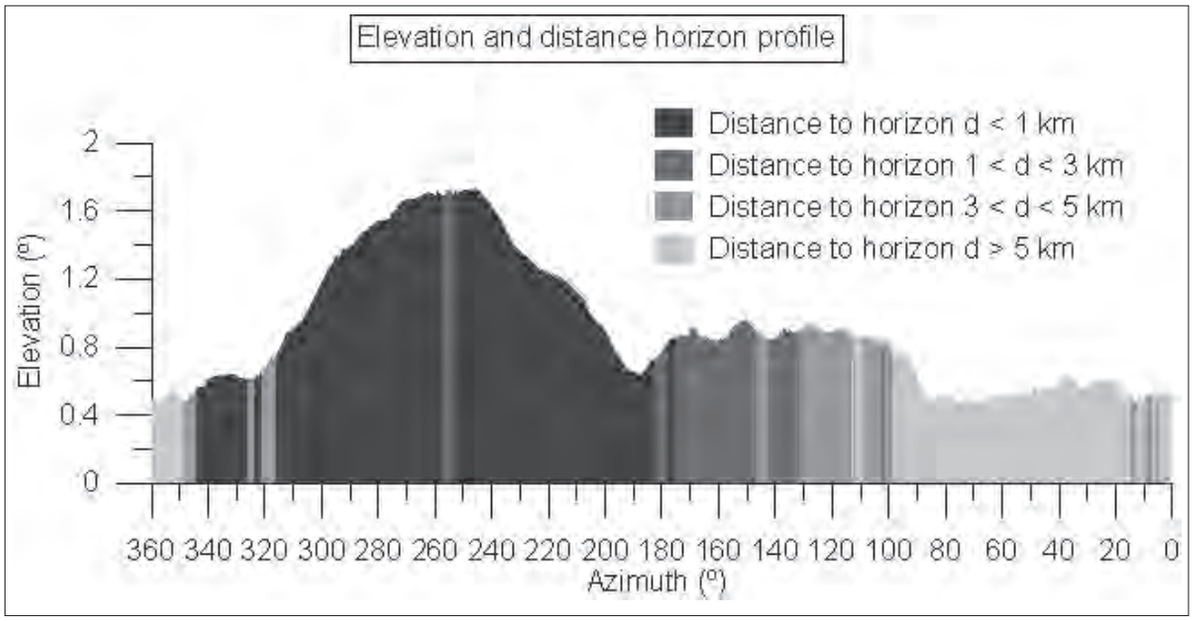


Fig. 4. Average elevation profile with average distance to horizon.

sea level), where ***d*** was the distance in metres from the site, measured over the maps:

$$d^2 \times \left[2{,}55 \times 10^{-5} - 1/(2 \times 6371)\right] \times 10^{-3} \qquad (3).$$

This data was compared with the profiles that Andrew Smith kindly produced with his software, based on the SRTM elevation data from the Space Shuttle radar. The results are presented in Figure 4.

An algorithm using numerical differentiation to detect features in horizon elevation profiles was passed over Andrew Smith's data in an attempt to find possible horizon features. Only horizon segments at least 3 km distant were considered.

Generally, speaking, the sites have a distant but smooth horizon to the east and north-east. The enclosures seem to have been erected in places with selected terrain characteristics, and in this they differ from the seven-stone tombs in the same area. We did not find any horizon features common to more than 5 sites.

Symmetry Axis Calculation

We determined the coordinates of each menhir's centre from the DTM (the x-axis being the E-W direction and the y-axis the N-S direction), specifying an uncertainty of 0.5 m for standing menhirs and 3 m for recumbent ones, in both the x and y directions.

For the determination of the symmetry axis of each monument we used a procedure based on non-linear regression for fitting to the general quadratic equation of a conic, which offered a good fit to the shapes of the enclosures:

$$Ax^2+Bxy+Cy^2+Dx+Ey+1=0 \qquad (4).$$

For this equation the slopes of the two axes are ***q*** and ***-1/q***, calculated using the expression

$$q = \sqrt{\left(\frac{B-A}{C}\right)^2 + 1} + \left(\frac{B-A}{C}\right) \qquad (5).$$

The axis passing through the opening of the enclosure and/or corresponding to the longest enclosure dimension was chosen as the symmetry axis.

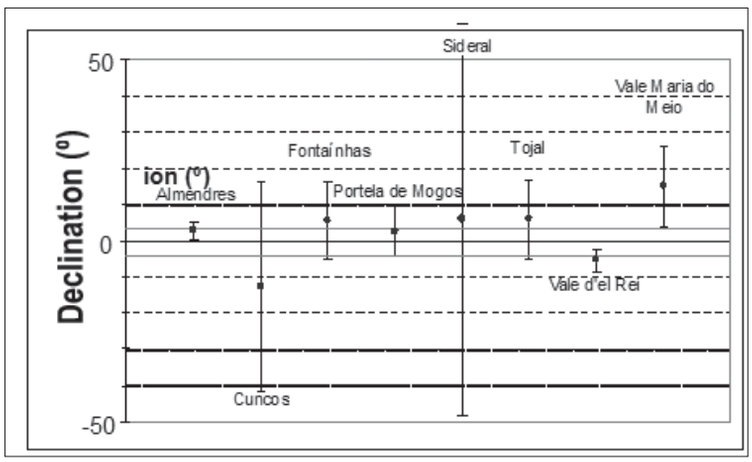


Fig. 5. Symmetry-axis declinations of the 8 enclosures with 2-sigma error bars.

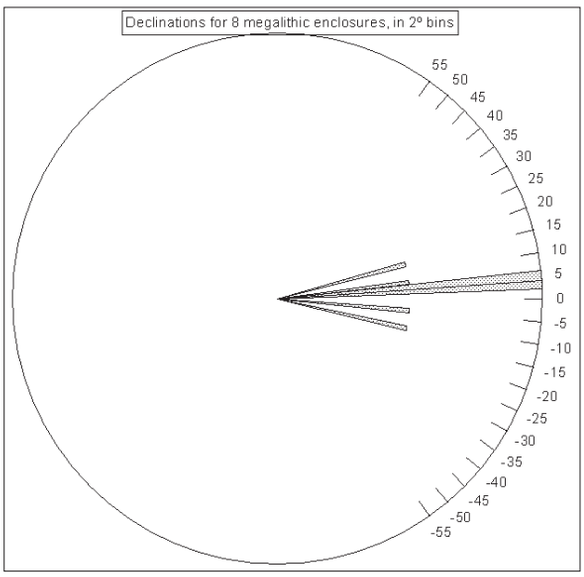


Fig. 6. Circular bar graph for the symmetry-axis declinations of 8 enclosures.

Curve fitting was done using LAB Fit[4] software that handles variables' uncertainties and produces the full resulting covariance matrix. This software also provides an error propagation calculation based on the standard expression for the absolute error. This function was used for the determination of the final uncertainties for arctan(q) or arctan(-1/q), and also for the declinations. For the declination calculation the astronomical refraction effects were calculated using G. G. Bennett's formula (Meeus 1991, p.102) for a temperature of 15º and a pressure of 1010 mbar. We used an uncertainty of 0.5º for the horizon elevation, including the uncertainty in the refraction effects, and 1" for the latitude (measured by GPS).

Discussion

As is clear from Figure 6, the orientations are all in a narrow range, close to the direction of due east. Since there is a very low probability of this happening by chance (~$7x10^{-7}$, using the expression[5] $n*(\theta_{range}/360)^{n-1}(6)$, with n=8) and there are no common horizon features that could justify such a pattern, we believe that only two explanations are possible: either an astronomical target (Sun, Moon or planets) or a construction following the slope, and thus as a consequence facing the far horizon, since we verified that the azimuth of the symmetry axis and the azimuth of the steepest slope have a correlation coefficient of 0.7.

If we consider the Sun or Moon to be the most probable astronomical targets, there is apparently an interest in declinations around that of the equinoxes. It is generally accepted that there are technical difficulties and no clear reasons for precise equinoctial orientations (Ruggles 1997). Nonetheless several natural signs from flora and fauna can be used together with astronomical events to mark seasonal changes. If for northern latitudes, the extreme limits of the solar and lunar azimuths can represent a strong motivation for special rituals, in lower latitudes where there is a more temperate climate, a similar motivation can occur at the beginning of spring and autumn.

The surveyed sites can be thought as a scenic/theatrical space facing the "stage" of the rising heavens.

Conclusions

We can conclude from the data that the enclosures do not seem to have been built just following the slope, but instead probably pointed to an astronomical target. There seems to be an interest in declinations that correspond to the Sun at the beginning of spring or end of summer or to the Full Moon at the beginning of autumn or end of winter.

It is interesting to compare our results with the declination distribution for the dolmens in the Alentejo according to Michael Hoskin[6] (Hoskin 1998, 2001, 2002). While possible solar declinations are also possible lunar declinations, Occam's razor argues here in favour of a solar orientation, since there are no exceptions outside the declination range from –24º to +24º. Hoskin interpreted this distribution as an orientation towards the rising Sun at the end of winter or the beginning of autumn, and probably the latter, since agriculture demanded less attention at that time of year, leaving time available for the construction of communal tombs. It is possible that, through cultural continuity, ritualistic use of the enclosures around the beginning of autumn or the end of winter, and particularly at Full Moon at the beginning of autumn, could have led, later in the Neolithic, to the construction of dolmens oriented towards the rising eastern horizon and particularly to the Sun, mostly in the same period of the year.

Acknowledgments

We wish to thank Nuno Crato, Carlos Daniel Paulino, Clive Ruggles and Manuel Calado for their helpful comments on early drafts of this paper. We wish also to express our gratitude to Andrew Smith from Adelaide University for the horizon elevation and distance-to-

[4] da Silva, Wilton P. and Silva, Cleide M. D. P. S., LAB Fit Curve Fitting Software (Nonlinear Regression and Treatment of Data Program) V 7.2.36 (1999-2007), available from *www.labfit.net*.

[5] See Ruggles 1999, p. 95.

[6] See Figure 9.

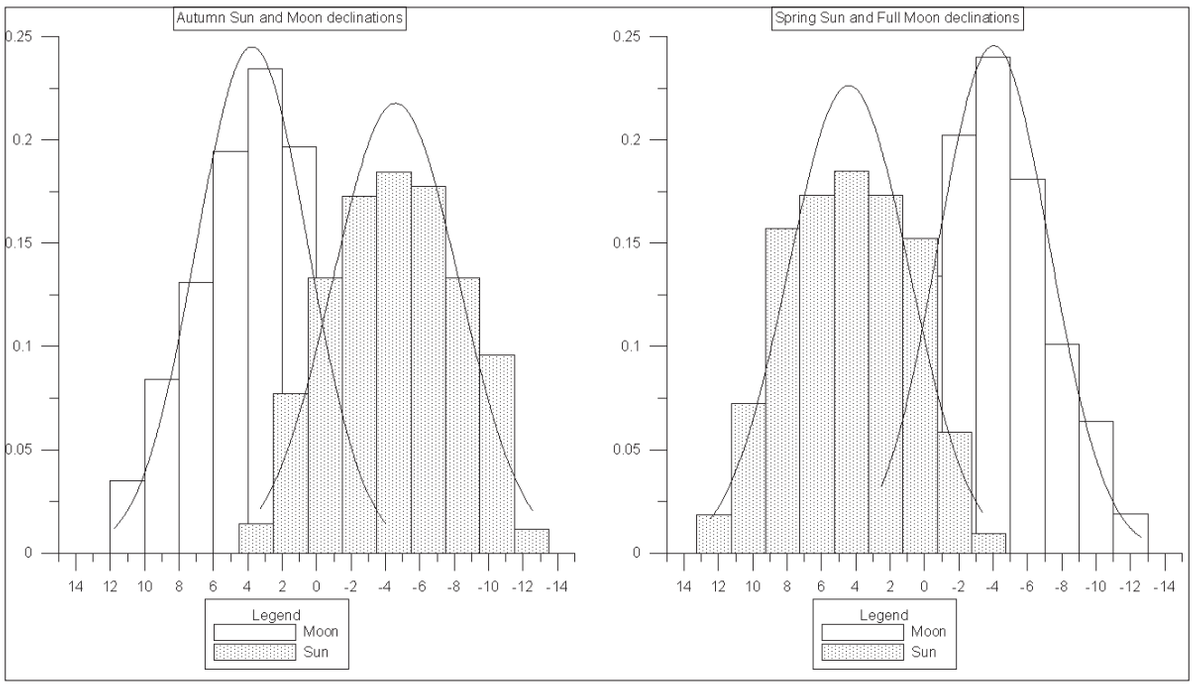


Fig. 7. 428-year simulation for Sun and Full Moon declinations **(a)** at "Autumn Full Moon equinox" and **(b)** at "Spring Full Moon equinox".

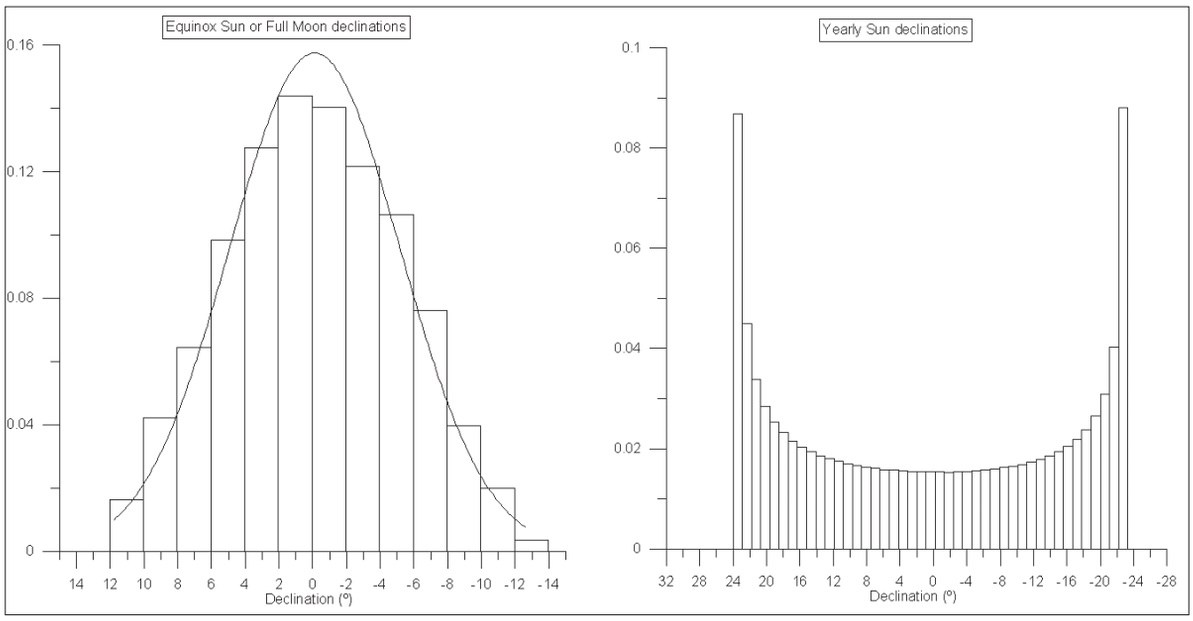


Fig. 8. (a) 428-year simulation for Sun and Full Moon declinations for both "Full Moon equinoxes". (b) 93-year simulation for annual solar declinations.

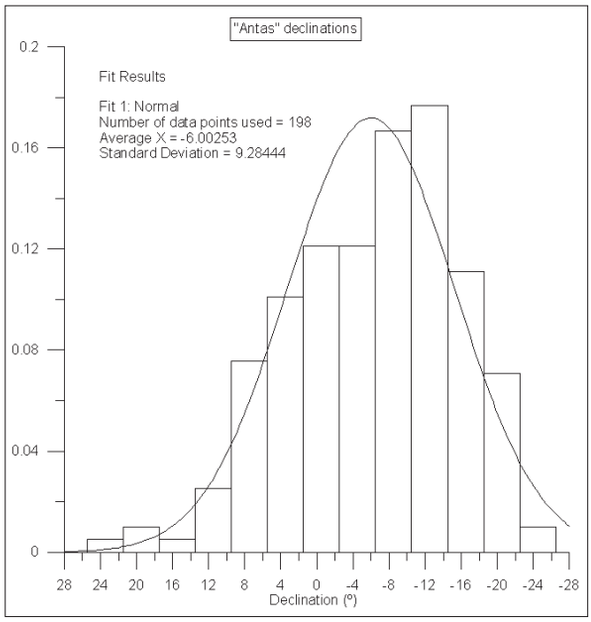


Fig. 9. Distribution of declinations of 198 Alentejo dolmens (or "Antas").

horizon profiles produced by the software that he is developing. Thanks are also due to Marta Freitas for her kind help on our last day of fieldwork.

References

ALVIM, P., 2004. Recintos megalíticos da região da serra de Monfurado e os "Cabeços do Meio-Mundo": monumentos, paisagem e cultura no Neolítico alentejano. In: M. CALADO, ed. *Sinais de Pedra. Actas do I Colóquio Internacional sobre Megalitismo e Arte Rupestr*e. Évora.

ALVIM, P., 1996-97. Sobre alguns vestígios de paleoastronomia no cromeleque dos Almendres. *A Cidade de Évor*a, II-2, 5-23.

BURL, A., 1999. *The Stone Circles of Britain, Ireland and Brittany*, New Haven and London: Yale University Press.

CALADO, M., 2004. *Menires do Alentejo Central. Génese e Evolução da Paisagem Megalítica Regional.* Ph.D. Thesis. Lisboa: Universidade de Lisboa.

CARDOSO, J. L., 2002. *Pré-história de Portugal.* Lisboa: Verbo.

GOMES, M. V., 2002. *Cromeleque dos Almendres. Um monumento socio-religioso neolítico.* Lisboa: Universidade Técnica de Lisboa.

GOMES, M. V., 1997. "Estátuas-menires antropormóficas do Alto Alentejo. Descobertas recentes e problemática. *Brigantium*, 10, 255-279.

GOMES, M. V., 1989. Arte rupestre e contexto arqueológico, *Almansor*, 7, 225-269.

GOMES, M. V., 1986. O cromeleque da Herdade de Cuncos (Montemor-o-Novo, Évora). *Almansor*, 4, 7-41.

HOSKIN, M., 2002. Studies in Iberian Archaeoastronomy: (9) An Overview, *Archaeoastronomy*, 27, 75-82.

HOSKIN, M., 2001. *Tombs, Temples and their Orientations.* Bognor Regis: Ocarina Books.

HOSKIN, M., and colleagues 1998. Studies in Iberian Archaeoastronomy: (5) Orientations of Megalithic Tombs of Northern and Western Iberia", *Archaeoastronomy*, 23, 39-87.

MEEUS, J., 1991. *Astronomical Algorithms.* Richmond: Willmann-Bell Inc., 102-103.

RUGGLES, C. L. N., 1997, Whose Equinox? *Archaeoastronomy*, 22, 45-50.

RUGGLES, C.L.N., 1999. *Astronomy in Prehistoric Britain and Ireland.* New Haven and London: Yale University Press, 95.

da SILVA, C.M., 2004. The Spring Full Moon. *Journal for the History of Astronomy*, 121, 475-478.

da SILVA, C.M., CALADO, M., 2003. New astronomically significant directions of the Central Alentejo Megalithic Monuments. *Journal of Iberian Archaeology*, 5, 67-88.

da SILVA, C.M., 2000. *Sobre o possível significado astronómico do cromeleque dos Almendres.* Évora: A Cidade de Évora, 109-128.

Received: 1 November 2007; Revised: 5 December 2008

CENTRINIO ALENTEŽO MEGALITINIŲ ĮTVIRTINIMŲ ORIENTAVIMAS

Fernando Pimenta, Luís Tirapicos

Santrauka

Straipsnyje aptariamas Alentežo (Alentejo) provincijos (Pietų Portugalija) 12-os megalitinių aptvarų orientavimas. Nors būta įvairių bandymų nagrinėti šį klausimą (Alvim 1996–1997, 2004; Silva 2000), stigo visapusiško, visus aptvėrimus, įskaitant sugriautuosius, apimančio tyrimo (Cardoso 2002, p. 235).

Dalis šių objektų, datuojamų 6–5 tūkstantmečiais pr. m. e., yra vieni seniausių akmeninių aptvarų Europoje. Anot archeologo M. Calado (Calado 2004, p. 72, 82), dominuojanti šių aptvarų forma buvo pasagos pavidalo į rytų pusę atverta struktūra.

Tyrimas atskleidė orientavimo į rytus modelį: aptvėrimai statyti ne tik pagal reljefą, bet greičiausiai ir paisant astronominių objektų, ypač Saulės padėties pavasario pradžioje ar vasaros pabaigoje bei Mėnulio pilnaties padėties rudens pradžioje ar žiemos pabaigoje.

Šiuos rezultatus galima palyginti su Alentežo dolmenų deklinacijų pasiskirstymu (Hoskin 1998, 2001, 2002). Nors galimos Saulės deklinacijos yra kartu ir Mėnulio deklinacijos, remiantis Okamo skustuvo principu labiau tikėtinas orientavimas pagal Saulę, kadangi už deklinacijų ribų tarp -24º ir +24º nėra išimčių. M. Hoskin tokį pasiskirstymą aiškina kaip orientavimą į tekančią Saulę rudens pradžioje ar žiemos pabaigoje, kuomet mažiau pastangų skiriama žemdirbystei ir lieka laiko bendruomenės kapaviečių įrengimui.

Vertė Jurgita Žukauskaitė

CARDINAL AND LUNISOLAR ALIGNMENTS AS ALIGNMENTS OF GENDER AND OF POWER

SACHA STEPHENS

Abstract

Gender terms have been used to interpret some aspects of the archaeology of Neolithic and Early Bronze Age monuments. Frequently male and female inhumations are aligned cardinally and standing stones may be 'male' pillar and 'female' lozenges. However, the astronomical alignments at monuments are frequently on lunar standstills and solstices which bisect the cardinal alignments. The anthropology of gender suggests that the concept of a 'gender of power' is useful in explaining how ritual power is realised through the scrambling of sexual identities. Proficiency in aligning monuments on lunar-solar cycles may well have been a device to appropriate ritual power.

