Gorgias Précis Portfolios 6

Time and Astronomy in Past Cultures

Edited by

Arkadiusz Sołtysiak

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6

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Preface

The present volume contains papers presented at the conference "Time and Astronomy in Past Cultures" which was held in Toruń early spring last year. This meeting was organised as a commemoration of the late Andrzej Wierciński (1930–2003) who after a long academic career in the fields of physical and cultural anthropology initiated at Warsaw University in mid-1970s the scholarly research on astronomy in culture and ancient calendars. His studies (published e.g. in "Almogaren") concerned chiefly the astronomy, calendars, and cosmogony of ancient Mexico, although occasionally Professor Wierciński discussed also the Biblical and Egyptian topics. The most comprehensive collection of His writings has been published in the book "Tlillan–Tlapallan. Estudios sobre la religión mesoamericana" (Polish Society for Latin American Studies: Warsaw 1999).

The idea of organising the conference had been conceived in early 2004 by Professor Mariusz Ziółkowski, the disciple and successor of Professor Wierciński as the head of the Department of Historical Anthropology at Warsaw University, and himself an outstanding student of ancient astronomical traditions. Toruń was selected as the place of the conference for two reasons: first, being the city of Nicolaus Copernicus it was the most obvious place for discussing the past astronomical ideas, second, the kindness of local municipality made the organisational challenges easy to cope with. Apart from the Department of Historical Anthropology, also the Toruń Planetarium has been involved in the preparation of the meeting and his director, Mr. Lucjan Broniewicz, became the member of the Organising Committee. In the preparation of the symposium's scientific program, we were supported also by the European Society for Astronomy in Culture (ESAC/SEAC) represented by its former president, Dr Stanisław Iwaniszewski. Owing to the assistance of the Toruń Municipality the conference could have taken its place in a very beautiful old room of the Scientific Society at Toruń, located in the heart of the Gothic Old Town.

During the three days of the conference (from Wednesday, March 30 till Friday, April 1, 2005) about 40 registered participants listened to 28 papers divided into ten sessions (the full list of the papers is presented below). In general, the topics discussed during the conference were quite varied, from the most numerous category of ancient and medieval Near East (11 papers), through European archaeoastronomy (4 papers), astronomy of medieval Europe (5 papers) and ethnic traditions of Eastern and Northern Europe (6 papers), to astronomy in New World cultures (2 papers). In most cases the papers provoked fruitful discussions, which unfortunately cannot be described here. The present volume contains twelve papers representing almost all topic categories covered by the conference.

It is obvious that any scientific meeting owes its success to many people. Many thanks are due to the participants of the conference who had created a very friendly atmosphere and provided a proper level of scientific discussion. Mr. Michał Zaleski, the President of Toruń, assumed not only the honorary patronate, but also facilitated the organisational works. Mr. Lucjan Broniewicz, the director of Toruń Planetarium and co-organiser of the conference, enabled us to offer a public lecture about Stonehenge given by Professor Clive Ruggles

(University of Leicester, UK), which was a very important accompanying event aimed to the popularisation of our field of research. The Organising Committee would like to thank also Prof. Andrzej Woszczyk, the hospitable President of the Scientific Society at Toruń, Dr. Stanisław Iwaniszewski, the President of ESAC/SEAC, and Dr. Mateusz Wierciński who both strongly supported our meeting, as well as Mr. Grzegorz Grabowski (Director of the Department of Culture in Toruń Municipality) who helped us to solve many organisational problems. Thanks are also due to other persons who took a part in the organisation of the conference: Jadwiga Kopczyńska (Department of Culture in Toruń Municipality), Jan Pronobis (Director of the Scientific Society at Toruń), Emilia Zakrzewska (the restaurant "Ratusz"), Krzysztof Semrau (Toruń Planetarium), Lidia Rygielska and Barbara Kasprzak (our registers), and the staff of the Scientific Society at Toruń. Last but not least, I would like to thank the four referees who had performed really hard work and strongly contributed to the shape of the present volume.

Our meeting has been sponsored by the Ministry of Science and Information Society Technologies (now Ministry of Education and Science, the grant No. H01H 034 25) and the Department of Culture in Toruń Municipality. The publication of the proceedings has been financially supported by the Institute of Archaeology at Warsaw University.