Key words: Avebury, West Kennet Avenue, gender, Dark Moon, gender of power, cardinal alignment, lunar alignment, lunar standstill.

Introducing the Stones

Avebury circle is the largest megalithic circle in Europe. It was built in the late Neolithic/Early Bronze Age, about the same time as Stonehenge which lies about 20 miles to the south. Joining the south-south-east corner of Avebury circle is the West Kennet Avenue. This once comprised a double row of 99 pairs of megalithic stones and stretched for some 2.5 km, linking the vast circle to the small wood and stone circle known as The Sanctuary. All that is visible of the West Kennet Avenue today is a short section at the north-western end leading up to Avebury circle. This largely reconstructed section is marked by some remaining stones and a number of concrete plinths erected in those positions which have been identified by archaeology as having once held stones. In all just 72 positions are marked.

North's Alignments

John North (1996) has identified a number of lunar and cardinal alignments along the entire length of this section of the avenue. By drawing sight lines across the avenue between paired stones standing directly opposite each other, and between stones standing diagonally across from each other, North has made the following cautious suggestions: at the *north western* end of the avenue sight lines drawn between opposite stones lie in the approximate direction of the southern major standstill moonset, while the diagonally paired stones at this end lie cardinally on an east/west axis. At the *south eastern* end of the avenue sight lines drawn between opposite paired stones lie in the approximate direction of the minor standstill southern moonset and the minor standstill northern moonrise. In this same south eastern stretch the diagonally paired stones are approximately aligned on the minor standstill southern moonrise on one diagonal and cardinally on a north/south axis on the other diagonal. North recognises that we cannot deem such approximate arrangements of stones as intentional moon alignments, suggesting that the builders may not have been trying to create precise alignments but may have been merely 'aspiring to an ideal'. But even given this qualification, there are reasons why it may be problematic to view such a low level of precision as intentional positioning of any kind: First, given the proliferation of potentially *accurately* lunar and solar aligned monuments as Stonehenge and Avebury circle (Burl 2002; North 1996; Sims 2006), there seems no good reason for taking into consideration (as evidence) such *inaccurate* alignments in the contemporary West Kennet Avenue. Second, without a convincing explanation of why these more 'approximate' alignments would have held any importance for the society in question any research will be indefensible against charges of over-interpretation. Third, this paper proposes that more accurate alignments do exist along the West Kennet Avenue which is reason in itself for rejecting the less accurate ones identified by North.

The aim of this paper is to propose an alternative way to determine whether there are intentional moon alignments along the avenue which warrant further investigation and testing. By working from theory to alignment, rather than from alignment to interpretation, as North does, we can follow higher standards of proof. If any of these or other alignments can be

deemed to be intentional with a degree of certainty then this will provide an important source of evidence which can be used to discover the purpose of the avenue, the Avebury monument itself, and something of the culture which built them.

The Need for Theory

Avebury circle has been studied to a greater degree than the avenue. Burl (Burl 2002) and North (North 1996) have shown that amongst its alignments is one on the southern major standstill moonset and the winter solstice sunset. This double alignment of standstill moon and solstice, which has been shown to occur at over 300 other stone monuments (Burl 1981; North 1996; Ruggles 1999), has the curious but invariant property of guaranteeing a dark moon[1] at the time of the solstices. Although Ruggles (Ruggles 1999) deems this property 'anomalous', Sims (2006) has interpreted Stonehenge, 20 miles to the south of Avebury, in terms of its dark moon alignment. Dark moon is usually of no interest to astronomers or archaeologists, but to anthropologists, an alignment on dark moon is not surprising. Current matrilineal-matrilocal coalition models of human origins predict that dark moon would have been particularly significant for Mesolithic and Palaeolithic foragers. A coherent and well-documented anthropological model can provide a way into the minds of the monument builders which would be impossible using archaeology alone. However, for such a model to gain any purchase in this particular archaeological site, it must be able to be used to make testable predictions.

The Coalition Model of Human Origins and the 'Gender of Power'

This model predicts that in Palaeolithic times, in order to become ritually powerful, men and women would access what has been called by Power, Watts and Aiello (Power and Aiello 1997; Power and Watts 1997), the 'gender of power'. By scrambling their biological sexual identity, in other words, by 'playing at being the other', matrilineal-matrilocal coalitions of women would reverse the normal signals of mate recognition at the ritually important time of dark moon. By scrambling their gender, women signalled 'wrong sex' to potential mates, reversing the normal signals of animal courtship in order to motivate men into preparing for monthly big game hunting parties. Timing the hunt to lead up to and finish at the time of full moon would mean the most possible light was available by which to hunt. At the culmination of the hunt, signalled by full moon, men would return with meat, ritual power would be turned off, men and women would relax the gender-scrambling, return to their biological sex (weak gender) and everyday life would return. Thus it is argued: while there are two biological *sexes* (male and female), which are fixed by biological fact, *gender* is a movable feast and the two genders (powerful and weak) can be appropriated by either sex. With the splitting of the lunar month into two, the notion of binary opposites was born: sacred/profane, wet/dry, left/right etc. Hence society, ritual and time itself had an essentially binary character for these early humans and the clock which governed the binary nature of time was the moon (Knight, 1991; Power and Aiello 1997; Power and Watts 1997).

Ritual gender-scrambling can still be seen today in many African hunter-gatherer and hunter-herder rituals. For example, new Ndembu chiefs undergo symbolic feminisation and during their coronations are considered to be neither male nor female (Turner 1969). For the Hadza, the ritual focus occurs at dark moon and examination of the Hadza *epeme* ritual reveals systematic sex reversal (Power and Watts 1997). The mixing of gender is also apparent in initiation ceremonies where adolescent girls and boys take on the characteristics of the opposite sex. Ju/'hoan initiated girls are treated as hunters while boys are secluded as if menstruating. Both are considered to be sexually ambivalent, neither male nor female (Lewis-Williams 1981; Turner 1967) and to be extremely ritually powerful (Turner 1969). The ritually potent 'liminal' state is likened to death and is linked to darkness, bisexuality and eclipses (Turner 1969). These African rituals can be viewed as reminiscent of ancient practices. With striking similarity to the model of human origins the resumption of sexual relations is usually a ceremonial mark of the return to normal society (Turner 1969). Power and Watts suggest that when gender was first constructed by early humans, it was constrained by binary structure, mapping onto a nature/culture divide, but did not embody a sexual hierarchy (Power and Watts 1997, p.103-4). This early social dynamic would have started to become unsustainable with the extinction of megafauna and by the time of the British Neolithic this egalitarianism had been subverted as elite men had begun to appropriate the gender of power, monopolising ritual power. However, the religion and cosmology would linger on for thousands of years identifiable as a 'time-resistant syntax' (Sims 2006).

This model provides one way to interpret the possible dark moon alignment at the Avebury circle; it must now

[1] I use the term 'dark moon' rather than 'new moon' to overcome any possible confusion with first waxing moon. By 'dark moon' I simply mean the time when there is no visible moon in the sky.

be tested further by checking whether other aspects of the model can be found in evidence in this monument.

Gender of Power in the West Kennet Avenue

North has suggested that diagonally paired stones across the avenue are cardinally aligned along a north/south axis at the southern end and east/west close to the circle. Acknowledging that this constitutes no more than a possible alignment, North asks: Can we find anything to support the idea that the stones are placed in a meaningful way? At the very least we should be looking for other evidence that things have been placed with the cardinal directions in mind. One likely place to expect cardinal alignment is the archaeological burial record. Many, if not most Neolithic and Early Bronze Age societies across Europe tended to align their dead with a cardinal direction in mind and often there is a gender difference in direction (Parker Pearson 1999). In Britain the clearest evidence for cardinal alignment of the dead comes from Yorkshire where societies contemporary with the West Kennet builders aligned their bodies very clearly with women laid out with their heads to the west and men to the east (Clarke 1970; Tuckwell 1975). In the Avebury region the situation is more complicated. My initial survey of burial data indicates a marked tendency for Late Neolithic/Early Bronze age bodies to be cardinally aligned; this time with heads to the north. However, over 88% of all skeletons found in the Avebury area are male. The few female remains that have been found, point to the south. We could deduce that in Avebury too, bodies were cardinally aligned according to gender but the fact that so few women are buried at all in the Avebury region must be significant. Women are, at the very least being buried in a different manner, if they are buried at all. This is in marked contrast to the early Neolithic when men, women and children were buried communally in near-equal numbers. This change in the treatment of the dead indicates a time of great social change (Parker Pearson 1999).

The gender of power thesis gives an explanation for the emergence of the separation between the sacred and the profane, the defining characteristic of religious thought (Durkheim 1915). While I have not completed my work on burial evidence in the Avebury area, first indications are that human sacrifices and other burials found within monuments, in other words ritually significant or sacred burials, show a tendency to be buried cross-cardinally. At least five bodies in the West Kennet Avenue alone show evidence of human sacrifice and all are buried cross-cardinally (Smith 1965). It is possible that a distinction is being made between sacred and profane death. Intriguingly, Parker Pearson has suggested that intentionally sexually ambiguous Early Bronze Age burial might indicate the powerful and/or dangerous (Parker Pearson 1999). While they appear to have aligned stones in the avenue with cardinal directions in mind, the builders ensured that procession along the avenue never involved movement along the 'male' north or 'female' south axes. The bisection of the gendered cardinal directions in burials, the cross cardinal route of the West Kennet Avenue and the alignment on the southern major standstill moonset (which lies on a near-perfect cross-cardinal axis) can be viewed as an attempt to access the sacred 'power direction'. This would add enormous potency to the rituals carried out. If the correlation between cross-cardinal burial and sacred death turns out to be more widespread then this will provide strong support for the model.

Lunar Symbolism in the West Kennet Avenue

It is likely that West Kennet Avenue was originally made up of 99 pairs of stones. There are also 99 pairs of stones in Avebury outer circle. 99 is a lunar-solar number, being the smallest number of moon cycles which will coincide with solar cycles. The remaining stones of the avenue are numbered in pairs. Pair 1 is those two stones closest to the circle while pair 37 is those stones furthest away to the southeast. Those stones on the east side of the avenue are 1a, 2a, 3a and so on, while on the west side the numbering follows a pattern of 1b, 2b, 3b etc. There is one exception to the rule of having paired stones along the avenue. At position 30b a stone was never placed. In other words stone 30a never had a companion stone across the avenue. The non-existent stone becomes all the more significant when we realise that this position is 29½ pairs of stones away from Avebury circle: 29½ is the average length in days of the lunar month. Bearing in mind that there are also 29½ sarsen uprights in the outer ring of Stonehenge, with its multiple lunar-solar alignments (North 1996; Sims 2006), this odd building feature cannot be ignored. Given that a) Avebury circle is aligned on the 'missing moon', and b) that we have a missing stone at this otherwise rather insignificant position of 30b, 29½ pairs away from the circle, it can reasonably be assumed that the pairs of stones represent moon phases.

Using the Coalition Model to Predict Alignments

The model can now be used to predict which phenomena should occur at which places and at which times. By testing the model in this way, at the same time a reason is offered for the existence of any alignments. There are 4 key aspects: the celestial body in question, whether the body in question should be setting or a rising, exactly where each phenomenon should occur, and when. If all these predictions can be confirmed as correct then the move can be made from the mere possibility of an alignment to some degree of certainty.

According to the model, position 30b where no stone was ever placed should represent that night when no moon shows in the sky. As the ethnographic record confirms, dark moon signifies the onset of ritual power mode, so we would expect the signal for this to be the *last glint* of sunset on the night of the dark moon. By deduction from the dark moon alignment at position 30b, there should be a full moon alignment around pair 15. As full moon signifies the switch to everyday mode, this is likely to be marked by the *first glint* of the rising *full* moon. From the date of the solstice, and the fact that we have stones representing moon phases, we can be very specific about which day these alignments should be seen: sunset on the night of the dark moon one month away from the solstice and the night of full moonrise closest to the solstice. If we can find an alignment on these very particular phenomena then it is reasonable to conclude that it was intentional.

Testing the Model

Let us pick a likely year to perform the test: for example, the major standstill of 1997 BC. It is sunset at the night of the dark moon, exactly one lunar month away from the winter solstice. Using stone 30a as a back sight, calculations show that the last glint of the sun would have been seen setting into the horizon at 235° directly above position 30b. An exactly similar phenomenon occurs at Stonehenge (North 1996; Sims 2006). According to the model and the ethnographic examples given, this signalled to the ancient participants the precise moment of the onset of dark moon and the time of ritual power, just as predicted. Now let us move forward half a lunar cycle to the night of the full moon, counting the stones as we go, each pair representing one night. At full moon we arrive at pair 15. Stone 15a is a very odd looking stone. It stands in its own ditch, has a flat top and when viewed from its paired stone at the average height of a Neolithic man, its top is exactly level with the background horizon. These engineered details have set the height of the stone at an exact place and suggest the potential for a precise viewing point. On this particular night, 26th December 1998 BC, using stone 15b as a back sight, calculations show that the first glint of full moon could have been seen rising at 39.8° out of stone 15a. This may be interpreted as signalling the switching off of ritual power, as predicted by the model.

Conclusion

Rather than starting from alignments and then attempting an interpretation, a coherent and well-documented anthropological model was used to predict the astronomical phenomena in the West Kennet Avenue. The existence of these very particular alignments, found to occur at the right time and position, would have been impossible to predict and may well have gone undiscovered had this model not been used as a starting point. The combined use of archaeoastronomy and anthropology has generated the following conclusion: while North appears to have over-interpreted the number of moon alignments along the West Kennet Avenue, it is likely that the cardinal alignments he has identified are intentional.

References

BURL, A., 1981. By the light of the cinerary moon: chambered tombs and the astronomy of death. In: C.L.N. RUGGLES, A.W.R. WHITTLE, eds. *Astronomy and Society in Britain During the Period 4000-1500 BC.* British Archaeological Reports British Series 88, Oxford: BAR, 243-74.

POWER, C., WATTS, I., 1997. The Woman with the zebra's penis. Gender, mutability and performance. *Journal of the Royal Anthropological Institute*, 3, 537-560.

SIMS, L.D., 2006. The Solarization of the Moon: Manipulated Knowledge at Stonehenge. *Cambridge Archaeological Journal*, 16(2), 191-207.

TUCKWELL, A., 1975. Patterns of Burial Orientation in the Round Barrows of East Yorkshire. *London University Institute of Archaeology Bulletin 1975*, 12, 95-123.

BURL, A., 2002. *Prehistoric Avebury.* New Haven (CT): Yale University Press.

CLARKE, D.L., 1970. *Beaker Pottery of Great Britain and Ireland*. Cambridge: CUP

DURKHEIM, E., 1915. *The Elementary Forms of the Religious Life: A Study in Religious Sociology.* London: Allen and Unwin.

KNIGHT, C., 1991. *Blood Relations: Menstruation and the Origins of Culture* London: Yale.

LEWIS-WILLIAMS, J.D., 1981. *Believing and Seeing: Symbolic Meanings in Southern Rock Art Paintings.* London: Academic Press.

NORTH, J., 1996. *Stonehenge: Neolithic Man and the Cosmos.* London: Harper Collins.

PARKER PEARSON, M., 1999. *The Archaeology of Death and Burial*. Stroud: Sutton Press.
POWER, C., AIELLO, L.C., 1997. Female proto-symbolic strategies. In: L.D. HAGER, ed. *Women in Human Evolution*. London: Routledge, 153-171.
RUGGLES, C.L.N., 1999. *Astronomy in Prehistoric Britain and Ireland*. New Haven & London: Yale University Press.
SMITH, I., 1965. *Windmill Hill and Avebury*. Oxford: Clarendon Press.
TURNER, V.W., 1967. *The Forest of Symbols: Aspects of Ndembu Ritual*. Ithaca: Cornell University Press.
TURNER, V.W., 1969. *The Ritual Process: Structure and Anti-Structure*. Harmondsworth: Penguin.

Received: 2 November 2007; Revised: 31 October 2008

SAULĖS IR MĖNULIO ORIENTACIJOS KAIP LYTIES IR GALIOS RODIKLIAI

Sacha Stephens

Santrauka

Avebury (Viltšyras, Anglija) akmenų ratas, didžiausias megalitinis ratas Europoje, buvo pastatytas vėlyvuoju neolito – ankstyvuoju bronzos amžių laikotarpiais. Jame, kaip ir daugelyje kitų megalitinių paminklų, išskiriamos dvejopos pagrindinės akmenų orientavimo kryptys: Mėnulio laidos kryptis pietinės didžiosios lunisticijos metu ir žiemos saulėgrįžos saulėlydžio kryptis.

Siekiant paaiškinti šio ir kai kurių kitų neolito bei ankstyvojo bronzos amžiaus laikotarpių megalitinių paminklų reikšmingas astronomines orientacijas, pasitelkiamas vadinamasis matrilinijinis-matrilokalinis žmogaus kilmės modelis (iškeliantis ritualinio lyčių (gender) sukeitimo svarbą pirmykštėse bendruomenėse) ir remiamasi prielaida, kad paleolito ir mezolito bendruomenėms ritualiniais tikslais galėjo būti svarbus jaunaties (vadinamojo „juodojo Mėnulio“) laiko nustatymas.

Vertė Jonas Vaiškūnas, Jurgita Žukauskaitė

SEARCHING FOR THE ASTRONOMY OF ABORIGINAL AUSTRALIANS

RAY P. NORRIS

Abstract

It is widely accepted that the traditional culture of Aboriginal Australians has a significant astronomical component, but it is unclear whether this component extended beyond ceremonial songs and stories. Here I summarise a growing body of evidence that there was a deep understanding of the motion of objects in the sky, that this knowledge was used for practical purposes such as constructing calendars, and there may even be evidence for careful records and measurements.

Key words: Australia Aboriginal.

Introduction

Amongst the 400 indigenous cultures in Australia, each with its distinct mythology, ceremonies, and art forms, threads a strong interest in the night sky. Since Aboriginal cultures stretch back unbroken for 50,000 years or more, it has been suggested (e.g. Haynes 1992) that the Australian Aboriginal people were the world's first astronomers. This argument rests upon two hypotheses: one is that the Aboriginal people were practicing astronomy, and the second is that these practices stretch back 50,000 years. The project described here aims to test the first hypothesis in a systematic way.

The word "astronomy" implies more than a passing interest in the phenomena in the sky, or recognising a few stars or their patterns. It implies a quest to understand the sky, to ask questions about the motion of the Sun and Moon, to ponder what would cause phenomena like eclipses or comets, and to ask whether events in the sky are connected to those on Earth. So the aim of this project is to explore whether there exists evidence for such a deep interest amongst traditional Aboriginal people. The project has two key components.

In some parts of Australia, such as Arnhem Land in the North of Australia, these cultures are flourishing. For example, Yolngu people still maintain traditional aspects of their lifestyle, and continue to conduct initiation ceremonies, at which much of the traditional lore is passed from generation to generation. The first thread of the project aims to record their stories and ceremonies, and as much of the astronomical lore as might be told to an uninitiated white person.

In other parts of Australia, the Aboriginal culture was badly damaged by the arrival of Europeans some 200 years ago. For example, the Aboriginal people around Sydney disappeared within a few years of the arrival of Europeans, due to a combination of introduced disease, exclusion from their sources of food and water, and even deliberate genocide. In these regions, little is known of the original culture of the Aboriginal people, but we can study it by examining their art and artefacts. Thus the second thread of the project focuses on surveying and recording the rock engravings of the Sydney basin region and the stone arrangements of Victoria.

Aboriginal astronomy was first described by Stanbridge (1857), and subsequent important works include those by Mountford (1976), Haynes (1992), Johnson (1998), and Cairns and Harney Yidumduma (2003). Most of these works focus on how objects in the night sky represent events or characters in Dreaming stories, and only touch briefly on practical applications or on interpretation of the motion of the sky.

For example, several Aboriginal groups tell how the Pleiades are a group of sisters chased by a young man in the constellation of Orion. Although this similarity between Aboriginal and Greek stories suggests early cultural contact between Aboriginal and European people, it is unlikely that such contact took place. It is more likely that the Aboriginal people independently devised the stories in a sort of cultural convergent evolution. But more interesting to this project is the report by Harney Yidumduma (1959) that the Kuwema people used the heliacal rising of Orion to tell them when to harvest dingo puppies, which were an important food source.

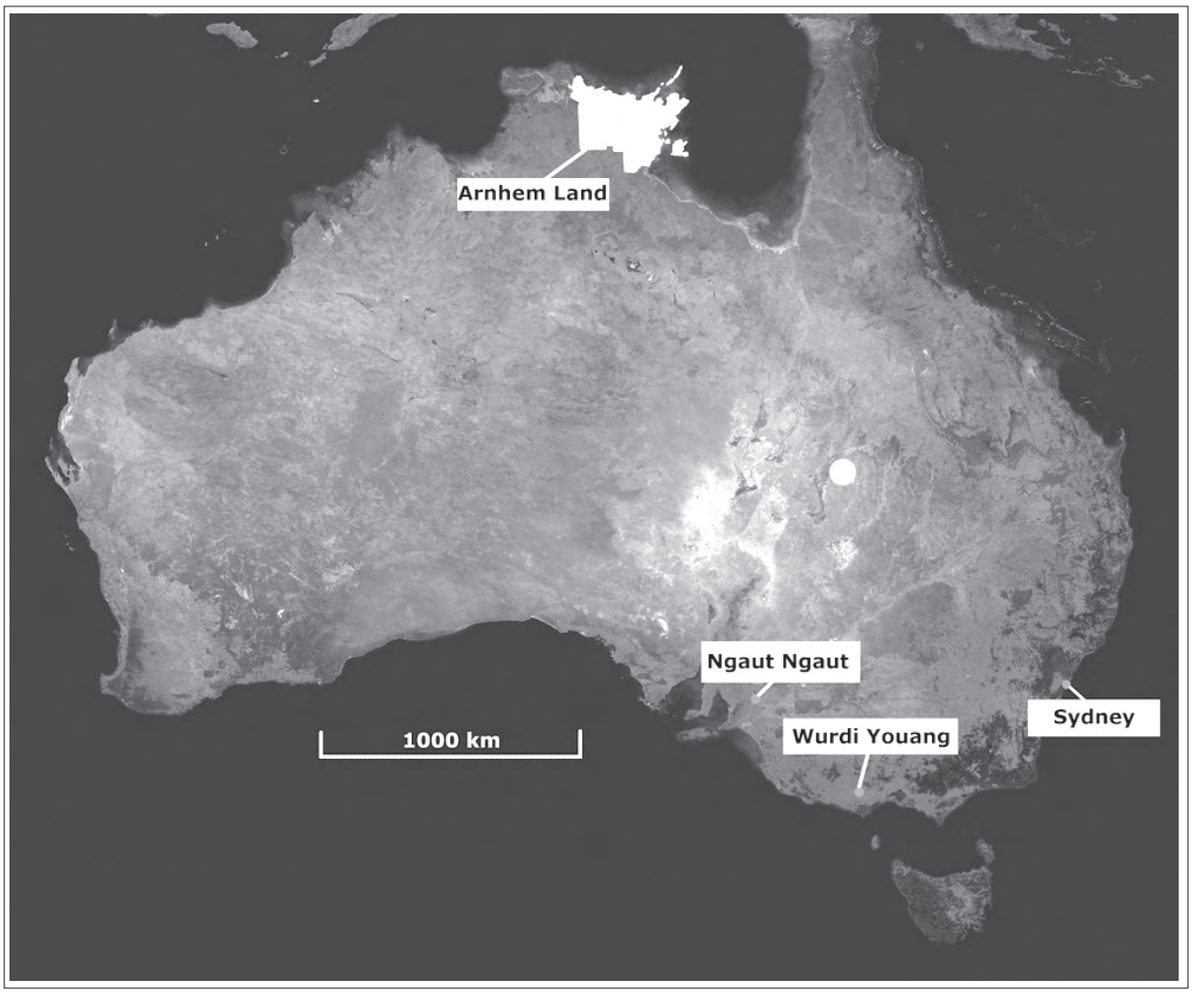


Fig. 1. Map of Australia.

Cultural Background

The many Australian Aboriginal cultures are quite distinct from each other, and their languages can be as different as Chinese is from Italian. Nevertheless, there are some common threads.

For example, most Aboriginal cultures are centred on the idea that the world was created in the "Dreaming" by ancestral spirits who have left their symbols all around us. If one can understand these symbols, then one has a complete understanding of the world, of the meaning of life, and of the rules by which one must live – a sort of user manual for existence. Naturally, the night sky is an important chapter of this manual.

The southern sky is striking compared to that of the northern hemisphere, often dominated by the magnificent river of the Milky Way weaving across the zenith, crossed by numerous dust lanes. For those living in Australia before the advent of streetlights, the night sky would be an important and integral part of their understanding of the world. Naturally, they would notice that particular stars or patterns are seen only at certain times of the year. Furthermore, since many chose to travel in the cool of the night, they would quickly find that stars are useful for navigation.

An impediment to this study is the misinformation permeating the literature, dating from an era when racial stereotypes were widespread even amongst academics. For example, Blake (1981) states categorically "No Australian Aboriginal language has a word for a number higher than four". Having watched Aboriginal children counting in the Tiwi language to see who could hold their breath longest underwater, I very much doubt this. More importantly, complex Aboriginal number systems have since been well-documented in the literature (e.g. McRoberts 1990; Tully 1997). Such ingrained attitudes state equally misleadingly that Aboriginal people "don't measure things", and so would not be interested in or capable of careful astronomical measurements. Rather than relying on such assertions, this project concentrates on exploring the available evidence.

Sun, Moon, And Eclipses

In most Aboriginal cultures, the Moon is male and the Sun is female. For example, the Yolngu people of Arnhem Land in the far north of Australia tell how Walu, the Sun-woman, lights a small fire each morning, which we see as the dawn (Wells 1964). She decorates herself with red ochre, some of which spills onto the clouds, creating the red sunrise. She then lights her torch, made from a stringy-bark tree, and travels across the sky from east to west carrying her blazing torch, creating daylight. As she descends at the end of her journey, again some of the red ochre dusts the clouds to give the red sunset. On reaching the western horizon, she puts out her torch, and starts the long journey underground back to the morning camp in the east. Thus the Yolngu people explained the daily motion of the Sun across the sky and back again under the ground.

The Yolngu people call the Moon Ngalindi and he too travels across the sky. Originally, he was a fat lazy man (corresponding to the full Moon) for which he was punished by his wives, who chopped bits off him with their axes, producing the waning Moon (Wells 1964; Hulley 1996). He managed to escape by climbing a tall tree to follow the Sun, but was mortally wounded, and died (the new Moon). After remaining dead for 3 days, he rose again, growing round and fat (the waxing Moon), until, after two weeks his wives attacked him again. The cycle continues to repeat every month. Until Ngalindi first died, everyone on Earth was immortal, but he cursed humans and animals so that only he could return to life. For everyone else, death would thereafter be final.

But the Arnhem Land stories go much further, even explaining why the Moon is associated with tides. When the tides are high, water fills the Moon as it rises. As the water runs out of the Moon, the tides fall, leaving the Moon empty for three days. Then the tide rises once more, refilling the Moon. So, although the mechanics are a little different from our modern version, the Yolngu people obviously had an excellent understanding of the motions of the Moon, and its relationship to the tides.

The Warlpiri people explain a solar eclipse as being the Sun-woman being hidden by the Moon-man as he makes love to her. On the other hand, a lunar eclipse is caused when the Moon-man is threatened by the Sun-woman who is pursuing him and perhaps catching up. These two stories demonstrate an understanding that eclipses were caused by a conjunction between the Sun and Moon moving on different paths across the sky, occasionally intersecting (Warner 1937). This realisation is found in several other language groups. For example, Bates (1944) recounted how, during the solar eclipse of 1922, the Wirangu people told her that the eclipse was caused by the Sun and Moon "becoming husband and wife together".

Fig. 2. A rock engraving showing a crescent.

Amongst thousands of beautiful rock engravings in Ku-ring-gai Chase National Park, just outside Sydney, are a number of crescent shapes, such as that shown in Fig. 2. Archaeologists (e.g. McCarthy 1983) have traditionally referred to these shapes as boomerangs. However, a detailed study (Norris 2008) has shown that these shapes are more likely to represent crescent moons than boomerangs. For example, boomerangs usually have two straight lengths rather than a single curved crescent, and rarely have pointed ends. Furthermore, it is unclear why a man and woman should reach up towards a boomerang in the sky. But if these shapes are moons, then why is the moon shown with the two horns pointing down, since that configuration is seen only in the afternoon or morning when the Sun is already high in the sky, and the moon barely visible?

One answer is that it might depict an eclipse. In Fig 2, the man stands in front of the woman, partly obscuring her. Such carefully-drawn obscurations are unusual in these rock carvings, and in this case may well represent the Moon-man obscuring the Sun-woman during a solar eclipse.

The Calendar

Aboriginal calendars tend to be more complex than European calendars, and those in the north of Australia are often based on six seasons. Some Aboriginal groups mark them in terms of the stars which appear during these seasons. For example, the Pitjantjatjara people say that the rising of the Pleiades in the dawn sky in May heralds the start of winter (Clarke 2003). Perhaps even more importantly, the heliacal rising of a star or constellation can tell people when it's time to move to a new food source. For example, when the Mallee-fowl constellation (Lyra) appears in March, the Boorong people of Victoria know that the Mallee-

fowl are about to build their nests, and when Lyra disappears in October, the eggs are laid and are ready to be collected (Stanbridge 1857). Similarly, the appearance of Scorpius told Yolngu people that the Macassan (Indonesian) fisherman would soon arrive to fish for Trepang.

Close to the Southern Cross (a possum in a tree, according to the Boorong people) is a dark cloud of interstellar dust, called the Coalsack by astronomers. To the Wardaman people, it's the head of a lawman (B. Yidumduma Harney, personal communication, 2005), but to many others, it's the head of the Emu in the Sky. The emu's body stretches down to the left towards Scorpius, dominating the southern Milky Way. In Ku-ring-gai Chase National Park is an engraving of an emu, which appears to be oriented (Cairns 1996) to line up with the Emu in the Sky, in the correct orientation, at just the time of year when real-life emus are laying their eggs.

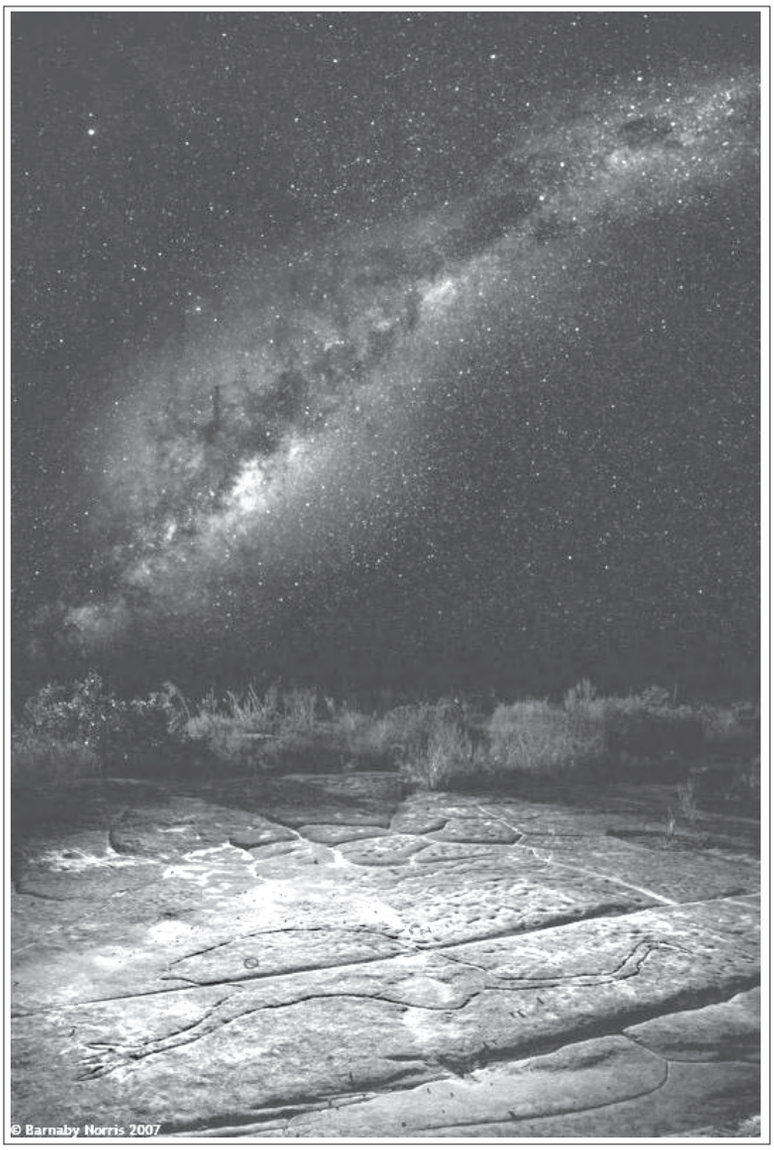


Fig. 3. The emu in the sky above her engraving. © Barnaby Norris.

The Planets

Yolngu people call the planet Venus "Banumbirr", and tell how she came across the sea from the east in the Dreaming, naming and creating animals and lands as she crossed the shoreline, and continued travelling westwards across the country, leaving as her legacy one of the "songlines" which are important in Aboriginal cultures.

In an important and beautiful "Morning Star Ceremony", earthly Yolngu people communicate with their ancestors living on Baralku, the island of the dead, with the help of Banumbirr together with a "Morning Star Pole". The ceremony starts at dusk and continues through the night, reaching a climax when Banumbirr rises a few hours before dawn. She is said to trail a faint rope behind her along which messages are sent, and which prevents her from ever moving away from the Sun. This faint line in the sky is probably zodiacal light, which is caused by extraterrestrial dust in the plane of the solar system. Although difficult to see for most of us in our polluted skies, it is easily visible in the clear dark skies and low latitude of Arnhem Land.

The Morning Star ceremony tells us two important things. One is that Yolngu people had already observed that Venus never strays far from the Sun, which they explain in terms of the rope binding the two bodies together. The other is that the Morning-Star ceremony has to be planned well in advance, since Venus rises a few hours before dawn only at certain times of the year, which vary from year to year. So the Yolngu people also track the complex motion of Venus well enough to predict when to hold the Morning Star Ceremony.

Astronomical Measurements

Having established that traditional Aboriginal cultures embodied a deep interest in the motion of heavenly bodies, can we find any evidence to support the "Stonehenge hypothesis " that careful observations

Fig. 4. The carvings at Ngaut Ngaut, said to represent lunar cycles.

were made, records kept, or structures set up to point to the rising and setting places of heavenly bodies?

On the banks of the Murray River, north of Adelaide, is a site called "Ngaut Ngaut". It belongs to the Nganguraku people, and engraved images of the Sun and Moon testify to its astronomical connections. Close to the engravings are a series of dots and lines carved in the rock, which, according to the traditional owners, show "cycles of the Moon". This oral tradition has been passed through generations from father to son, but since initiation ceremonies were banned (along with the Nganguraku language) by Christian missionaries over a hundred years ago, only this fragment of knowledge survives, and it is not known exactly what the symbols mean. The rich record engraved on the walls of Ngaut Ngaut has so far defied attempts at decoding it. So, for the moment we must label it as intriguing, but not conclusive evidence of Aboriginal astronomy.

Even closer to the Stonehenge Hypothesis is the Wurdi Youang stone arrangement in Victoria, which was built by the Wathaurung people before European settlement, but all records of its use have now disappeared. This egg-shaped ring of stones, about 50m in diameter, has its major axis almost exactly East-West. At its Western end, at the highest point of the circle, are three prominent waist-high stones. Morieson (2003) pointed out that some outlying stones to the West of the circle, as viewed from these three stones, seem to indicate the setting positions of the Sun at the equinoxes and solstices. Norris et al (2008) have confirmed these alignments and have shown that the straight sides of the circle also indicate the solstices.

However, a sceptic might still raise some doubts. First, the outliers are only accurate to a few degrees - could these alignments have occurred by chance? Second, although the stones of the circle are large and immovable, the outliers are small and could have been moved.

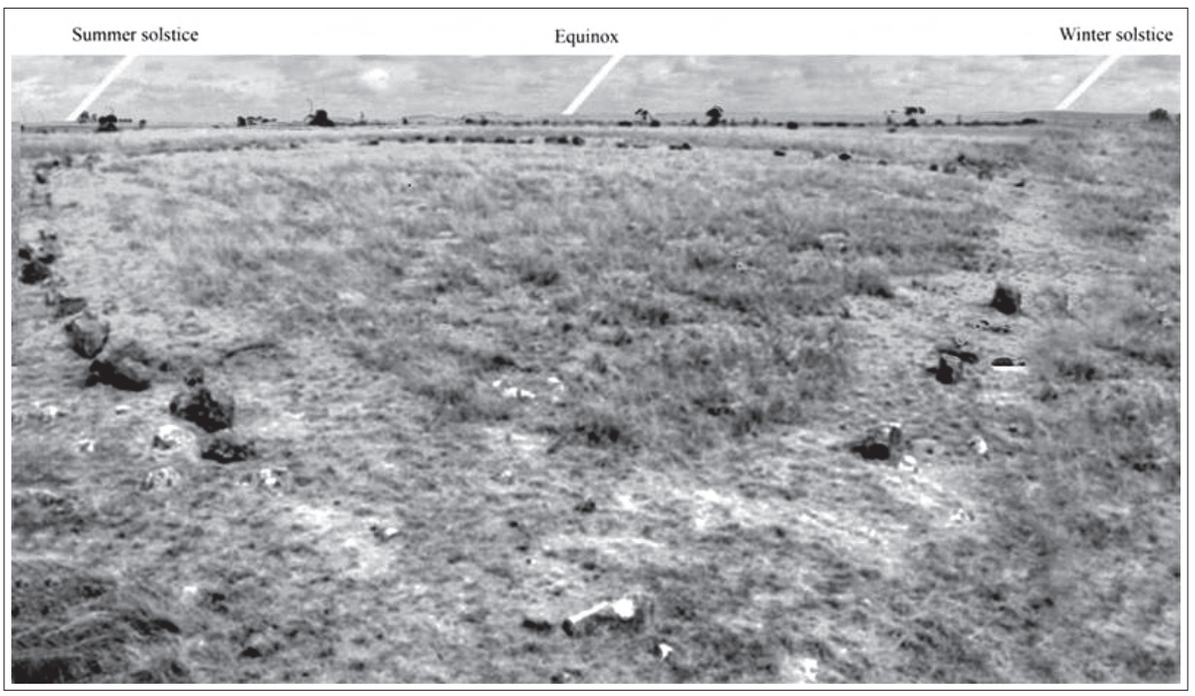


Fig. 5. The view across the Wurdi Youang stone circle, showing the positions of the setting sun at the solstices and equinox. Lower part of the composite. © John Morieson.

Third, besides the outliers indicating the solstices and equinox, there is an additional outlier whose significance is unclear. While these doubts may seem contrived, they have to be answered, and the best way to do so would be to find another site with similar astronomical alignments. Other stone arrangements in Victoria also indicate the cardinal points, from which we may conclude that the local Aboriginal people knew these directions with some precision, presumably by observing celestial bodies. But are there other sites which point to the position of the solstices? The search continues.

Conclusion

There is a growing body of evidence that traditional Aboriginal people were deeply fascinated by the sky, and the motion of the bodies within it, and had a far richer and deeper knowledge of the sky than is usually appreciated. However, while the evidence for actual measurements or records is suggestive, it remains unproven, although the clues are sufficiently tantalising to fuel the search for more evidence.

Acknowledgements

This project is dedicated to the hundreds of thousands of Indigenous Australians who lost their lives after the British occupation of Australia in 1788. I especially thank the elders and people of the Yolngu community at Yirrkala, NT, for their help and hospitality, and for their permission to discuss aspects of their culture in this paper. I am also grateful to the other Indigenous groups who have welcomed us onto their land. I also thank Cilla Norris, who helped with much of the research described here, and my colleagues Hugh Cairns, Paul Curnow, and John Morieson for their help and collaboration.

References

BATES, D., 1944. *The Passing of the Aborigines*, London: John Murray.

BLAKE, B.J., 1981. *Australian Aboriginal Languages.* London: Angus & Robertson.

CAIRNS, H., 1996. *Sydney Rock Carvings & Astronomy*, unpublished manuscript.

CAIRNS, H., HARNEI YIDUMDUMA, B., 2003. *Dark Sparklers: Yidumduma's Wardaman Aboriginal Astronomy, Northern Australia 2003.* Sydney: Hugh Cairns.

CLARKE, P.A., 2003. *Where the Ancestors Walked. Australia as an aboriginal landscape.* Crows Nest: Allen & Unwin.

HARNEY YIDUMDUMA, B., 1959. *Tales from the Aborigines.* Adelaide: Rigby.

HAYNES, R. D., 1992. Aboriginal Astronomy. *Australian Journal of Astronomy* 4, 127-140.

HULLEY, C.E., 1996. *Dreamtime Moon.* Chatswood, NSW: Reed Books

JOHNSON, D., 1998. *Night skies of Aboriginal Australia: a noctuary*. Sydney, N.S.W: Oceania Publications, University of Sydney.

MCCARTHY, F. D., 1983. *Catalogue of Rock Engravings in the Sydney-Hawkesbury District.* Sydney: New South Wales National Parks and Wildlife Service.

MCROBERTS, R.W., 1990. *Counting at Pularumpi.* Library of the Australian Institute of Aboriginal and Torres Strait Islanders Studies.

MORIESON, J., 2003. Solar-based Lithic Design in Victoria, Australia. In: *World Archaeological Congress*, Washington DC.

MOUNTFORD, C.P., 1976. *Nomads of the Australian Desert.* Adelaide: Rigby.

NORRIS, R.P., 2008. *Crescent moons in Sydney Rock Engravings*, in preparation.

NORRIS, R.P., NORRIS, P.M. and MORIESON, J., 2008. *Wurdi Youang: An Australian Aboriginal Stone Circle with solstitial indicators*, in preparation.

STANBRIDGE, W.E., 1857. On the astronomy and mythology of the Aborigines of Victoria. In: *Transactions of the Philosophical Institute of Victoria*, Volume 2, 137-140.

TULLY, J., 1997. *Dja Dja Wurrung Language of Central Victoria including place names*, privately published.

WARNER, W.L., 1937. *A black civilization: a social study of an Australian tribe.* New York: Harper.

WELLS, A., 1964. *Skies of Arnhem Land.* Sydney: Angus & Robertson.

Received: 25 October 2007; Revised: 7 January 2008

AUSTRALIJOS ABORIGENŲ ASTRONOMIJOS BEIEŠKANT

Ray P. Norris

Santrauka

Australijoje egzistuoja apie 400 skirtingų vietinių kultūrų, turinčių savitą mitologiją, ritualus, meno formas. Daugelyje iš jų aptinkama ryškių astronominių žinių elementų. Vis dėlto šioms įvairioms kultūroms yra būdingi ir bendri vaizdiniai, kaip antai, „Emu danguje“ (emu – Australijos paukštis *Dromaius novaehollandiae* – vert. past.) – tamsių debesų telkinys Paukščių Take, taip pat žinomi įvairūs visiems bendri pasakojimai apie Saulę, Mėnulį, Orioną, Sietyną. Nors Saulės užtemimų buvo bijomasi, žinomi mažiausiai du nepriklausomi liudijimai, kad vietiniai žmonės užtemimus siejo su Saulės ir Mėnulio jungtimi.

Mūsų projektas skirtas šių kultūrų studijoms dviem pagrindinėmis kryptimis. Viena kryptis – darbas su vietinėmis kultūromis, tokiomis kaip Yolngu, Šiaurės

Australijoje, kurių tradicinė kultūra klesti. Įrašinėjame pasakojimus ir fiksuojame astronomines žinias tiek, kiek jų gali būti pateikta nenusimanančiam baltajam asmeniui.