Warsaw, April 1, 2006 — Arkadiusz Sołtysiak

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The Calendar in the Flood Narrative

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Abstract: *This study essays an analysis of the Flood Narrative (Gen. 6-8; hereafter: FN) from the standpoint of a fresh methodology: numerology. According to this methodology, numbers are not only signs of quantity but bear meanings of quality as well. Numbers in this understanding are unconditional and are to be grasped while casting a blind eye on the context in each particular case. For our purposes, applying numerology to the FN strengthens some modern scholarly concepts while rejects others, by taking a new look at an old problem.*

From several dozen FN's in the whole world, part of the uniqueness of the Biblical FN lies in the numbers that are embedded in the text. These numbers are classed into two groups: quantitative, or absolute numbers, such as 7, 40, or 150, and relative numbers, such as 17/2, 17/7, representing dates (day/month/year). The quantitative numbers in the FN join together to make the 361 days of a solar year, and this calendar, as well as the perfection of 360, are discussed.

The relative numbers are dates that are mentioned in the log-book made by Captain Noah in his ark (either E or P). These dates do not reflect a series of coincidental dates but rather a coherent calendar. It is figured that God spoke to Noah on the first day of the first month (1/1) in the 600th year from the creation of the world, and that after 7+40 days the flood began, on the 17th of the second month (17/2), 600. The date of each of the incidents recorded in the FN is discussed, since each date is meaningful. The final recorded date, falling out on 27/2/601, is calculated upon the plotline of a complete solar year: 12 lunar months with 11 intercalated days. This solar-lunar year is identical with the lunar-based calendar known today as the Jewish Calendar.

The Masoretic text differs from the LXX, the Qumran version, and the other varieties. Observing the numbers helps in understanding of the redaction and scribal copying processes that shaped the FN into its present form, after many ages of development.

The aim of this study is to analyze the Flood Narrative (Gen. 6-8) from the standpoint of a fresh methodology: numerology. According to the method, numbers are not only signs of quantity but contain a meaning of quality as well. This form of communication is non-conditional on its context. Applying it to the FN strengthens some scholarly modern concepts and rejects others while taking a fresh look at an old problem. The study is built both upon former studies in astronomy and astrology among the Jews in Antiquity,[1] and upon studies in numerology.[2]

[1] M. Bar-Ilan, "Astrology in Ancient Judaism," "Astronomy in Ancient Judaism," J. Neusner, A. Avery-Peck, and W. S. Green (eds.), *The Encyclopaedia of Judaism*, V, Supplement Two, Leiden–Boston: Brill, 2004, pp. 2031–2044.

[2] M. Bar-Ilan, *Genesis Numerology*, Rehovot: Association for Jewish Astrology and Numerology, 2004 (Hebrew); idem. *Biblical Numerology*, Rehovot: Association for Jewish Astrology and Numerology, 2005 (Hebrew). For an English review of the first book, see: http://www.bookreviews.org/bookdetail.asp?TitleId=4331.

Proceedings of the Conference "Time and Astronomy in Past Cultures", Toruń, March 30 – April 1, 2005, A. Sołtysiak (ed.), Warszawa – Toruń 2006, pp. 13–32.

A. State of the field

In Rabbinic tradition disputes were carried on concerning the dates recorded in the FN, one taking place in Late Antiquity and another in the Middle Ages. The latter can be seen in reading Rashi's and Nahmanides' commentaries *ad locus*. However, both agree upon the idea that the Flood lasted a complete solar year, beginning on 17/2 through to 27/2 in the next year, meaning a lunar year plus an 11 day intercalation to complete a solar year. Ibn Ezra condemned those who thought that the FN reflects purely a solar year, though one is apt to say that the whole discussion of the calendar of the FN was colored by a distinct theological bias. That is to say, it was not easy for a Rabbinic commentator to conclude that the Biblical calendar was different from his own in his own time. In Rabbinic circles it was indeed claimed, though this was far from being set down as a dogma, that the Jewish calendar was already revealed to Moses at Mt. Sinai. Having this notion in the background was not conducive to striking for a new understanding of an old issue.

According to Arab astrologers in the Middle Ages, the inclusion of all the dates in the FN is supposedly immaterial. Al-Biruni and Al-Tanuki (fl. 10–11th c.) calculated that the flood began because of a specific positioning of the stars in relation to the earth that took place either on 11 February 3381 or in 3102 BCE.[3] However, these exact dates are based on an astrological assumption, and until it be proven that God as portrayed in the Bible obeys medieval astrological rules, one must rule out this explanation.