Kita kryptis skirta Pietryčių Australijos vietinių žmonių astronomijos studijoms. Šias kultūras per keletą metų smarkiai apnaikino europiečių gyvenvietės. Čia tiriami ir fiksuojami petroglifai Sidnio baseino regione, taip pat akmenų konstrukcijos Viktorijoje. Sidnio uolų menui, iš visko sprendžiant, būdingas ryškus astronominis simbolizmas: čia paminėtinas emu atvaizdas uoloje (labiau primenantis „Emu danguje“ nei tikrovišką paukštį emu) bei dažnai vaizduojamas Mėnulio pjautuvas. Nustatyta, kad Viktorijoje esantis akmenų ratas apytikriai orientuotas į saulėgrįžas ir lygiadienį, bet turima ir kitų pavyzdžių, kur akmenys gana kruopščiai orientuoti pagal pasaulio šalis. Toliau vykdant tyrimą siekiama nustatyti, ar šie pastebėjimai gali būti pagrįsti statistiškai.

Vertė Jurgita Žukauskaitė

VII. ARCHAEOLOGY, FOLKLORE AND THE RECOVERY OF PAST ASTRONOMIES

ALTERNATIVE ARCHAEOASTRONOMIES – AN OVERVIEW

STANISŁAW IWANISZEWSKI

Abstract

My paper focuses on diverse misinterpretations in archaeoastronomy grouped into three main topics: 1. Archaeoastronomy, modernity, and ethnic and national identities; 2. 'Alternative' and 'fringe' archaeoastronomies; 3. Neo-shamanic, neo-pagan, and New Age perspectives and the reinvention of an astronomical tradition. They all are briefly described in order to remind us we should be increasingly aware of our own prejudices and of the styles of analysis we may be imposing on the celestial lore of other peoples.

Key words: alternative archaeoastronomies, astralism, panbabylonianism.

Defining the Ground for Archaeoastronomy

The ways in which societies are engaged with their surroundings are neither absolute nor universally valid. Each society has its own lifeworld which may or may not be different from any other. Not all societies are equally active in constructing their own surroundings, but all acquire some knowledge of the world in the process of dwelling in the world. Phenomenological notions of "being-the-world" advocated by Ingold (2000, p.5, 185-187) imply that celestial lore, like other types of cultural knowledge, is acquired, altered, represented and shared in the process of dwelling in the world. Hence it should be elicited within the context in which it functions. This context has many social, material and symbolic components which should not be separated from each other. Viewed in this way, celestial lore should be conceived as embodied in peoples' forms of acting in the world rather than as being locked inside peoples' heads. The advantage of this perspective is that it offers the possibility of studying people's perceptions of the sky through different expressions embedded in diverse social practices and structures, and in material evidence.

Even if the anthropological and archaeological concepts of culture routinely consider context as a source of knowledge, their contextualizations are not heuristically neutral[1]. While anthropologists and archaeologists may well be aware of their analytical biases, other scientists may not. Archaeological narratives reach diverse audiences and may be worked out in relation to different political, ideological, religious, pseudoscientific, and other agendas. Archaeology attracts different groups who may define themselves through the display of distinctive symbolic forms, including objects and practices used in the past. While archaeology and anthropology use the concept of culture as a means of explaining human difference and attempting to elucidate what is relevant for cultural diversity and what is commonly shared by all humans, modern or marginalized groups may use the cultural (and scientific) legacy of the past for the greater recognition of their cultural 'authenticity' or for specific political reasons.

Finally, all our propositions and viewpoints are made within the framework of modern science in which objects of inquiry are removed from the context in which they had functioned and are analyzed in terms of western logic with categories and techniques that are imported from our own societies. The difference between embedded and non-embedded knowledge has long

[1] Briefly, context may be defined as the recognition of the interactive nature of the archaeological record. It refers to the material remains of the past that are created, used, and deposited in a spatial, temporal, typological and functional relationship to other remains. The point here is that the recognition that (specific) context exists depends on the skills of researchers and on the theories they use.

been the basis for neglecting the value of nonwestern types of astronomies (see Rochberg 2004, p.14–43). While the aim of modern science is to offer a type of objective knowledge which by definition is disembedded, archaeology and anthropology recognize that each interpretation is partial and provisional.

Archaeoastronmy and 'Alternative' Archaeoastronomies

'Alternative' archaeologies is a term typically used to describe 'fringe', 'cult' and 'pseudo' archaeologies (Wallis 2003, p.9-12; Bender 1995, p.270) in order to avoid pejorative connotations. Following Trigger (1984) I use this term to embrace a diversity of interpretative narratives affecting local and regional archaeologies.

From its start, archaeoastronomy has served purposes other than scientific (its function has been educational, ideological, and political) and has been exposed to many modern social-cultural phenomena including globalism, multiculturalism, (scientific and cultural) relativism, heritage preservation and management, and astro-tourism. Today, archaeoastronomical narratives may be used to feed the fervor of new-ageism, to revive occultism and hermeticism, to endorse the political aspirations of social-cultural movements or even to instigate scientific imperialism. Studying 'alternative' archaeoastronomies may serve to identify, at least on a descriptive level, the political and ideological motivations affecting ongoing research.

Archaeoastronomy grew out of a romantic commitment that architectural remains of the past possess certain hidden meaning (Wood 1978, p.1–2). In accordance with mythical accounts, old monuments were assumed to be connected to rituals, religious festivities and ceremonies and their forms and structures and locations within particular landscapes were supposed to convey elements of ancient wisdom (e.g. Hirsch 1965). Hence, mathematical and geometrical attributes found in architectural features became indicative of some sort of knowledge of their designers and builders, and astronomical alignments were perceived as elements revealing the celestial knowledge of the ancients.

The idea that the traces of the past contain some hidden meaning is rooted in the concept of "degenerationism" (Whitrow 1990, p.173-175; Gosden 1999, p.23-24) derived from the cyclical-degenerative concept of world history. During the sixteenth and seventeenth centuries European societies saw themselves as directly descending from Classical Antiquity and according to the Classical myth of the Golden Age – the Garden of Eden imagined as the peak epoch of human thought and culture – successive civilizations were seen as having degenerated from a higher to a lower stage.

Because the notion of progress was rejected, the only way to acquire new knowledge was to discover the hidden wisdom of the ancients, which was believed to be encoded in their architecture. The rediscovery of Greek culture in the eighteenth century was very important to the creation of European identity, because the work of Classical artists, especially the canons of aesthetics, quickly became central to European education (the British Great Tour and its regional imitations). After Napoleon´s campaigns, Egypt came to be considered as the cradle of high culture and civilization, and later Egypt was joined by Mesopotamia. Ancient wisdom, thought to be lost, was recovered after the decipherment of ancient documents that revealed the deep interest in astronomy of ancient peoples in the Near East. As all great civilizations of the ancient world (Chinese, Indian, Mayan, Aztec, Inca and druidic) appeared to possess (relatively) advanced knowledge about the sky, ancient large-scale architecture which was traditionally conceived as mysterious and impossible to be adequately comprehended, became quickly conceived as encoding knowledge about cosmic order – the hidden key to understanding how the universe works.

Occultism and hermeticism

'Alternative' archaeoastronomies share the same attitude with respect to ancient monuments, though they conceive this in a slightly different form. Occultism investigates the spiritual world which is usually hidden from ordinary vision, or exists 'out there', beyond the world of human beings (Gettings 1978, p.7). The relations between God, man and the world can adequately be described and studied by individual subjects who perceive them through various spiritual techniques and represent them through hermetic symbolic languages. Occultist (cabalistic, numerological, Rosicrucian, Masonic, hermetic) traditions believe this hidden reality is often encoded in works of art, in a secret symbolism which is intentionally made to be decoded and understood only by the initiated (Gettings 1978, p.7). From the standpoint of occultism, architectural forms and Egyptian hieroglyphic writing are examples of such a symbolic means devised for the transmission of spiritual mysteries to the initiated which are virtually inaccessible to the profane (Ashe 1979; Curl 1982 cited by Trigger 1995, p.267). Egyptian pyramids and western European megaliths were conceived as obvious examples of such architecture and converted into targets of the ongoing research.

Occultists quickly explored the potential significance of the historical and archaeological past. Their 'recon-

structed' chains of events, individuals and secret societies engaged in the transmission of esoteric knowledge usually began in the ancient civilizations of Egypt and/or India which were themselves regarded as repositories of a millenary tradition left by the survivors of the collapsed Atlantis civilization which had received the knowledge in turn from extraterrestrial beings. Most of the esoteric speculation about Egyptian mysteries is a pure Hellenistic construction well placed within the Greek traditions of alchemy and astrology, and offers no keys to the astronomical knowledge of old Egypt (Jordan 2006, p.110-114).

Astral mythology and astralism

The discovery of the Temple of Isis-Hathor at Dendera with its ceiling depicting the heavens reinforced the idea of the antiquity of Egyptian astronomy. One of the visitors to Dendera was Ch. F. Dupuis, a founder of astralism, the nineteenth-century prototype of archaeoastronomy[2]. Known as solar or astral mythology (*Astralmythologie*) or astralism (*astralistica*), this field of research interpreted religion, myths and rituals almost exclusively in terms of astronomical events. Originally motivated by the antireligious fervor of post-revolutionary France, this approach was later developed by F. M. Müller who conceived mythologies as primitive rationalizations of celestial phenomena. Its extreme manifestations reduced the content of all myths, legends and even fairy-tales to the eternal contest between the sun and night (Dorson 1955, p.406-407), interpreted biblical and early Christian narratives entirely in terms of solar mythology (e.g. E. Stucken), and overemphasized the role of the moon in culture ('pan-lunarism' of E. Siecke). These excessive speculations rejected notions of independent or parallel developments of astronomical knowledge and assumed that all mythologies based on astronomical events containing detailed (but hidden) information spread through the world by diffusion from Mesopotamia (panbabylonianism) or from Egypt (panegyptism)[3]. The lack of contextualized evidence and the abuse of comparative method and cross-cultural comparisons, among other factors, enabled astralism to survive into our times[4].

Archaeoastronomy, Modernity, Ethnic and National Identities

Recognizing that the emergence of archaeology is linked to the rise and spread of nationalism, colonialism and imperialism (Trigger 1984), I propose to see the development of archaeoastronomy as connected to the process of the cultural legitimation of modern science. The aim of archaeology has been to promote fictitious social unity by glorifying the past and the achievements of the indigenous peoples or peasants who constituted part of modern societies, and by asserting cultural distinctiveness from their neighbors. My point is that when science and technology were ideologically equated with the ideas of progress and objectivity (Habermas 1996), astronomy was quickly claimed to be "the oldest science known to humankind". In the framework of early positivist models of culture[5], all material remains associated with specialized astronomical knowledge (megaliths, pyramids, temples, churches) previously appropriated by ethnic, nationalist and chauvinist discourses, became regarded as proof of the scientific advancement and intellectual superiority of a nation's ancestors over other peoples and societies.

Cultural diffusionism often reflects power imbalances in the relationships between scientifically and technologically advanced and less developed societies. Following G. Kosinna (1911), the spread of megalithism in western Europe has been associated with the expansion of Aryan peoples bringing higher culture to the primitive indigenous and non-Aryan societies. Imagine, for instance, scores of priests traveling along the coast of Atlantic Europe and diffusing the idea of megalithism (Childe 1929, 209; Hawkes 1934, p.26),[6]

[2] In his main study entitled *Origine de toutes les Cultes, ou la Réligion Universelle* (1794), Charles Francois Dupuis proposed a common origin and unity of the astronomical and religious myths of the ancients (Hoffmann 1991, p.11, 15-18).

[3] After the discovery of the famous library of Assurbanipal, when tens of clay tablets revealed the antiquity of Babylonian astronomical and mathematical knowledge, heralding the emergence of panbabylonianism, or panbabylonism, a type of pseudo-science emerged within the newly established discipline of Assyriology. While Alfred Jeremias and Hugo Winckler argued that modern (scientific) astronomy derived from the cosmic philosophy of Sumer and Babylon and that all known ancient astronomies diffused from its Sumerian origins, the British school of panegyptism represented by Grafton Elliot Smith and William J. Perry advocated the idea that modern astronomy had Egyptian roots.

[4] The ideas of Eduard Seler, Robert Lehmann-Nitsche, Friedrich Röck, Leo Frobenius, Giorgio de Santillana and Hertha von Dechend, among others, still affect ongoing research.

[5] Nowadays the concept of culture is usually applied to categorize distinct human groups and to refer to the differences between them. Culture is used as a means of explaining human diversity. The adoption of the monothetic (bounded and homogeneous) model of culture, while at the same time equating of science and technology with "high" culture and with the spread of European colonialism, resulted in the model of cultural diffusion that was projected back into the past.

[6] In accordance with the positivist perspective of that epoch, culture was considered an essentialist entity, tied to a spa-

or migrating peoples bringing megalithism to the colonized land (Daniel 1941, p.46-47). A. Baschmakoff (1930) attributed calendars encoded in megalithic astronomical alignments in Brittany to the activity of pre-Aryans and R. Müller (1934, 1936) claimed the Aryan origin of stone circles at Odry. Even today, megaliths are considered as embodying the traditions of Celticity (Dietler 1994; Bender 1995; Ziolkowski and Lebeuf 1991). Chauvinistic arguments over-emphasized the role of western European megaliths and dismissed the importance of the central European Neolithic circular enclosures and earthen long barrows, thus reflecting ideas of the cultural and technological superiority of Western Europe.

Though ancient Maya societies never developed a cohesive collective identity nor built a unified polity, today's nationalist sentiments often evoke their common fictitious past through the manipulation of emotionally and symbolically charged cultural traditions. A "mystique model" (Webster 2006) representing ancient Maya civilization as a theocracy being ruled by wise priests and astronomers, often finds echo in publications that feed Maya chauvinistic fervor, New-ageism, astro-tourism, and romantic or occultist attitudes to the past. Exaggerated interpretations of Maya astronomical knowledge[7] are endlessly repeated in contemporary scientific and popular literature.

Archaeoastronomy, Neo-Shamanic and Pagan Perspectives: the Reinvention of an Astronomical Tradition

Neo-shamanic and neo-pagan attitudes to the past often make reference to the manipulation of symbols and the invention of tradition already described in anthropological studies of identity and ethnicity. In this respect neo-shamanic and neo-pagan movements appear to be free of the temporal or spatial-territorial constraints that typify all nationalist and ethnic claims, and thus enable their members to construct fictitious narratives (and imagined communities) built upon an eclectic assemblage of past and present religious and spiritual beliefs (Rountree 2002). Since such movements do not insist on presenting proofs of historical continuity, they often defy all traditional conceptualizations of absolutist and bounded notions of identity and belonging[8]. However, beyond simply challenging the rigidity of academic discourse, neo-Shaman and neo-Pagan narratives produce interpretations that reflect the localized socio-political concerns of modern societies.

Conclusions

Celestial knowledge conceived as a type of pre-modern astronomy is conceptually separated from its social-cultural meaning and analyzed in terms of western logic. However, we have seen that all archaeoastronomical interpretations of the past can be regarded as being governed by the particular scientific, political, religious, cultural or even economic agendas of their creators. "Astronomy", "calendar", "alignment", "observatory" and "time" represent concepts by means of which we can describe, analyze and study ancient societies, but these concepts are not neutral research tools; rather, they are cultural products of our epoch. In addition, the conceptual framework through which our own cultures order the social and material world is also changing through time and affects our interpretations of the past. 'Alternative' archaeoastronomies remind us that we should be aware of our own prejudices and of the styles of analysis that we may be imposing on the celestial lore of other peoples.

Perhaps it is useful to make a distinction between "celestial lore" as a culturally specific category and "astronomy" understood as an universal phenomenon denoting the multiple ways in which celestial knowledge is made manifest. Celestial lore is acquired through an active engagement with the life world ("dwelling" perspective) while astronomy may refer to culturally paradigmatic levels of abstraction. Hence, we may assume that while all architecture conveys a conception of the world, of time and space, it also reveals the skills and intentions of the designers who conceived them and of the builders and users who constructed or reworked them. The shift of emphasis from the observer's model to the agent's model is therefore a logical step in the development of cultural astronomy

References:

ASHE, G., 1979. *The Ancient Wisdom*. London: Abacus.
BASCHMAKOFF, A., 1930. Les alignements de Carnac (Morbihan). *L'Anthropologie*, 40, 40-75.

tial unit and encompassing synchronic phenomena; hence all typical and spatially bounded traits of the past were assumed to be expressions of ethnic groups (Johnson 1999, p.16-18).

[7] Examples include Teeple's (1930, p.70-85) Determinant Theory, Thompson's (1952) idea of the Maya philosophy of time, and Schele et al.'s (1990, p.165-171) accounts of the "star wars".

[8] See the controversy regarding the legacy of The Bighorn Medicine Wheel as a prehistoric site or a cultural site (Boggs 2002, 503-604). Bender's (1995) account of the appropriation of Stonehenge by different groups is an excellent example of the functioning of 'alternative' archaeologies.

BENDER, B., 1995. Stonehenge – Contested Landscapes (Medieval to Present-Day). In: B. BENDER, ed. *Landscape. Politics and Perspectives.* Oxford & Providence: Berg, 245-279.
BOGGS, J. P., 2002. Anthropological Knowledge and Native American Cultural Practice in the Liberal Polity. *American Anthropologist,* 104(2), 599-610.
CHILDE, G. V., 1929. *The Danube in prehistory.* Oxford: Clarendon.
DANIEL, G., 1941. The Dual Nature of the Megalithic Colonisation of Prehistoric Europe. *Proceedings of the Prehistoric Society*, 7, 1-49.
DIETLER, M., 1994. Our Ancestors the Gauls: Archaeology, Ethnic Nationalism, and the Manipulation of Celtic Identity in Modern Europe. *American Anthropologist,* 96(3), 584-605.
DORSON, R. M., 1955. The eclipse of solar mythology. *Journal of American Folklore,* 68(270), 393-416.
GETTINGS, F., 1979. *The Occult in Art.* New York: Rizzoli International.
GOSDEN, C., 1999. *Anthropology and Archaeology. A Changing Relationship.* London & New York: Routledge.
HABERMAS, J., 1996. *Ciencia y técnica como "ideología"*. Madrid: Tecnos.
HAWKES, J., 1934. Aspects of the Neolithic and Chalcolithic Periods in Western Europe. *Antiquity,* 8(29), 24-42
HIRSCH, F., 1965. *Der Sonnwendbogen.Eine himmelskundliche Entdeckung auf Rügen und ihre Beglaubigung durch Kinderspiele, Sagen, Märchen und Schattenzeichen der Urschrift Alteuropas.* Lahr: (privately published).
HOFFMANN, H., 1991. *Astralistyka. Szkice z dziejów religioznawstwa polskiego.* Kraków: Nomos.
INGOLD, T., 2000. *The perception of the environment. Essays in livelihood, dwelling and skill.* London & New York: Routledge.
JOHNSON, M., 1999. *Archaeological Theory. An Introduction*. Oxford & Malden, Mass: Blackwell.
JORDAN, P., 2006. Esoteric Egypt. In: G.G. FAGAN, ed. *Archaeological fantasies. How pseudoarchaeology misrepresents the past and misleads the public,* Abingdon & New York: Routledge, 109-128.
KOSSINNA, G., 1911. D*ie Herrkunft der Germanen. Zur Methode der Siedlungsarchälogie*. Leipzig: Curt Kabitzch.
MÜLLER, R., 1934. Zur Frage der astronomischen Bedeutung der Steinsetzung Odry. *Mannus,* 26, 289-309.
MÜLLER, R., 1936. *Himmelskundliche Ortung auf Nordisch-Germanischen Boden.* Leipzig: Curt Kabitzch.
ROCHBERG, F., 2004. *The Heavenly Writing: Divination, Horoscopy, and Astronomy in Mesopotamian Culture.* Cambridge: Cambridge University Press.
ROUNTREE, K., 2002. Re-inventing Malta's Neolithic Temples: Contemporary Interpretations and Agendas. *History and Anthropology*, 13(1), 31-51.
SCHELE, L., FREIDEL, D., 1990. *A Forest of Kings.* New York: Morrow.
TEEPLE, J. E., 1930. Maya astronomy. *Carnegie Institution of Washington,* Publication 403, Contrib. 2, Washington.
THOMPSON, J. E. S., 1952. The Character of the Maya. In: *Proceedings of the Thirtieth International Congress of Americanists.* London: Royal Anthropological Institute, 36-40.
TRIGGER, B., 1984. Alternative Archaeologies: Nationalist, Colonialist, Imperialist. *Man, N.S.,* 19 (3), 355-370.
TRIGGER, B., 1995. Romanticism, nationalism, and archaeology. In: P.L. KOHL, C. FAWCETT, eds. *Nationalism, politics, and the practice of archaeology*. Cambridge: Cambridge University Press, 263-279.
WALLIS, R. J., 2003. *Shamans and Neo-Shamans. Ecstasy, alternative archaeologies and contemporary Pagans*. London & New York: Routledge.
WEBSTER, D., 2006. The mystique of the ancient Maya. In: G.G. FAGAN, ed. *Archaeological Fantasies. How pseudoarchaeology misrepresents the past and misleads the public.* Abingdon & New York: Routledge, 129-153.
WHITROW, G.J., 1990. *El tiempo en la historia. La evolución de nuestro sentido del tiempo y de la perspectiva temporal.* Barcelona: Crítica.
WOOD, J. E., 1980. *Sun, Moon and Standing Stones*. Oxford: Oxford University Press.
ZIOLKOWSKI, M. S. and LEBEUF, A., 1991. Archéoastronomie? *Les nouvelles de l'archéologie,* 44, 19-22.

Received: 1 November 2007; Revised: 17 November 2008

ALTERNATYVIOJI ARCHEOASTRONOMIJA. TRUMPA APŽVALGA

Stanisław Iwaniszewski

Santrauka

Archeoastronominis paveldas yra tiek politinė, tiek ir globali problema. Skirtingų kultūrų archeoastronominių vietų grupavimas grindžiamas iš konteksto išskiriant specifinius reikšmingus astronominius komponentus ir suteikiant jiems apibrėžtą reikšmę, nustatomą pagal Pasaulio paveldo centro projektą. Nors materialūs objektai šiandien traktuojami kaip objektyvūs, paklūstantys mokslo (astronomijos) dėsniams, vis dėlto iki šiol tam tikros grupės žmonių priskiria jiems skirtingas prasmes. Straipsnyje aptariamos sociopolitinės ir „kraštutinės" archeoastronomijos interpretacijos, laikantis postprocesualinės archeologijos požiūrio. Nagrinėjamos temos: 1. Archeoastronomija, modernumas, etninis ir tautinis tapatumas; 2. „Alternatyvioji" ir „kraštutinė" archeoastronomija; 3. Neošamanizmo, neopagonybės ir Naujojo amžiaus (New Age) perspektyvos bei atradimai astronominėje tradicijoje.

Vertė Jurgita Žukauskaitė

THE CASE STUDY OF THE BOORONG

JOHN MORIESON

Abstract

They were here as recently as 150 years ago. They spoke about the main players in their celestial domain and pointed them out in the night sky. Today they are gone and the reconstruction of their cosmology has required the breadth of the nineteenth century natural philosopher, drawing on zoology, botany, and linguistics, ethnography, geography and anthropology, as well as patient, long-term naked eye observation. It has been an exciting and stimulating task to gradually unfold these stories of the Australian Aboriginal clan who were regarded by neighbouring clans as the best astronomers in the region.

Key Words: Australia, Aboriginal, Boorong, ethnoastronomy.

Introduction

I got to the stars via stone arrangements constructed by Australian Aboriginal people in my home state. One of these stone arrangements has a line of symmetry running due east and west, and on investigating, I discovered a possible means by which these stones had been placed to create this line.

Fig. 1. Wurdi Youang, Victoria, Australia.

There are strong cultural reasons why a ceremonial site should be constructed on an east-west alignment. East symbolises rebirth and is an important focus of initiation rituals for boys entering manhood. West symbolises death and is a part of funerary rites.

This arrangement is known as Wurdi Youang, the local clan was the Worin Buloke, but these people had all been killed or died within twelve years of the British arriving. So, there are no descendants to tell us the story of this place.

We note that three large rocks at the western end mimic the height of hills on the horizon and that small stones outside the perimeter line up with the setting sun at the solstices and the equinox (*centre right*).

Fig. 2. Western end, Wurdi Youang.

And from the diagram (*right*), we see the little stones outside the perimeter of the very large stones line up with

the setting sun at the solstices and at the equinox. This investigation took two years of regular observations before I was able to establish this possibility.

Having worked out how this ceremonial place may have been constructed, I then wished to know if there might be a connection with the stars, as well as the sun.

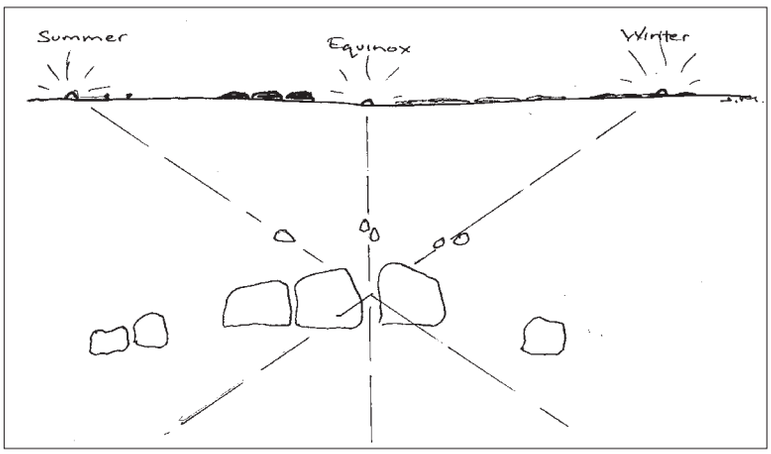


Fig. 3. Possible solstice & equinox markers.

Background

I came across a paper by William Stanbridge who addressed the Philosophical Institute in Melbourne in 1857, one hundred and fifty years ago.

Stanbridge was the first Englishman to take up residence in the country of the Boorong, which is in what we now call northwest Victoria. Often cloudless during the day, this dry country is a spectacular star-filled vista at night. Stanbridge wrote that the Boorong "pride themselves upon knowing more of Astronomy than any other tribe" (Stanbridge 1857, p.137).

The nearby lake they called "direl" because even though most often dry, it is salt encrusted, absorbs moisture from the atmosphere, and in its few centimetres covering of water, provides a mirror image of the night sky. "direl" in the local language means "night sky" or "space".

In his notes, Stanbridge wrote down the name of the forty stars or constellations given to him by the Boorong, added the European equivalent, and wrote a cryptic clue for each celestial name. The first one I looked for was 'Neilloan'. Stanbridge wrote:

> *"Neilloan (Lyra), (a Loan flying), the mother of Totyarguil and discoverer of the loan eggs, which knowledge she imparted to the Aborigines. When the loan eggs are coming in to season on earth, they are going out of season with her. When she sits with the Sun the loan eggs are in season".* (Stanbridge 1857, p.138-39).

We can call this extract the ethnological reference.

The Research

The first thing I had to do was learn about the lowan, also called the malleefowl. I found the authoritative text and commenced to read the ornithological account. At the same time I looked for Neilloan in the night sky. I found her by looking for Lyra, or by first finding Vega, courtesy of the European sourced astronomical manual.

I started as an astronomical novice, but I turned this into an advantage. Instead of looking for a musical instrument I looked for a malleefowl. And I noticed that the positioning of the stars seemed to resemble the outline of the bird in profile. I was astounded. But I was also dismayed because I could see only Vega unassisted. I had to use binoculars to see the other stars and I knew that these were not available to the thousand generations of the Boorong. However I learned from an eye specialist that Aborigines had significantly better eyesight than the mainstream population and can see these stars unassisted. Thus knowledge of human physiology was important.

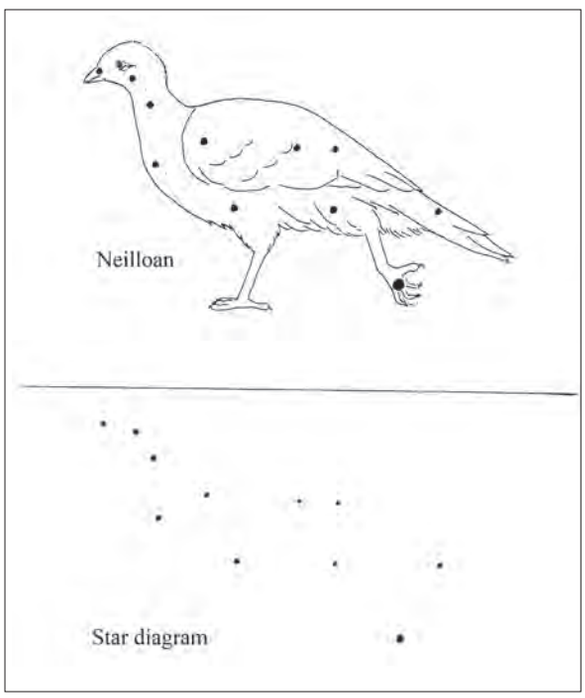


Fig. 4. Boorong constellation of the malleefowl.

And as I read more about the malleefowl I became quite excited. There seemed to be a series of coincidences between the life of the malleefowl on earth and with Neilloan in the night sky. The first is that the appearance of Neilloan in the Southern Hemisphere sky, from March to October, coincides with two significant occurrences on Earth. March is when the malleefowl begins to refurbish its laying mound for the next season's egg production. This continues off and on until October when the egg-laying season begins, as long as the weather has been propitious. This is when Neilloan leaves the sky. As Stanbridge puts it, *"When she sits with the sun the Loan eggs are in season".*

Malleefowl do not sit on their eggs to incubate them. They use the warmth of the laying mound instead and have adopted all kinds of strategies to keep the temperature of the egg chamber at a constant 23°C. Early in the season, the organic matter, when wet, will rot and ferment and this process supplies sufficient heat to incubate the eggs. As summer arrives and the ground heats up, the malleefowl will remove material to allow the sun's rays to penetrate and will close the mound to retain the heat as the temperature drops.

The female lays eggs every few days, uses massive amounts of energy to do so and therefore spends most of her time feeding. The male tends the mound, keeping the temperature constant and keeping predators at bay.

Another coincidence relates to the Lyrid meteor showers in April, June and July. The Boorong people could have seen these as the stones and grains of sand kicked into the air by the malleefowl as adjustments being made to the mound. The kicking foot of Neilloan is the major star in the constellation, being Vega, the fifth brightest star in the sky. These are things I have learnt from astronomy and zoology that help build a case for a malleefowl constellation as described by the Boorong.

Broadening the Case Study

Linguistics too helps us build a case for this bird having special qualities as well. Whilst "Loan" is a widely used alternative mainstream name for the malleefowl, the "Neil" prefix is not used. In one local Aboriginal language, "Neil" means a magical or special status. For instance, "Neilgroonye" is the Doctor's charm bag or poison bag. Neilloan has not been placed in the night sky for ecological reasons alone and her special status probably means that she was a Creator Being for the Boorong.

On earth, "lowan" is also used as a place name. In northwest Victoria, the parish of Lowan is also in the County of Lowan. A Shire of Lowan was created in 1875, possibly coinciding with the demise of the Boorong clan. The use of this name for localities provides a geographic insight, which may also hint at an anthropological connection.

In Australia many place names are derived from Aboriginal language usage and because Australian Aborigines have a very close relationship with the land certain places are endowed with special properties of species maintenance. One instance is a stone arrangement elsewhere in Victoria that is in the shape of an active malleefowl mound and we believe it was a place where increase ceremonies were performed to honour this bird and ensure the maintenance of it as a species and food source. Thus the place name "lowan" may not just have meant the presence of the lowan bird or malleefowl, but also a place where it was honoured and respected.

This strong relationship with the land meant the Boorong could have trust in its ability to provide sustenance. This is reflected in Stanbridge's comment that Neilloan is the "discoverer of the Loan eggs which knowledge she imparted to the Aborigines".

Identification with the Malleefowl

Malleefowl eggs are large, highly nutritious and very tasty. When the Boorong observed the disappearance of Neilloan from the sky they would know that the laying season had begun and they might head off for malleefowl country for a change of diet and an easily obtained egg supply. And while they were there, another aspect would unfold. The Aboriginal parent and child would observe much about the daily life of the malleefowl pair that was applicable to their own behaviour.

Much of the activity at the mound is gender-specific: foraging and egg-laying by the female, nest maintenance and temperature monitoring by the male. Other activities require teamwork. Together they remove and replace organic material at the top of the mound to increase or reduce the temperature inside the egg chamber. When digging out the egg chamber, as the cavity deepens and a single kick won't get the sand and debris over the rim of the mound, one bird will work halfway up the side of the egg chamber so that as sand is kicked up from the bottom by one bird, the higher bird puts it over the rim. They also seem to converse together. The appearance of the female at the mound is always greeted with a series of deep-toned utterances from the male and as long as the female is nearby he continues to make these sounds. The female responds in kind.

Fig. 5. Example of teamwork.

Thus the malleefowl provides an excellent role model for human behaviour in that they mate for life, demonstrate specialised gender responsibilities, demonstrate teamwork and cooperation, mutually defend their territory, cooperate in the daily search for food and possess the patience and tenacity required during a successful breeding period.

Observation of Neilloan in her passage across the sky during the non-gathering period would remind and reinforce the knowledge gained from patient observation. So these might be termed anthropomorphic and sociological insights.

Socio-Legal Aspects of Boorong Astronomy

We can make a further anthropological comment when we learn about other celestial beings that were described by Stanbridge. We discover, for instance, that Neilloan's son is 'Totyarguil', a purple crowned lorikeet located in our northern sky based on Aquila. We find from our ethnographic source that he is the creator of the mighty Murray River and a Dreamtime hero of epic proportions. Totyarguil inherits his mother's moiety but has a different "skin" name, so will have to marry someone from a preferred clan within the other moiety.

We discover from Stanbridge that the mother of Totyarguil's wives is also in the sky, but in the south, based in Achernar. Her name is Yerredetkurrk and her earthly counterpart is the fairy owl or owlet nightjar. When we note the movement of Totyarguil in and out of our northern sky we observe an interesting inverse correspondence with Yerredetkurrk. As she ascends the southern sky, Totyarguil descends and disappears. As she descends to the treetops, it is Totyarguil's turn to reappear and become ascendant. This relationship mimics a strongly held law that it is evident in all traditional Australian Aboriginal communities being that of mother-in-law/son-in-law avoidance. Transgression may be punishable by death for its observance is absolutely of paramount importance for maintenance of genetic hygiene in small population pools.

Archaeological investigation at Lake Tyrrell, [the Anglicised version of "direl"], lead us to accept an occupation date of 30 to 40 thousand years. This means that there may have been over a thousand generations of people continuously using this country.
Small wonder then that a giant text-book of the land was created in the sky to provide instruction in the law, morality, role models, seasonal food gathering and a multitude of other teachings and knowledge that are reflected in the rest of the Boorong celestial panoply.

Conclusion

Thus in my exploration of the four pages of cryptic clues bequeathed firstly to William Stanbridge by the Boorong and from Stanbridge to us, I have sought explanation through western astronomy, ornithology and zoology, linguistics, anthropology and sociology, archaeology and geography, ethnology and ethnography, and human physiology. It has been, and continues to be, a very exciting and stimulating journey and I am very proud to be able to bring this insight into the intelligence and intellectual powers of a vanquished people who did not require literacy to transfer their knowledge from generation to generation, but instead used the stars and their superlative imagination to do so.

References

[The format of this list reflects the multi-discipline research methodology]

Anthropology and Archaeology

BERNDT, R. M. and BERNDT, C. H., 1981. *The World of the First Australians*. Sydney: Lansdowne Press.

MOWALJARLI, D. and MALNIC, J., 1993. *Yorro Yorro*. Broome: Magabala Books.

STREHLOW, T. G., 1945. *Aranda Traditions*. Melbourne: Melbourne University Press.

RICHARDS, T., PAVLIDES, C., WALSHE, K., and WEBBER, H.J.R., 2007. Box Gully: New Evidence for Aboriginal occupation of Australia south of the Murray River prior to the last glacial maximum. *Archaeology in Oceania*, 42, 1-11.

Astronomy (Aboriginal)
HAYNES, R. D., 1992. Aboriginal Astronomy. *Australian Journal of Astronomy*, 4 (3), 127-140.
MORIESON, J., 2006. From Archeo to Ethno – An Indigenous Australian Astronomy: The Story of Action Research into Boorong Astronomy since 1995. In: T. BOSTWICK and B. BATES, eds. *Viewing the Sky Through Past and Present Cultures. Oxford VII Selected Papers,* Pueblo Grande Museum Anthropological Papers, 15, 139-148. Can also be viewed on www.bdas.50webs.com
MORIESON, J., 2003. *The Astronomy of the Boorong*. Paper delivered to World Archaeological Congress (WAC5), Archaeoastronomy of the Old World and Oceania. Washington D.C.
MORIESON, J., 2003. *Solar Based Lithic Design.* Paper delivered to World Archaeological Congress (WAC5), Archaeoastronomy of the Old World and Oceania. Washington D.C.

Astronomy (Western) and History of Astronomy
KRONK, G. W., 1988. *Meteor Showers: A Descriptive Catalogue*. Hillside, NJ: Enslow Pub Inc.
RIDPATH, I. and TIRION, W., 1988. *Collins Guide to Stars and Planets*. London: Collins.
ALLEN, R.H., 1963. *Star Names, Their Lore and Meaning*. New York: Dover.

Ethnology/Ethnography
MATTHEWS, R. H., 1904. Ethnological Notes on the Aboriginal Tribes of New South Wales and Victoria. *Royal Society of NSW*, 1, 203-381.
STANBRIDGE, W. E., 1857. On the astronomy and Mythology of the Aborigines of Victoria. *Proceedings of the Philosophical Institute.* Melbourne.

Geography
BLAKE, L., 1977. *Place Names of Victoria*. Adelaide: Rigby Limited.
CLARK, I. D., 1990. Aboriginal Languages and Clans. *Geography,* 37. Melbourne: Monash University, 1800 – 1900.

Human Physiology
TAYLOR, H. R., 1981. Racial Variations in Vision. *American Journal of Epidemiology,* 113(1), 62-80.

Linguistics
BROUGH SMYTH, R., 1898. *The Aborigines of Victoria*. Vols 1, 2. John Curry O'Neill.
HERCUS, L., 1969. *The Language of Victoria: A Late Survey*. Canberra: Australian National University.
STONE, A. C., 1911. The Aborigines of Lake Boga, Victoria. *Royal Society of Victoria*, 23(2), 433-469.

Ornithology
BERULDSEN, G., 1980. *A Field Guide to Nest and Eggs of Australian Birds*. Adelaide: Rigby.
FRITH, H. J., 1962. *The Malleefowl*. Melbourne: Angus and Robertson.

Sociology
HARRIS, S., 1977. *Millingimbi Aboriginal Learning Contexts*. PhD dissertation, New Mexico University.
ONG, W. J., 1982. *Orality and Literacy: The Technologizing of the Word.* London: Methuen.

Zoology
PIZZEY, G., 1966. *Animals and Birds in* Australia. Melbourne: Cassell Australia.
STRAHAN, R., ed., 1983. *The Australian Museum Complete Book of Australian Mammals*. Melbourne: Angus and Robertson.

Received: 1 November 2007; Revised: 4 September 2008

BŪRUNGŲ SOCIALINIAI TYRIMAI

John Morieson

Santrauka

Būrungai (Boorong) – Australijos aborigenų gentis – gyvenusi dar prieš 150 metų. Šiandien būrungų nebėra, ir jų kosmologijai rekonstruoti būtinas XIX a. gamtos filosofo akiratis, įskaitant zoologiją, botaniką, lingvistiką, etnografiją, geografiją bei antropologiją, ir kantrus ilgalaikis stebėjimas. Tai jaudinantis ir įkvepiantis uždavinys: pamažu atskleisti šios Australijos aborigenų genties, kurios žmones kaimyninės gentys apibūdino kaip geriausius regiono astronomus, pasakojimus. Didžiausia Australijos tyrinėtojo atsakomybė – siekti sugrąžinti šias, geriausiu atveju interpretacines, žinias būrungų palikuonims. Būrungai, kaip ir kiti Australijos aborigenai, įsibrovus europiečiams, patyrė didžiulius socialinius sukrėtimus, ligas ir išmirė. Jų palikuonys tikrai egzistuoja ir kartu su australais stebisi bei gėrisi iš naujo atrandama šios genties astronomija.

Vertė Jurgita Žukauskaitė

NATIONALISM AND POLITICS IN THE RECOVERY OF PAST ASTRONOMIES

STEPHEN C. MCCLUSKEY

Abstract

Since its origins, archaeoastronomy has been influenced by nationalist traditions in archaeology. This paper addresses the consequences of these political influences, considering several important questions: To what extent is this quest for past astronomies influenced by nationalist political agendas? How should those of us studying past astronomies respond to these external pressures? To what extent is comparatively recent ethnographic and folkloric evidence suitable for the recovery of past astronomies? The author considers that awareness of these influences and limitations is essential for any scholarly attempt to recover past astronomies.

Key words: nationalism, colonialism, imperialism, cultural identity, historiography, folklore, ethnography, romanticism, tourism, cultural revival.

Introduction

As the Conference Announcement says: "The purpose of the round table discussion is to propose a critical examination of the value and limitations of astronomical and cosmological traditions found in folklore, archaeology, and the historical records used sometimes as evidence for national or cultural identity. How (or whether) we can reconstruct past astronomical practices and cosmological knowledge from the limited evidence we have at hand? Our goal is to frame the problem and prepare further discussions."

I would like to address the aspect of this topic dealing with the possible influences of local, regional, or national agendas on the integrity of our work. I was drawn to this idea as I became concerned about the faint scent of nationalist agendas in some of the presentations that I'd seen of late, both at conferences and in submissions to the journal, *Archaeoastronomy*. I kept recalling Olaf Pedersen's comments (1982, p.269) on the history of archaeoastronomy at Oxford I, where he noted how archaeoastronomy was discredited for decades by its association with the nationalist search for the ancient German origins of astronomy. He closed his critique with the comment that "today 'archaeoastronomy' does not have any mythical function – or does it?"

Since archaeoastronomers have, in the last forty years, been fully conscious of the epistemological ambiguities of our reconstructions of past astronomies and our attempts to place those astronomies in their cultural contexts, we must also be sensitive to the various pressures in our modern contexts which may push us to create popular illusions.

Pedersen's questioning of archaeoastronomy's role in the creation of national mythology invites a critical examination of the value and limitations of folklore, archaeology, and the historical record as evidence for a nation's astronomical traditions. Several traditions of historical, archaeological, and anthropological criticism can contribute to this discussion.

Critiques of Nationalist Scholarship

One of the most strident historiographical critiques of the myth of the nation in history is that of the American medievalist, Patrick Geary. He presented the influence of nationalism upon history – and for that matter, the contributions of historians to nationalism – as both an absolute evil and as an ethical challenge to historians (2002, p.15):

[I]t has turned our understanding of the past into a toxic waste dump, filled with the poison of ethnic nationalism, and the poison has seeped deep into popular consciousness. Cleaning up this waste is the most daunting challenge facing historians today.

The British historian, Eric Hobsbawm, pointed out the logical connection between historical practice and the spread of nationalist ideologies in an invited plenary address to the American Anthropological Association (1992, p.3):

For historians are to nationalism what poppy-growers in Pakistan are to heroin-addicts: we supply the essential raw material for the market… What makes a nation is the past, what justifies one nation against others is the past, and historians are the people who produce it.

Archaeologists Philip Kohl and Clare Fawcett extended Hobsbawm's metaphor of the corrupting dream-world of narcotics to many of the professions that contribute to archaeoastronomical and ethnoastronomical research (1995a, p.13):

Archaeologists (and perhaps linguists, folklorists, and ethnographers) must be compared with the concocters of even more powerful hallucinogens, which distort the past to the likening of nationalists intent on demonstrating the uniqueness of their people.