U. Cassuto was one of the few modern commentators to pay attention to the numbers in Genesis, and in the FN in particular.[4] He drew attention to the number 7 in the FN as well as in Mesopotamian sources. He used the word "harmony" to denote the symmetry of the numbers in the FN, a noticeable fact to any beginner. However Cassuto discussed only two dates – the days upon which the Flood began and ended. Since he did not exceed the aforesaid Rabbis' discussion, it is clear that from the numerical point of view he did not add much to the modern study of the FN.

A new twist to the whole subject arose after the discovery and analysis of the Qumranic findings. Not only were the Qumranites interested in calendrical issues (treated or mentioned in some 20 different texts), but they specially treated the FN by presenting it with some slight changes: foremost, the final date of the FN is not 27/2 as it says in the Masoretic text, but rather the 17/2.

Several modern studies have been made in the recent past to explain this aberration, and almost all of them are related one way or another to the theory of A. Jaubert, who claims that the explicit calendar in Qumran of 364 days was implicitly embedded in the FN, hence a flood that begins and ends at

[3] D. Pingree, "Indian and Pseudo-Indian Passages in Greek and Latin Astronomical and Astrological Texts," *Viator*, 7 (1976), pp. 141–195 (esp. 149 ff.); D. Pingree, *From Astral Omens to Astrology from Babylon to Bikaner*, p. 53–54; Bernard R. Goldstein, "Astronomy and the Jewish Community in Early Islam," *Aleph*, 1 (2001), pp. 17–57 (esp. 26–30).

[4] U. Cassuto, *Genesis Commentary: MiNoach ve'ad Abraham*, Second edition, Jerusalem: Magness, 1953, pp. 32–84 (Hebrew).

the 17th denotes a solar calendar just as 364 days denotes it.[5] Her theory has been criticized for several reasons, but additionally it does not focus on the FN but rather on Qumran, her point being to demonstrate the Qumranite calendar's antiquity.[6] Other studies on the FN have added more to our understanding of the sectarians' text; perhaps one may look upon the following discussion as built upon these former studies, that of F.H. Cryer included,[7] though with from the special standpoint of issues neglected up till now: numerology combined with textual criticism.

At the end of this short history of the study of the FN one more fact should not be overlooked. In the study of Old Testament the FN served as a model and prototype for the documentary theory, which states that the Bible was compiled from different documents, written by different people in different times. This is so because in the FN it is easily demonstrable how the narrative consists of separate stories that were later combined into one narrative.[8] Former studies on this subject not only pondered the FN, but also touted on high the whole school of documentary criticism. This school has been so certain in its hypotheses of the existence of several documents making up the Pentateuch that it often takes its method for granted and sometimes mistakenly imposes it globally on the Biblical text, attempting to explain the various lacunae and aberrations while not trying to understand many of those issues that do not "belong" to its scholarly heritage. It is believed that the main issue that was disregard by former scholars of this bend has been that of numbers, and for their sake the discussion continues.

It has been well known for more than a century, that Flood stories were told all over the world throughout Antiquity.[9] Collecting stories does not further scholarship, however making new observations and asking new questions on the basis of these stories is a core of modern learning. So the main question should not be "How many variants of the FN are known?" (implying that the Bible is of no special importance, and just one among many), but rather: "What is unique to and in the Biblical FN?". One answer to this question is simply, the numbers included therein. The text is framed and embedded with many numbers of all sorts. Moreover, when one begins to analyze these numbers, even paying no attention to the text itself, it becomes apparent that the numbers in the FN come in two types of measure: There are numbers that denote quantity, such as of the amounts of days, animals, and so forth – these are called quantitative numbers. And there are numbers that are relative to a whole – these are called relative numbers. In our case the latter constitute dates, relative almost by definition: a specific day relatives to a specific month and to a specific year.

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[5] A. Jaubert, "Le calendrier des Jubilees et de la secte de Qumran. Ses origines bibliques," *VT* 3 (1953), 250–264.

[6] Liora Ravid, "The Book of Jubilees and its Calendar – A Reexamination," *Dead Sea Discoveries*, 10/3 (2003), pp. 371–394; S. Najm and Ph. Guillaume, "Jubilee Calendar Rescued from the Flood Narrative," *Journal of Hebrew Scripture*, 5/1 (2004) [in: http://www.arts.ualberta.ca/JHS/Articles/].

[7] Frederick H. Cryer, "The Interrelationships of Gen. 5,32; 11,10-11 and the Chronology of the Flood (Gen. 6-9)," *Biblica*, 66 (1985), pp. 241–261.

[8] Richard E. Friedman, *Who Wrote the Bible?*, New York: Summit Books, 1987, pp. 53–60.