Defenses of Nationalist Scholarship

I should point out that not all studies of nationalism take such strong opposition to their subject. Trigger (1995) notes that while many crimes were committed in the name of nationalism in various parts of the world, it also provided a sense of group identity and meaning for individuals which have been the tools for resisting dynastic and colonial oppression and which led to the collapse of the Soviet Union. In this mixed evaluation, he considers that it is more important that we understand, rather than just respond emotionally to the phenomenon of nationalism.

Some take a more value-neutral approach. Since the nation remains today "the largest and most powerful collectivit[y] with which people possess an affiliation," these scholars seek to understand the "strength, scope, and intensity of this kind of collective identity, ...its origins and development... and [its] long-term persistence and/or changes" (Smith 2003, p.3; see also Anderson 1991).

For better or worse, there seems to be a widespread consensus in the literature that archaeology is often inextricably intertwined with external political motives.

Archaeoastronomy and Nationalism

Trigger (1984, p.360) pointed out one element of nationalist archaeology of special relevance to archaeoastronomy: its tendency to focus on the creative achievements of peoples assumed to be national ancestors.

One version of this nationalist archaeology has a long connection with some familiar elements of archaeoastronomy: Stonehenge and the British megalithic sites. In the hands of 18th century British antiquaries, such as John Aubrey and William Stukeley, popular discussions of the Druids came to emphasize their British, rather than French origins. They became the source of ancient philosophical and scientific knowledge, which was carried Eastward from Britain to Greece, to India, and ultimately to China (Fowler 1987, p.235-236). Romantic interpretations of Stonehenge, such as William Wordsworth's view (1958, p.472-475) that it was shaped by the Druids, so to represent their knowledge of the heavens conformed to this nationalist agenda:

The popular picture of megalithic astronomy thus provides an object lesson of British cultural superiority as the source of Eastern learning, and by implication, of the legitimacy of their rule over those peoples who had benefited from their learning (Fowler 1987, p.237). Even in more recent times we find advocates of astronomy at Stonehenge making similar claims that the astronomy of Stonehenge was far in advance of anything practiced in the Mediterranean world (Hawkins 1965).

While our studies must focus on the specific historical contingencies of a particular time and place, we cannot allow our investigations of past astronomical achievements to slide into a kind of simplistic essentialism, where an undefined particular "national genius" is seen as explaining those achievements.

The Uses of Origin Myths

Another common theme in nationalist uses of archaeology is the desire to provide a people who currently occupy a territory and its rulers, a sense of legitimacy and antiquity through links to a primordial, mythic, and sacred past and to employ archaeologically defined common elements to define the extent of a people's proper territory. Such claims of continuity are contradicted by the evidence for the transitory nature of peoples emphasized by modern historians. Yet the creation and manipulation of these origin myths is not an exclusively modern phenomenon.

In places as diverse as early medieval Europe and precolonial Mexico, ruling elites have manipulated history to create ties to their ancient predecessors (Geary 2002, p.77-78; Fowler 1987, p.231-232). Turning specifically to archaeoastronomy, many of us are familiar with the Maya practice of computing astronumerological intervals to link events in the lives of contemporary rulers with significant events in the historical or distant mythic past (Aldana 2007)

Such appropriations of the ancient past continued in Mexico, especially after the Mexican Revolution of 1910, with which a policy of *indigenismo* created the image of "a coherent and defined nationality" that fully incorporated the pre-Hispanic past. Archaeology became important as a way to demonstrate the nation's past achievements and occupied a central place in the newly restored National Museum of Anthropology (Florescano 2000).

The public display of ancient knowledge extended this appeal beyond the scientific audience into the broader worlds of popular education and tourism. The well known solar hierophany at the Temple of Kukulcán (the Castillo) at Chichén Itzá draws crowds of tourists at the equinoxes to see the serpent appear to descend the staircase (you can barely see it in the left side of this image). This raises the further question of the extent to which the pressures of tourism drive the interpretation of ambiguous archaeoastronomical sites such as the alleged supernova petroglyph at Chaco Canyon or the Woodhenge at Cahokia.

Astronomies And Cultural Identity

Over fifty years ago the historian of astronomy, Otto Neugebauer, based his work on the transmission of astronomical ideas among peoples, arguing that astronomical and astrological ideas and parameters, by their systematic nature, provided one of the most reliable indicators of cultural communication (1951). Yet the very ease of the transmission of astronomical ideas emphasizes the danger in identifying a particular astronomical system with a particular people. Nonetheless, sometimes archaeoastronomy has used astronomical concepts to identify and even create historical peoples, as we have seen in Thom's studies of "megalithic man" (1954, 1961, 1966).

An example from Native American astronomies may shed some light on this point. It is well known that one of the most widespread Native American cosmological themes is that of the original quadripartition of the universe, delimited by sacred places (often mountains or water sources) marking either the cardinal directions or the directions of solstitial sunrise and sunset (McCluskey 1993).

One of the most common variants of this four directional schema is the association of the four directions with four colors to form a system of color-direction symbolism The diffusion and distinctive local expressions of such systems offer an opportunity for considering the value of astronomical ideas as identifying markers of particular cultures.

In the Eastern Pueblos – specifically at the Tewa pueblo of San Juan – the directions are marked by sacred places at the conventional cardinal directions (Ortiz 1969, p.13-16). In the Western Pueblos – specifically at the Hopi pueblo of Walpi – the directions are marked by sacred places at the place of winter and summer solstice sunrise and sunset (McCluskey 1990). The difference between the solstitial direction markers at Walpi and the cardinal direction markers at San Juan Pueblo offers a clear example of how different astronomical concepts can be associated with different peoples, and can thus be used as a marker of cultural identity.

A striking indication of the validity of this concept is the presence of the intrusive Tewa pueblo of Hano among the Hopi. Like the Hopi, Hano has a sun shrine atop the opposite mesa (Forde 1931). In this case, however, the shrine is due East of Hano pueblo; corresponding to the cardinal pattern which we have seen at the eastern Tewa pueblo of San Juan.

In this case, the archaeoastronomical data and the ethnohistorical record both indicate the existence of two distinct, but related, astronomical traditions. This suggests an important qualification of the nationalist historians' belief that cultural traditions are maintained over long historical periods. Here we see two communities which over long periods of time have developed distinct modifications of the Native American cosmological model, but over shorter periods of time have retained their distinct variants of that shared tradition.

Can We Reconstruct Past Astronomies?

Finally, let me return to the issue that I raised at the beginning: whether we can accurately reconstruct past astronomies and their social contexts. One of the leading critics of the historical reconstruction of past religious and calendric rituals and traditions has been the historian Ronald Hutton. In a series of important books, Hutton (1994, 1996) has looked at most of the so-called ancient traditions of English calendar festivals and has demonstrated fairly convincingly that most of them are early modern in origin, few of them being able to be traced back before the 16th century.

Hutton has pointed out, for example, that many of the festivities associated with May Day (which we can note is a "Celtic" mid-quarter day which gained notoriety in association with the Thom calendar) were in fact nineteenth century revivals – or perhaps recreations – during the social transformations accompanying the depopulation of the countryside and the growth of urban England.

Hutton's historical investigations, combined with the theoretical insights of Hobsbawm, Anderson, and others, raise serious questions about whether the recovery of past astronomies will actually reach back into the pre-literate past or will only reach back to the comparatively recent past when these "traditional" astronomies were invented.

What I draw from these studies is that our various efforts to reconstruct past astronomical practices should all be subjected to the kind of critical approach that

we previously, and fruitfully, applied to the work of Alexander Thom. Now we can also look at the various political, economic, or national agendas that led people to record folklore and archaeological remains in the course of the last centuries as a way to recover and restore the lost past of a nation or a culture. We now see indigenous peoples striving to wrest control of their own histories from academic archaeologists and anthropologists in order to present their culture in a more favorable light. In this context, we must ask: to what extent do these local concerns to promote peoples or regions threaten to bias our work and how can we take advantage of them without compromising our academic rigor?

References

ALDANA, G., 2007. *The Apotheosis of Janaab' Pakal: Science, History, and Religion at Classic Maya Palenque*. Boulder, CO: University Press of Colorado.

ANDERSON, B., 1991. *Imagined Communities: Reflections on the Origin and Spread of Nationalism.* 2nd. ed. London: Verso.

FLORESCANO, E., 2000. The Creation of the Museo Nacional de Antropología of Mexico and its scientific, educational, and political purposes. In: J. HUTCHINSON and A.D. SMITH, ed. *Nationalism: Critical Concepts in Political Science*, vol. IV. London: Routledge.

FORDE, C. D., 1931. Hopi Agriculture and Land Ownership. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland*, 61, 357-405.

FOWLER, DON D., 1987. Uses of the Past: Archaeology in the Service of the State. *American Antiquity*, 52, 229-248.

GEARY, P., 2002. *The Myth of Nations: The Medieval Origins of Europe*. Princeton: Princeton University Press.

HAWKINS, G., 1965. Interview in *The Mystery of Stonehenge*. New York: CBS Television Network, distributed by McGraw Hill.

HOBSBAWM, E. J., 1992. Ethnicity and Nationalism in Europe Today, (plenary lecture to the American Anthropological Association). *Anthropology Today*, 8, 3-8.

HUTCHINSON, J., and SMITH, A. D., ed. 2000. *Nationalism: Critical Concepts in Political Science*. London: Routledge.

HUTTON, R., 1994. *The Rise and Fall of Merry England: the Ritual Year, 1400-1700*. Oxford: Oxford University Press.

HUTTON, R., 1996. *The Stations of the Sun: A History of the Ritual Year in Britain.* Oxford: Oxford University Press.

KOHL, P.L., and FAWCETT C., 1995a. Archaeology in the Service of the State: Theoretical Considerations. In: KOHL and FAWCETT, ed. *Nationalism, Politics, and the Practice of Archaeology*. Cambridge: Cambridge University Press.

KOHL, P.L., and FAWCETT, C., 1995. *Nationalism, Politics, and the Practice of Archaeology*. Cambridge: Cambridge University Press.

MCCLUSKEY, S.C., 1990. Calendars and Symbolism: Functions of Observation in Hopi Astronomy. *Archaeoastronomy*, no. 15, *Supplement to the Journal for the History of Astronomy*, 21, 1-16.

MCCLUSKEY, S.C., 1993. Native American Cosmologies. In: N.S. HETHERINGTON, ed. *Encyclopedia of Cosmology*. New York: Garland, 427-436.

NEUGEBAUER, O., 1951. The Study of Wretched Subjects. *Isis*, 42, 111.

ORTIZ, A., 1969. *The Tewa World: Space, Time, Being, and Becoming in a Pueblo Society*. Chicago: University of Chicago Press.

PEDERSEN, O., 1982. The Present Position of Archaeo-Astronomy. In: D.C. HEGGIE, ed., *Archaeoastronomy in the Old World.* Cambridge: Cambridge University Press.

SMITH, A.D., 2003. *Chosen Peoples: Sacred Sources of National Identity*. Oxford: Oxford University Press.

THOM, A., 1954. The Solar Observatories of Megalithic Man. *Journal of the British Astronomical Association*, 64, 396-404.

THOM, A., 1961. The Geometry of Megalithic Man. *The Mathematical Gazette*, 45, 83-93.

THOM, A., 1966. The Lunar Observatories of Megalithic Man. *Nature*, 212, 1527-1528.

TRIGGER, B.G., 1984. Alternative Archaeologies: Nationalist, Colonialist, Imperialist. *Man*, N.S., 19, 355-370.

TRIGGER, B.G., 1995. Romanticism, nationalism, and archaeology. In: P.L. KOHL and C. FAWCETT, eds. *Nationalism, Politics, and the practice of archaeology*. Cambridge: Cambridge University Press.

WORDSWORTH, W., [c. 1825] 1958. *The Prelude: or Growth of a Poet's Mind*. E. DE SELINCOURT and H. DARBISHIRE, eds. Oxford: Clarendon Pr.

Received: 29 October, 2007; Revised: 8 September 2008

NACIONALIZMO IR POLITIKOS ĮTAKA ATKURIANT SENĄJĄ ASTRONOMIJĄ

Stephen C. McCluskey

Santrauka

Straipsnyje pristatoma konferencijos apskritojo stalo diskusijų įžanginė dalis, kurioje nagrinėta folkloro, archeologijos ir istorinių šaltinių vertė bei ribotumas rekonstruojant senovės astronominę praktiką ir kosmologinę sampratą. Tarp astronomines ir kultūrines tyrinėjimų rekonstrukcijas ribojančių veiksnių paminėtini lokaliniai, regioniniai ir nacionaliniai veiksniai, motyvuojantys daugelį kultūrinės astronomijos tyrimų. Pirmojoje Oksfordo konferencijoje Olafas Pedersenas, aptardamas nacių siekį ieškoti senovės germanų astronomijos šaknų, iškėlė mitinių archeoastronomijos funkcijų klausimą.

Su šia diskusija susijusi ir pastarojo meto istorinės, archeologinės ir antropologinės praktikos kritika. Dar aštresnė kritika kreipiama į tautos laikymą ilgalaikiu

istoriniu veiksniu, trukdančiu suvokti praeitį, taip pat į žalingą tokių nacionalistinių interpretacijų poveikį šiuolaikinei politikai.

Nors yra ir ne tokių kritiškų nuomonių, įžvelgiančių pozityvų nacionalistinių interpretacijų poveikį, kad ir kaip būtų, archeologija ir istorija neišvengiamai susipina su politiniais aspektais. Pagunda šlovinti praeities civilizacijų laimėjimus akivaizdžiai egzistuoja ir archeoastronomijos studijose.

Tai nėra naujas reiškinys: jau XVIII a. britų senovės tyrinėtojų nuomonė, kad Stounhendžo astronomija atskleidžia britų laimėjimus, puikiai tiko tuometinei imperialistinei Britanijos politikai. XX a. pradžioje porevoliucinėje Meksikoje actekų ir majų astronominiai laimėjimai buvo įtraukti į nacionalinę tradiciją ir tapo svarbiu elementu kuriant ir skleidžiant naują tautinę tapatybę.

Taigi senovės astronominių laimėjimų interpretacijos yra pernelyg supaprastinančios esmę, kai šiems laimėjimams paaiškinti pasitelkiamas ilgalaikis „nacionalinis charakteris“. Tokie tvirtinimai apie tęstinumą neatitinka šiuolaikinių istorikų ir archeologų pabrėžiamos akivaizdžiai laikinos tautų prigimties. Detali astronominių tradicijų analizė rodo sąveiką tarp esminių idėjų ilgalaikio tęstinumo ir pokyčių, vykstančių jas perimant ir savaip išreiškiant įvairiose bendruomenėse.

Rimtą problemą atskleidžia Britanijoje pasirodę nauji darbai, kuriuose apie praeities religijų ir kalendorinių tradicijų senumą sprendžiama iš folkloro šaltinių ir labai retai pasitelkiami istoriniai tyrimai. Dažnai folkloras perteikia tik palyginti netolimoje praeityje susiformavusias „tradicijas“.

Pastangos rekonstruoti senovės astronominę praktiką pirmiausia turi būti lydimos kritinio požiūrio į ankstesnius tradicinius archeoastronominius tyrinėjimus. Svarbiausias uždavinys – nustatyti, kokiu mastu lokaliniai ir nacionaliniai veiksniai gali kelti tendencingumo grėsmę tyrimams ir kokiu būdu mes galime išnaudoti juos nekompromituodami akademinio tikslumo.

Vertė Jurgita Žukauskaitė

VIII. NEW TECHNOLOGIES AND METHODS IN CULTURAL ASTRONOMY

COSMIC CATASTROPHES AND CULTURAL DISASTERS IN PREHISTORIC TIMES? THE CHANCES AND LIMITATIONS OF A VERIFICATION

BARBARA RAPPENGLÜCK

Abstract

In the past three decades cosmic events such as supernovae and the impact of large meteorites have undergone a remarkable renaissance in being considered as a trigger of radical change, not only on geological timescales but also among prehistoric cultures. In such theories, archaeological horizons indicative of destruction events are combined with evidence from dendrochronology, ice-core analysis, mythical traditions etc. and are put forward as evidence for cultural disasters caused by cosmic events. This paper critically scrutinizes the underlying concepts of "cosmic catastrophe" and "cultural disaster" as well as the methods that are meant to corroborate them. Special emphasis is placed upon the limitations that show up in analyzing myth and folklore.

Key words: catastrophe, cultural downturn, prehistory, supernova, impact, geomythology, myth.

Introduction

In the 1980s the idea achieved prominence that the impact of a large asteroid had caused the extinction of the dinosaurs and the end of the Cretaceous Period, thus heralding the revival of the 19th-century geological concept of catastrophism. The term "catastrophism" refers to the theory that sudden, short-lived, violent events such as eruptions of volcanoes, extreme floods, or earthquakes were essential triggers for geological processes of change. In the new hypothesis, the impact of large meteorites or comets became seriously considered as a potential agent in catastrophism. This conjecture was further fuelled by the observable break-up of the comet Shoemaker-Levy 9 and the impact of the fragments into Jupiter in 1994. More and more consideration was given to the question of whether supernovae, dense debris from comets or the impact of large meteorites could not only trigger geological processes but could also pose a threat to human civilizations and might have influenced history. Within the last twenty years a number of publications have presented evidence that claims to show the catastrophic effects of such cosmic events on prehistoric or ancient civilizations, mostly with worldwide or at least continent-wide consequences. We can briefly summarize five typical theories.

- Firestone et al (2006): The debris of a supernova put a dramatic end to the Clovis culture in North America in about 11000 BC.
- Allan and Delair (1997): The products of a supernova completely disarranged the solar system and caused a world-wide catastrophe in 9500 BC.
- Tollmann (1993): The break-off of a gigantic comet caused multiple impacts and world-wide catastrophes in 7750 BC. All major religions are an attempt to cope with this apocalyptic experience, as are many cultural monuments (Stonehenge, the pyramids, etc.).
- Clube and Napier (1982): Since the 3rd millennium BC, clouds of cometary debris (Taurids) have produced impacts that affected the Earth and caused dust-events that resulted in worldwide climatic downturns. Major celestial gods originally represented comets; and cultural/political crises coincided with phases of increased meteoritic activity.
- Baillie (2000): Closely passing comets or clouds of cometary debris caused worldwide climatic downturns in particular years during the last three millennia; these events correspond to cultural/political changes.

Methodically, these theories face a fundamental problem: with the exception of Firestone's, they lack any of the geological, mineralogical or chemical evidence accepted throughout the world as proof of an impact or of material related to a cosmic event: there are no craters, no rocks with impact-induced shock-metamorphism, nor any material providing relevant cosmochemical data. The conclusion that cultural disasters occurred that were induced by a cosmic trigger is based on combining archaeological horizons of presumably sudden destruction, or historical records of social disturbance, with the results of dendrochronology, ice-core analysis, mythical traditions, etc. Thus the question arises: what different possibilities exist of verifying cosmic catastrophes and related cultural disasters in prehistoric times? And what obstacles are encountered?

Theoretical considerations

The definition of the terms "catastrophe" and "disaster" – especially in connection with "culture" – is fiercely disputed in the scientific literature. The least common denominator is to say that "catastrophe" means an abrupt, violent event with human victims. Any further possible aspects such as changes in political and societal coherence, abandonment of a region or changes in material culture are controversial if used to try to characterize a "catastrophe" (Torrence 2002). It is important to be aware of this fact, because in everyday speech the term "catastrophe" is applied very loosely to any awful event, and a catastrophe can seem all the more disastrous the more unimaginable its trigger is. The authors of the theories cited above do not give an account of their concepts of "catastrophe" and "cultural disaster". For them it seems to be self-evident that the presumed cosmic event must inevitably been disastrous on a worldwide scale and that such a disaster could not result in anything other than abrupt cultural change. Furthermore, another underlying theoretical assumption remains implicit: that abrupt cultural change is very probably caused by an external catastrophic event. These theoretical assumptions influence the data that are considered to verify a cosmic catastrophe, and especially the willingness to accept cultural change (different examples of which are presumed to be contemporaneous) in many different regions and myths from all over the world, as being triggered by a cosmic catastrophe. The problems of this approach are illustrated by examining some methodological considerations.

Methodological considerations

1. One of the fundamental methodological issues in dealing with catastrophes as possible cultural triggers is that of *exact dating*. A catastrophe is defined as an abrupt event, and in the case of a cosmic event, e.g. the impact of a big meteorite, "abrupt" does not mean within decades but within just a few minutes. Exact dating is needed in order to provide a firm basis for deciding whether an extreme natural event was only accidentally correlated to an episode of cultural change or whether it actually triggered it (Torrence and Grattan 2002, p. 2). In this context, the low accuracy of many dating methods used in prehistory is disturbing: for example, C14-dates, with an accuracy of around +/-50 years at best, will not enable us to determine whether a culture was already was in decline and then hit by an impact, or whether the impact caused the cultural downturn. Dendrochronology, a dating-method that in principle is of high precision, is less precise for prehistory. For many regions and periods there exist only floating dendrochronologies, which means that they are not absolutely fixed to calendar years but correlated to C14-dates, which are inaccurate as just mentioned. Problems in correlating indications of climatic downturns found in the dendrochronological data with big volcanic eruptions and even with cultural downturns are strongly debated in the relevant literature (Sadler and Grattan 1999), and these problems also apply to catastrophes of cosmic origin. Another problem occurs with the widespread stylistic dating of archaeological cultures. Stylistic dating in prehistory floats in time and, like C14, is insufficiently precise to pinpoint a catastrophe and its possible cultural effects.

These examples of three leading dating methods illustrate the fundamental problem of determining the precise date of a cosmic catastrophe in prehistory and thus of establishing its possible effect on cultural change.

2. A number of other factors also complicate the *evaluation of the cultural effects* of a cosmic catastrophe. A cosmic impact, for example, causes different effects on different scales depending on many factors (Tollmann and Tollmann 1993, p. 27-88). The scale of the air blast, the thickness and spatial extension of the layer of ejecta, the intensity of wild-fires, and the intensity of acid rain and toxic gases all interact with and affect the topography of the target area, vegetation and its seasonal development, climatic conditions, etc. Studies in volcanism, where somewhat similar phenomena are encountered, show us the broad range of effects that might have influenced the environment and thus society after an impact (Blong 1984, p.311-350). The different scales of environmental effects interact in turn with the circumstances of the affected society and influence the human responses such as the duration of abandonment of the target area and eventual changes in economic subsistence, social coherence, material culture and religious beliefs (Torrence 2002).

To handle these complex problems of interacting effects as well as those of exact dating, interdisciplinary research – undertaken in cooperation with geologists, archaeologists and other specialists – is indispensable, and it is essential to cross-check the results from the different disciplines.

In addition to the use of methods from the natural sciences and archaeology, something that regularly plays an important part in theories postulating a causal link between cosmic catastrophes and cultural disasters in prehistory is the study of myths (on the difficulties of defining "myth" see Masse et al 2007, p. 9-14). Often, traditions from different cultures all over the world and of an unknown age are mixed up in the argument. Therefore it must be asked what possibilities are opened up by, and what limits should be placed on, the use of myths to verify cosmic catastrophes and related cultural change.

3. *Do myths retain the memory of disastrous cosmic events?* This question raises a long-standing issue in the theory of myth: whether myths in general may reflect concrete historical events. For three decades, "geomythology" – a term coined by Dorothy Vitaliano – has put new life into the old problem. "Geomythology indicates every case in which the origin of myths and legends can be shown to contain references to geological phenomena and aspects, in a broad sense including astronomical ones (comets, eclipses, meteor impacts etc.)" (Piccardi and Masse 2007, Preface p.VII). Vitaliano differentiated between two kinds of geological folklore: "…that in which some geologic feature… has inspired a folklore explanation, and that which is the garbled explanation of some actual geologic event, usually a natural catastrophe" (Piccardi and Masse 2007, Preface p. VII).

Within the last few years a number of studies have been published that – through an interdisciplinary approach combining mythological and geological research – have succeeded in establishing that certain folklore has a concrete geological background. Examples include the changing ice-cover of two bays in Alaska between 1400 and 1800 AD (Vitaliano 1973, p.30-31), megatsunami events in the region of Australia (Bryant et al. 2007), earthquakes on the northeast coast of America (Ludwin and Smits 2007), and several prehistoric and historical volcanic eruptions (Vitaliano 1973, p.122-141). Among the last of these, the genesis of Crater Lake by the eruption of Mt. Mazama (USA) about 7700 years ago, as reflected in a myth of the Klamath natives (Masse and Masse 2007, p. 18-19), is actually a datable event. So too is a volcanic eruption on the island of Lipari (Italy) in the 6th century AD, reflected in a legend of San Calogero (Vitaliano 1973, p.141). All these examples are cross-checked by the analysis of myths as well as geological and archaeological research. They provide evidence that at least some myths do encode knowledge of natural events, mostly of a catastrophic character, and that a very few of them do even keep the memory of a concrete, datable geological event.

What about concrete cosmic catastrophes reflected in myths? Tollmann, Firestone, Delair and others have claimed that myths from all over the world reflect the cosmic catastrophes that they espouse. The examples they present demonstrate the whole problem of interpreting myths. First, there is the problem of mythical iconography: how can it be decoded? Some examples may illustrate the difficulties: The term "comet" stemming from Greek "kométes" = "hairy star" also indicates a connection between hair and the celestial objects called "comets". But (to take an example) a full head of splendid hair is well known as a symbol of power, strength, fertility and life-substance. Thus it would be mistaken to interpret every god or goddess whose splendid hair is emphasized as a comet. Another example is that of battling supernatural forces: The Tunguska event in 1908, very probably the explosion of a cosmic object, was described by the Evenki nomads as the battle of two shamans (Menges 1983, p. 5). But the volcanic eruption of Mt. Mazama mentioned above has also been described as the battle of two supernatural beings. Thus not every battle of such a kind signifies the explosion of a meteorite. Concerning the motifs of the "falling sky" and of "sudden darkness", Masse and Masse (2007) have exemplarily demonstrated the need for analyzing the different ascriptions of these motifs to eclipses, ash-fall from volcanic eruptions, or darkness caused by a cosmic impact. Thus one motif may represent different meanings that have to be elicited and evaluated in each individual case. Awareness of this fact should prevent us adopting one-sided interpretation.

On the other hand, Tollmann and others have collected quite a number of traditions that depict the details of a fall and impact of a meteorite in an intriguing manner. At least some of those descriptions must be considered to reflect a cosmic event. But there is the problem that none of the authors can date any of these traditions; they simply ascribe them to their favourite cosmic catastrophe. Given that the frequency of small cosmic events like that at Tunguska is estimated to be between 100 and 1000 years, there are fundamental problems in differentiating which event is reflected in any particular mythical tradition. When myths from all over the world are then mixed up in order to "prove" a special cosmic event, this problem becomes especially evident. Do myths from many parts of the world and

many different cultures indeed reflect one big event? Or does one myth reflect a cosmic event in, let us say, 2000 BC in the Near East, another an event of 1400 BC in Europe, and the next an event of 300 BC in South America or of 700 AD in the Sahara? Similar mythical descriptions of potential cosmic events give no clue to the identity of the proposed events, because it is probable that similar events would be described in similar ways. Furthermore, myths float in time: in other words, over time a narrative nucleus may gather additional mythical material, or may itself be ascribed to a new context. Therefore, in the absence of a time frame for a given myth, there is no chance of ascribing it to a specific cosmic event.

There exist two ways to obtain an estimate of the probable date of a myth that is meant to represent a concrete cosmic event. The first is direct, and can be applied where the myth itself and/or its history of tradition gives clues to its date. This approach has been followed, for example, by Rappenglück and Rappenglück (2007). The other approach is indirect, where a mythical tradition contains elements that can be cross-checked by geological (and archaeological) evidence. The geological evidence itself can be dated and thus provides indirect dating for the mythical tradition. Masse and Masse (2007) have attempted this approach by comparing the geographical distribution of certain mythical motifs with existing geological clues relating to a specific cosmic event, the Campo del Cielo impact in South America, which has been dated to about 2000 BC. Such an approach requires a rare coincidence of detailed and well-preserved evidence provided by other disciplines like geology and archaeology. It is at the least very risky, if not improper, when dealing with a cosmic event claimed to have had worldwide effects, because in this case the countercheck by spatial distribution becomes invalid. In summary, only very rarely will it be possible to allocate a myth a time-frame that allows it to be ascribed it to a specific cosmic event.

I would summarize the main problems and chances of verifying that a prehistoric cultural disaster was caused by a cosmic catastrophe as follows.

1. The central issue is the need for some kind of certified *geological evidence*. Geological evidence and mythical tradition together can verify a cosmic impact at a certain time, but not a cultural downturn. Geological and archaeological evidence in combination are ideal to serve the purpose, and may be complemented by mythical evidence. But mythical tradition and archaeological evidence without the geological data are not sufficient to confirm a cosmic catastrophe as the trigger of a cultural disaster.
2. The core problem is *dating*: the geological dating, the archaeological dating of the affected culture in question, and the dating of myths. Very probably, a number of myths describe the fall of meteorites and even impacts of significant size; but without a dating framework, connecting a myth to a concrete catastrophe of cosmic origin and to a special cultural downturn is unsupportable.
3. Awareness that *mythical motifs have multiple meanings*.
4. The problem of *effects*: Even when there is good geological and archaeological (and perhaps even mythical) evidence of a cosmic event, the scale of its effects depends on so many factors that catastrophic cultural effects are not self-evident.
5. Avoiding *theoretical preoccupation*: Depending on many factors, human responses to natural catastrophes vary extremely. To be able to verify without prejudice the scale of a culture's response to a natural catastrophe, it is crucial to reflect seriously upon one's own concepts of "catastrophe", "cultural disaster" and "cultural change".

Under these conditions, is it possible to verify a prehistoric cultural disaster, triggered by a cosmic event? Maybe Firestone's research has the potential to do so. Research on the Chiemgau Impact, a large meteoritic impact in South-east Germany during the 1st millennium BC (Rappenglück and Rappenglück 2007) that might have influenced Celtic culture, might also have the potential, but more precise dating and a better knowledge of the scale of the effects are required.

References

ALLAN, D. S. and DELAIR, J. B., 1997. *Cataclysm! Compelling Evidence of a Cosmic Catastrophe in 9500 B.C.* Rochester: Bear & Comp.

BAILLIE, M., 2000. *Exodus to Arthur. Catastrophic Encounters with Comets.* London: Batsford Ltd.

BLONG, R. J., 1984. *Volcanic Hazards. A Sourcebook on the Effects of Eruptions.* Sydney: Academic Press.

BRYANT, E. A., WALSH, G. and ABBOTT, D., 2007. Cosmogenic mega-tsunami in the Australia region: are they supported by Aboriginal and Maori legends? In: L. PICCARDI and W. B. MASSE, eds. *Myth and Geology.* London: Geological Society, 203-214.

CLUBE, V. and NAPIER, B., 1982. The Cosmic Serpent. New York: Universe Books.

FIRESTONE, R., WEST, A. and WARWICK-SMITH, S., 2006. *The Cycle of Cosmic Catastrophes: Flood, Fire and Famine in the History of Civilization*. Rochester: Bear & Company.

LUDWIN, R. and SMITS, G. J., 2007. Folklore and earthquakes: Native American oral traditions from Cascadia compared with written traditions from Japan. In: L. PIC-

CARDI and W. B. MASSE, eds. *Myth and Geology.* London: Geological Society, 67-94.

MASSE, W. B. and MASSE, M. J., 2007. Myth and catastrophic reality: using myth to identify cosmic impacts and massive Plinian eruptions in Holocene South America. In: L. PICCARDI and W. B. MASSE, eds. *Myth and Geology.* London: Geological Society, 177-202.

MASSE, W. B., BARBER, E. W., PICCARDI, L. and BARBER, P. T., 2007. Exploring the nature of myth and its role in science. In: L. PICCARDI and W. B. MASSE, eds. *Myth and Geology.* London: Geological Society, 9-28.

MENGES, K. H., 1983. *Materialen zum Schamanismus der Ewenki-Tungusen*. Wiesbaden: Otto Harrassowitz.

PICCARDI, L. and MASSE, W. B., eds., 2007. *Myth and Geology.* Geological Society, London.

RAPPENGLÜCK, B. and RAPPENGLÜCK, M., 2007. Does the myth of Phaethon reflect an impact? Revising the fall of Phaethon and considering a possible relation to the Chiemgau Impact. In: I. LIRITZIS, ed. Proc. of the International Conference in Archaeoastronomy SEAC 14th 2006 (*Mediterranean Archaeology and Archaeometry*, Special Issue 6, 3), 101-109.

SADLER, J. P. and GRATTAN, J. P., 1999. Volcanoes as agents of past environmental change. *Global and Planetary Change*, 21, 181-196.

TOLLMANN, A. and TOLLMANN, E., 1993. *Und die Sintflut gab es doch. Vom Mythos zur historischen Wahrheit*. München: Droemer Knaur.

TORRENCE, R., 2002. What makes a disaster? A long term view of volcanic eruptions and human responses in Papua New Guinea. In: R. TORRENCE and J. GRATTAN, eds. *Natural Disasters and Cultural Change*. London: Routledge, 292-312.

TORRENCE, R. and GRATTAN, J., 2002. The archaeology of disasters: past and future trends. In: R. TORRENCE and J. GRATTAN, eds. *Natural Disasters and Cultural Change*. London: Routledge, 1-18.

VITALIANO, D., 1973. *Legends of the Earth. Their Geologic Origin*. Bloomington, London: Indiana University Press.

Received: 16 October 2007; Revised: 15 April 2008

KOSMINĖS KATASTROFOS IR KULTŪRINĖS NELAIMĖS PRIEŠISTORINIAIS LAIKAIS. VERIFIKACIJOS GALIMYBĖS IR RIBOS

Barbara Rappenglück

Santrauka

Per pastaruosius tris dešimtmečius nepaprastai atgijo domėjimasis kosminių reiškinių, tokių kaip supernovos, didieji meteoritai bei jų smūgiai ir t. t., galėjusių lemti radikalius geologinių periodų pokyčius, įtaka priešistorės kultūrų kaitai. Tokios teorijos bando lyginti aptinkamus tam tikrų archeologinių sluoksnių (horizontų) sunykimo faktus su dendrochronologinių ir ledynų tyrimų rezultatais, mitine tradicija ir t. t. Šie duomenys pateikiami kaip kosminių reiškinių sukeltų kultūrinių pokyčių įrodymai. Šis straipsnis kritiškai nagrinėja „kosminės katastrofos“ bei „kultūrinės nelaimės“ koncepcijas ir jas verifikuojančius metodus.

Svarbiausios galimybės ir problemos verifikuojant priešistorinių kultūrų pasikeitimus, sukeltus kosminių katastrofų, yra šios:

1. Geologiniai duomenys. Remiantis geologiniais duomenimis ir mitine tradicija, galima patikrinti kosminių reiškinių įtaką kultūroms tam tikru laiku, bet remiantis šiais duomenimis negalima interpretuoti kultūrinio nuosmukio. Geologinės ir archeologinės medžiagos derinimas padeda spręsti problemą ir gali būti papildytas mitologiniais duomenimis. Tačiau mitologinė tradicija ir archeologinė medžiaga be geologinių duomenų negali patikimai patvirtinti kosminių katastrofų sukeltų kultūrinių nuosmukių.

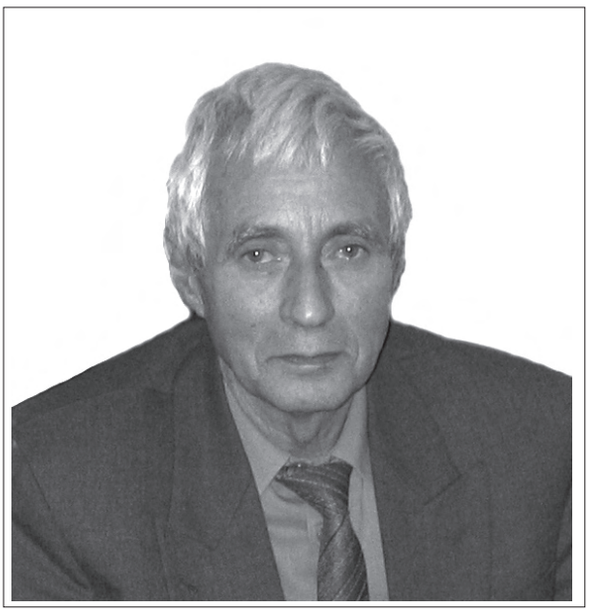
2. Esminė problema yra datavimas: geologinis datavimas, archeologinis kultūros datavimas (straipsnyje aptariamų poveikių lygmeniu) ir mitų datavimas. Daugumą mitų, pasakojančių apie meteoritų kritimą ir net jų dydį bei smūgio jėgą, dėl datavimo gairių nebuvimo sunku susieti su konkrečia kosminės prigimties katastrofa ir tam tikros kultūros nuosmukiu.

3. Mitinių motyvų supratimas ir naudojimas yra problemiškas, nes turi daugialypių prasmių.

4. Poveikio problema: net jei yra tinkama geologinė ir archeologinė medžiaga (ir, matyt, net mitinis klodas) jo padarinių mastas priklauso nuo daugelio veiksnių, todėl katastrofiški kultūriniai padariniai nėra savaime akivaizdūs.

5. Vengiant išankstinio teorinio nusistatymo: priklausydama nuo daugelio veiksnių žmonių reakcija į natūralias katastrofas yra nepaprastai įvairi. Siekiant išvengti išankstinių nusistatymų, verifikuojant kultūrinių atgarsių mastą, į gamtines katastrofas būtina rimtai kritiškai reflektuoti savo paties „katastrofos“ ir „kultūrinio nuosmukio“ ar „kultūrinės kaitos“ koncepcijas.

Vertė Audronė Bliujienė



IN MEMORIAM: IZOLD PUSTYLNIK
(17 March 1938 – 2 May 2008)

Izold Pustylnik, eminent astronomer and senior research associate at the Tartu Observatory, and member of SEAC (La Société Européenne pour l'Astronomie dans la Culture), died in the early morning of May 2, 2008.

Izold Pustylnik was born on March 17, 1938 into a family of millers in Odessa, Ukraine, as an only child. During World War II he was evacuated together with his mother to Uzbekistan. He lost his father in the war. After the war they returned to Odessa where Izold graduated from secondary school with high grades and from Odessa University *cum laude*. His interests in astronomy developed under the guidance of V. Tsessevich who was one of the leading researchers on close binary stars.

After a short period as a young scientist in Odessa and Kiev he applied in 1962 for a postgraduate position at the Institute of Physics and Astronomy in the Academy of Sciences of the then Estonian Soviet Socialist Republic. Remarkably, only three months after starting his postgraduate studies, Izold delivered his first academic seminar report at the Institute in Estonian. His skills in acquiring new languages were impressive: in the Institute's personnel records of 1992 Izold rated his command of Russian, Estonian, English and Polish as excellent; Ukrainian, German and French as languages he could read and translate; and Hungarian as a language he commanded at conversational level.

Following his postgraduate studies, Izold obtained the degree of Candidate of Science from the University of Tartu in 1958. In 1994 he was awarded a DSc from Saint Petersburg State University.

During the entire time he worked at the Tartu Observatory, Izold researched close binary systems – stars that, by orbiting very close to each other around a common centre of mass, help us to learn more about stars in general than can be done by studying single stars alone. He even defined a new category of stars – gas-eclipsed close binaries, which are binaries orbiting around each other in a common gas envelope. During the last decade he studied the subdwarf components of pre-cataclysmic binaries, trying to understand their structure, spectral features and evolution.

Though mainly a theoretician, Izold was active – and, over a very long period in his earlier academic career, also involved – in observing binary systems.

In recent years Izold took an interest in famous astronomers connected both with Estonia and Russia. Together with Vitalii Bronshten, he published a monograph on Ernst Julius Öpik, one of the best-known Estonian astronomers. Izold also wrote about Stanislavs Vasilevskii, a Latvian astronomer whose talent had remained hidden in the tumult of the 20th century, and thoroughly investigated the life and work of Erich Schoenberg, the German-Estonian astronomer who worked at the Tartu Old Observatory.

Izold's interests were not limited to the life and work of famous astronomers: he also attempted to draw parallels between the views of ancient astronomers and contemporary thought. At the 2002 Tallinn conference celebrating the passage of 150 years since the measurement of the Struve Geodetic Arc – a long meridian arc stretching from the Arctic Ocean to the Black Sea that has been inscribed onto the UNESCO World Heritage List – Izold analysed Friedrich Georg Wilhelm Struve's geodetic and astronomical measurements in the light of contemporary astronomical understanding.

In the mid-1970s, during the surge of national awakening in Estonia, astronomer Heino Eelsalu began to trace back Estonian national identity, almost lost by then, and focused on the interpretation of various myths connected with the starry sky, together with the examination of archaeological artefacts from an astronomical viewpoint. In so doing, he laid a solid foundation for the field of archaeoastronomy in Estonia. Eelsalu's enthusiasm fired many younger colleagues, Izold among them, for whom a new window had been opened onto the world. Izold became one of the main organisers of the 2002 International Conference of SEAC, which was held in Tartu, Estonia. At the conference he also delivered a weighty paper 'Does modern astrophysics widen the horizons of archaeoastronomy?' (published in the SEAC Proceedings, 2002).

Izold's fine language skills allowed him to cooperate with astronomers from many countries of the world. His active lifestyle marked him out and he was elected onto the boards of several international organisations. For instance, Izold had been a member of the Euro-Asian Astronomical Society virtually since its establishment.

Izold was also one of the main instigators of Euroscience Estonia. By a cruel irony, Izold was gone by the opening of the 2008 international seminar that he had summoned. The seminar was dedicated to the astronomer Ernst Christoph Friedrich Knorre who worked in Tartu before Struve's era.

Izold Pustylnik will be deeply missed by his colleagues in the Tartu Observatory and SEAC. He was a fine member of our observatory and interlocutor on scientific issues and life in general.

Tõnu Viik, Tartu Observatory

Translated by Kait Tamm

GUIDELINES FOR AUTHORS

Archaeologia Baltica is a semiannual academic refereed journal published in English about the archaeology of the regions around the Baltic Sea, with the focus on the eastern shore of the Baltic. The editorial policy is to publish a wide range of contributions in all fields of archaeology related to the Baltic Sea Region, from methodology to synthesis and theory. These may take the form of substantial research papers (up to 8,000 words) or shorter research reports. Short papers may include, for instance, new techniques, philosophical discussions, current controversies and suggestions for new research, as well as conventional research papers. Review or overview papers are welcome, as long as they are sufficiently critical, succinct and make a conceptual contribution to the field. The submission of a paper will be held to imply that it represents an original article, not previously published, and that it is not being considered for publication elsewhere.

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Articles for Archaeologia Baltica should be typed in English, double-spaced on A4 paper, with at least 30-millimetre margins. Submitted articles must include:

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- a summary up to an eighth of the length of the whole text, for translation into Lithuanian;
- captions for figures and tables supplied separately and appended to the disc copy of the text;
- numbers and labelling on figures should be in publishable form, the font size of the numbers and letters should not exceed 12, figures and tables should be not bigger than 16 centimetres wide and 24 centimetres high, with thin frames.

Three hard copies and a computer version (in Word for Windows) of contributions must be sub¬mitted to the Managing Editor. Computer-generated drawings must be provided in hard copy and digital format (TIFF, EPS or CDR), the resolution should be not less than 300 dpi.

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Cyrillic	Roman	Cyrillic	Roman	Cyrillic	Roman
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б	b	л	l	ц	ts
в	v	м	m	ч	ch
г	g	н	n	ш	sh
д	d	о	o	щ	shch
е	e	п	p	ъ	”
ё	e	р	r	ы	y
ж	zh	с	s	ь	’
з	z	т	t	э	e
и	i	у	u	ю	iu
й	i	ф	f	я	ia

Footnotes and endnotes should be avoided if at all possible.

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The volume cost 50 Lt (15 EUR) plus postage.

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ARCHAEOLOGIA BALTICA 10
ASTRONOMY AND COSMOLOGY IN FOLK TRADITIONS AND CULTURAL HERITAGE

Edited by Jonas Vaiškūnas

Klaipėda, 2008

SL 1335. 2008 12 20. Apimtis 49 sąl. sp. l. Tiražas 500 egz.
Klaipėdos universiteto leidykla, Herkaus Manto g. 84, 92294 Klaipėda
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Plate I.

Moments of the International SEAC 2007 & OXFORD VIII conference "Astronomy and Cosmology in Folk Traditions and Cultural Heritage". Photographs by J. Vaiškūnas and J. Marozas.

Fig. 1-2. Conference attendees enjoying each other's company.
Fig. 3. Members of the Conference organizing committee: J.Žukauskaite - Alvarez Romero, A.Girininkas, J.Vaiškūnas.
Fig. 4. Conference attendees at guided tour around the Curonian Spit – Neringa.
Fig. 5. Øistein Hanssen playing Sami chants (Joik) on flute.
Fig. 6. Prof. C.Ruggles and President of ISAAC S.C.McCluskey.
Fig. 7. Prof. C.Ruggles, the king of archaeoastronomy, on a two day sightseeing trip in Lithuania.

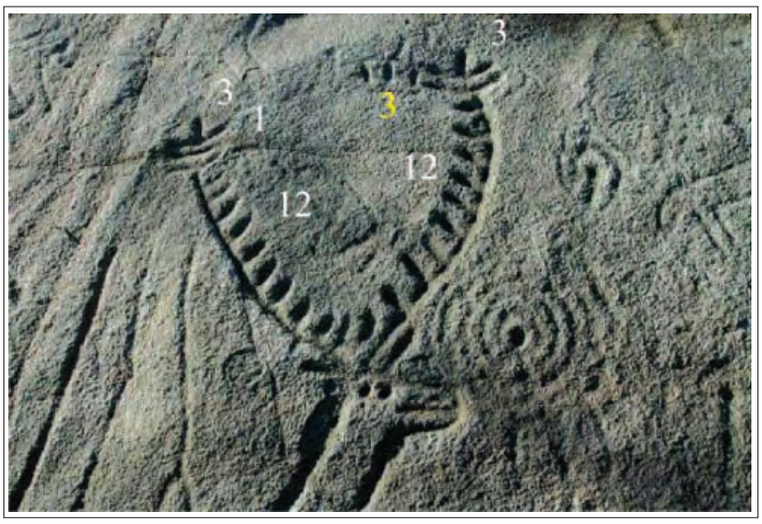

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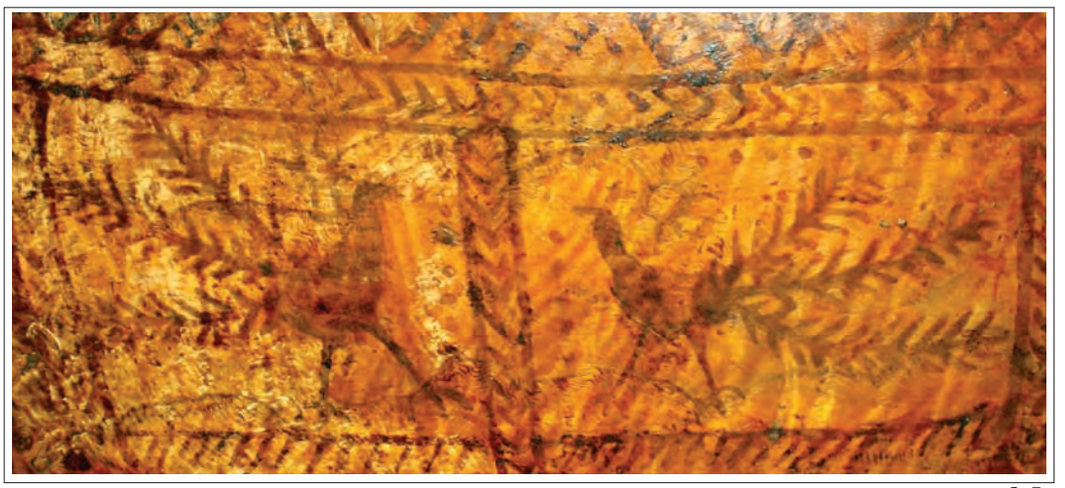
Plate II.

ANTONIO CÉSAR GONZÁLEZ GARCÍA, MARCO V. GARCÍA QUINTELA, JUAN ANTONIO BELMONTE, MANUEL SANTOS ESTÉVEZ
CALENDRICAL DEER, TIME-RECKONING AND LANDSCAPE IN IRON-AGE NORTH-WEST SPAIN

Fig. 2. The great deer at Laxe dos Carballos, Campo Lameiro, facing a circular motif to the right. Each of its antlers has 12 tips protruding inwards. There are also three tips at the top of each horn. The left horn has an additional isolated stroke running between the three top tips and the main antler. Note finally the three isolated strokes next to the right antler.
Fig. 3. The south-eastern horizon at Laxe dos Carballos. The nearby horizon is dominated by two low hills where two 'DIVI' inscriptions are located. A distant mountain dominates this horizon. The positions are indicated of winter solstice sunrise and moonrise at the major southern lunistice around 800 BC.
Fig. 6. Carved panel at Os Mouchos. This is an average-sized deer with overgrown antlers, showing possibly 12 tips on each of them.



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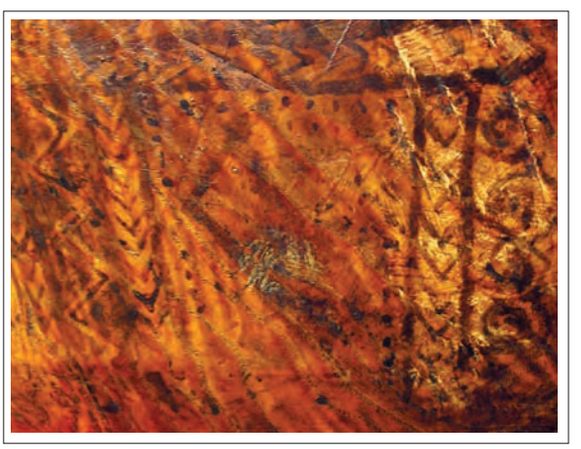

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Plate III.

JONAS VAIŠKŪNAS
SOME PERIPHERAL FORMS OF THE MEDITERRANEAN AND ORIENTAL ZODIAC TRADITIONS IN HEATHEN LITHUANIA

The signs of the Baltic scoop zodiac (BZ): 1. Pisces, 2. Aries, 3. Taurus, 4. Gemini, 5. Cancer, 6. Leo. Photographs by J. Vaiškūnas.

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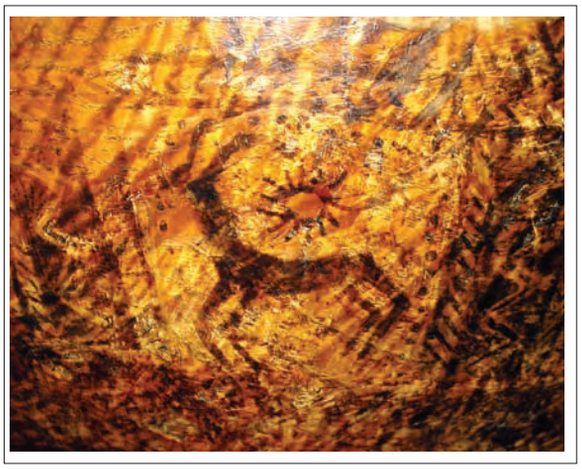

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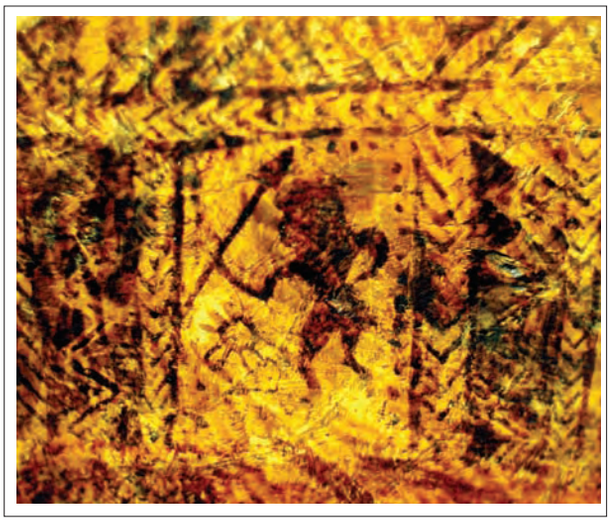

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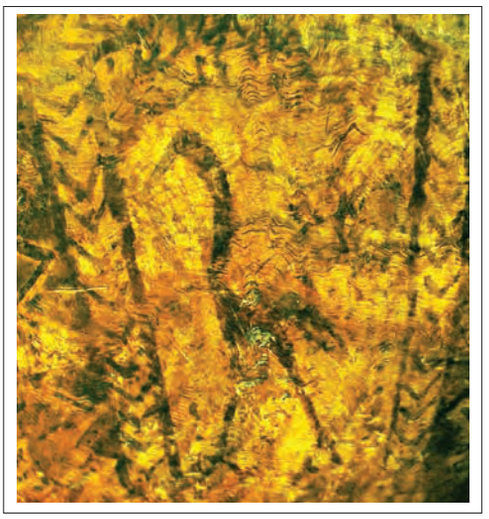

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Plate IV.

JONAS VAIŠKŪNAS
SOME PERIPHERAL FORMS OF THE MEDITERRANEAN AND ORIENTAL ZODIAC TRADITIONS IN HEATHEN LITHUANIA

The signs of the Baltic scoop zodiac (BZ): 7. Virgo, 8. Libra, 9. Scorpio, 10. Sagittarius, 11. Capricorn, 12. Aquarius. Photographs by J. Vaiškūnas.

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Plate V.

VITO FRANCESCO POLCARO, ANDREA MARTOCCHIA
WERE THE 185 A.D. AND 369 A.D. “GUEST STARS” SEEN IN ROME?

Fig. 1. The Priscilla (left) and Via Latina (right) catacomb frescoes.

ANDREI PROKHOROV
IMAGES ON THE STONES AT SCEBIARAKY VILLAGE IN NORTH-WEST BELARUS

Fig. 3. Anthropomorphic stone in Pruzhany containing the image of a pole with a semicircle.
Fig. 6. Cross from the village of Drachkovo (Smilovichy region).

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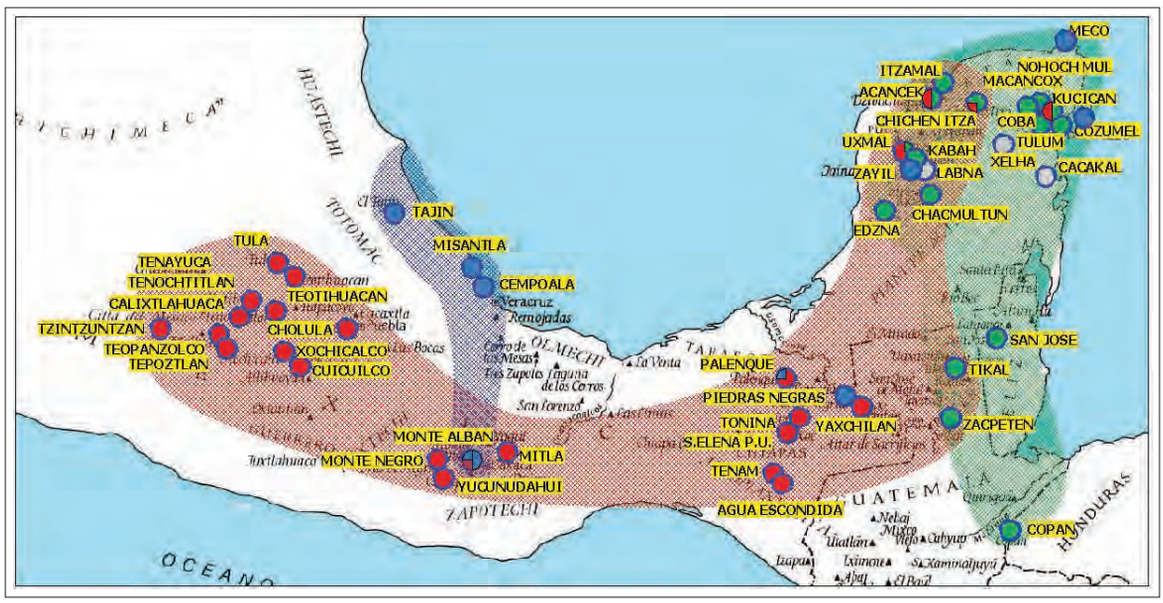

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Plate VI.

ANTONIO CÉSAR GONZÁLEZ GARCÍA, VESSELINA KOLEVA , DIMITAR KOLEV, JUAN ANTONIO BELMONTE

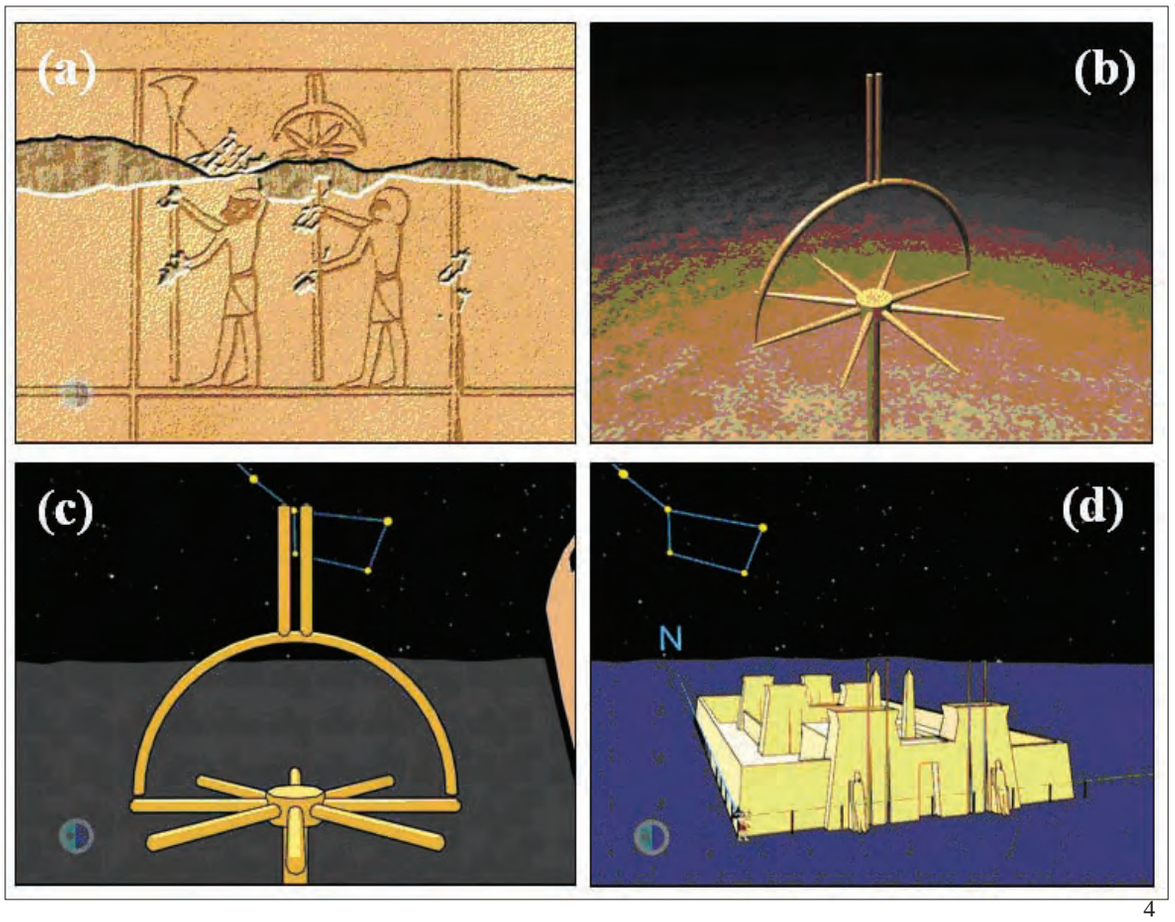
THRACIAN DOLMENS AND THEIR ORIENTATIONS

Fig.1. The dolmen at the Kirovski Komplex Farm near Belevren.

MARCELLO RANIERI

A GEOMETRICAL ANALYSIS OF MESOAMERICAN PRE-HISPANIC ARCHITECTURE: SQUARING TRIADS, NUMBERS, LENGTH UNITS AND THE CALENDAR

Fig.11. Distribution of t (red), ma (blue) and ci (green) units in Mesoamerica.



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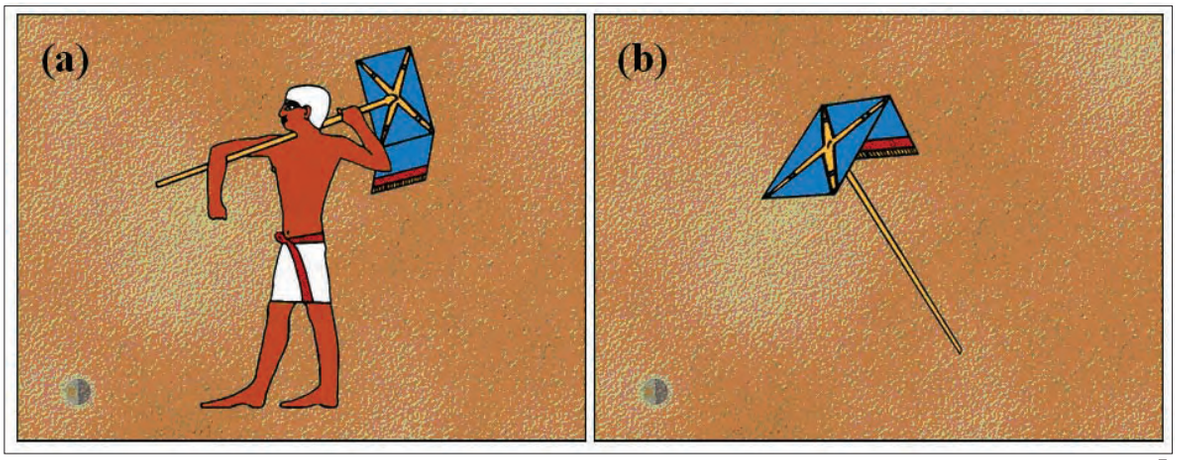

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Plate VII.

NOEMI MIRANDA, JUAN A. BELMONTE, MIGUEL ANGEL MOLINERO
UNCOVERING SESHAT: NEW INSIGHTS INTO THE STRETCHING OF THE CORD CEREMONY

Fig. 4. This sequence of images illustrates our hypothesis of the use of the sign of Seshat as a topographic instrument similar to the Roman groma. Panel (a) shows a relief from the solar temple of Niuserre at Abu Gurob, where the sign appears as a standard or movable object. Panel (b) presents the core of our idea where the sign is transformed into a real object: when changing the flat vision of the representation into a three-dimensional image, the seven radial elements that appear in the iconography of the goddess are transformed into an eight-radius movable "wheel". The uppermost elements of the sign represent a sighting device, or eyepiece, in the style of the merkhet, as shown in panel (c). Once the alignment had been obtained, the eight radii of the device would directly offer the four cardinal and four intercardinal directions, as defined in Shaltout, Belmonte and Fekri (2007) and illustrated in panel (d). Diagrams courtesy of SMM/IAC.
Fig. 5. The seba (star) parasol as represented in the mastaba of Tiy in Saqqara (a; adapted from Schäfer 2002), showing the way Egyptian "aspective" operated. The three-dimensional reconstruction of the device (b) follows the same rules we are proposing for the "instrument" (sign) of Seshat. Unlike the latter, however, all the elements of the device, i.e. both the pole and the four radii, are represented in this image. Diagrams courtesy of SMM/IAC.

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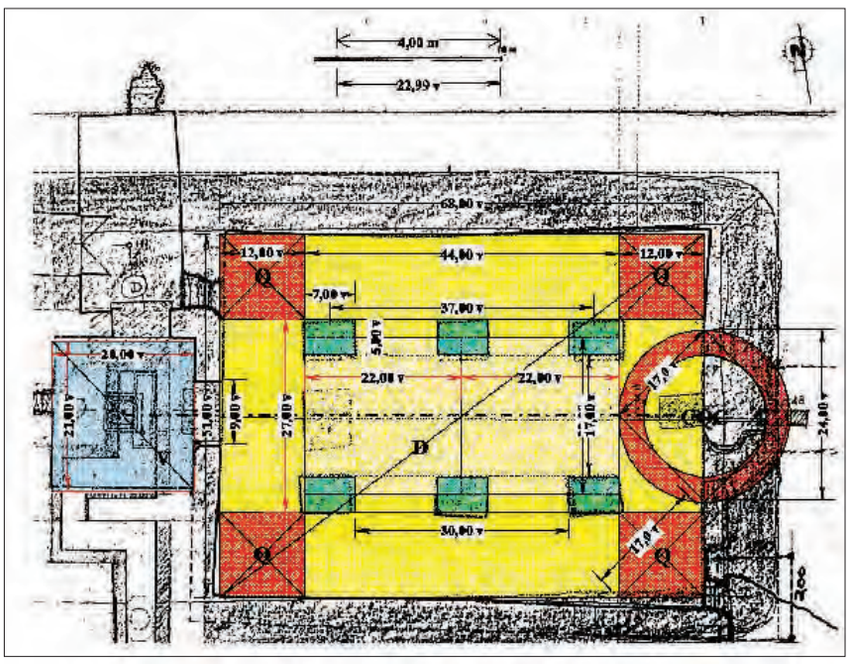

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Plate VIII.

LUCILLA LABIANCA, IDA SCIORTINO, SILVIA GAUDENZI, ANDREA PATANÉ, VITO FRANCESCO POLCARO, MARCELLO RANIERI

AN ARCHAEOASTRONOMICAL STUDY OF THE 'NEO-PYTHAGOREAN BASILICA' AT PORTA MAGGIORE IN ROME

Fig 2. The vault of the central nave of the basilica: notice the stucco representing the "Kidnapping of Ganimede" in the centre.

Fig. 3. Geometrical scheme of the Basilica.