[9] James G. Frazer, *Folk-Lore in the Old Testament* London: MacMillan and Co., 1919, I., pp. 104–361; F. Garcia Martinez and Gerard P. Luttikhuizen (eds.), *Interpretations of the Flood*, Leiden: Brill 1998.

Hence the present discussion focuses on each of the two types of the numbers. The first to come under our observation shall be the quantitative numbers, as they are easier to grasp, and the relative numbers build on them.

The aim of the following analysis is to discuss numbers, not texts. We arrive at the discussion bearing no prior premises concerning methods of counting Biblical calendars, or Biblical text composition. Needless to say, the discussion of numbers in the text is not necessarily contingent on any textual hypothesis out of the many, as numbers commit to a language all their own.

B. Quantitative (or absolute) numbers

There are many numbers in the FN, and they may easily be divided into the two aforesaid groups, the quantitative, or absolute numbers, and relative numbers, or dates. For the sake of coherence these two types of numbers deserve to be discussed separately. Let us begin with the simple numbers, numbers that play a role in quantitative measure. These numbers may be summarized in a table as follows:

Quantity of	Numbers used
Days	7, 40, 150, 150, 40, (7), 7, 7
Years	600, 601
Sons	3
Wives	3
Cubits	300, 50, 30, 15
Animals	2, 7

The days are the most countable article, and no doubt this lends to their importance. It is obvious that while one can count all the days, as they come in a consecutive order, one cannot give a counting of all the animals. Hence, while there are many numbers in the FN, the narrator chose to frame his story on the countable days. What is noticeable upon observation of these days in forming the framework, is that their numbers are given in a kind of a symmetrical set, seems to be a kind of a harmony as noticed by Cassuto. Just as the water of the Flood rose and then subsided, so it is in the case in the numbers: first an increase as in a set of A B C to make a peak, then a decrease of C B A to the starting point (with repetitions). This symmetry in arranging the numbers echoes an ancient understanding of the universe – space and time – that one can recognize in the 360 day year. This type of symmetry will be addressed again later.

The quantitative days in the FN represent no calendar, or at best reflect a very poor and imprecise one. To make this point, one should recall stories about people isolated from the world in a jail or on an island for indefinite time, whose ability to mark the weeks and months has lapsed. This shipwrecked mariner may not know how many days he has been marooned, but may still be able to declare a random "Day One," upon which to establish his own reckoning. However a sequential number of days does not a calendar make, but rather taking the sequence and calculating it against a known or determined calendar. Hence, the act of counting days reflects necessity over ignorance of precise astronomy, and a "calendar" such as this would only be a counting of days, not celestially based.

A setting such as this highly corresponds to the core story of the FN. In the rainy weather experienced with the Flood, when everybody was closed in within an ark on water, Noah could not have know the exact date by observing the sky and the Moon (as usually been done in Mesopotamia). So it becomes clear that merely counting the elapsed days in such circumstances would have been the only way to know the date. The date and time will always be *X* days after the beginning of the catastrophe, not an objective date in accordance with the Sun or Moon, but a relative time perspective of the situation since, perhaps, the last recorded date.

How to count the number of days from the beginning of the FN to the end has been a question historically under dispute, and one may claim that, numerologically speaking, the tally of all the days should be made with the expectation that a specific figure should appear as their sum total. The tally of all these days manifested in the text is as follows: 7, 40, 150, 150, 40, 7, 7, which all together totals 401 days. Unfortunately (one might say), the number 401 does not fit any known mold. While some may claim that there is no reason for it to fit anything meaningfully, on the other hand, we should not forget that all these numbers build a symmetric structure, a progression followed by a regression. There is for this then, good reason to assume that the sum of all the numbers should indeed "make sense". According to numerological theory, numbers do have a qualitative meaning, and a quick glance at the numbers here involved seems to affirm this concept.[10] However, the accumulation of all the days to 401 seems to be senseless.

The next step, after not succeeding at first, is of course to try again. Here we shall disregard the first two numbers, 7 and 40. These numbers denote the beginning of the FN but not necessarily the beginning of the Flood itself, and perhaps, we reason, we ought to be counting strictly the days of flood. God warned that in 7 days he would cause the heavens to rain, and thus did it rain for 40 days and 40 nights. Few successive days of rain do not necessarily bring on a flood. However, by 40 successively rainy days the earth will no doubt be inundated in flood; therefore one should not begin the counting of the days of the flood with the 7 days or the 40 days. Rather we count the 150 days of rising waters, and then the 150 days of receding waters. This brings the days of actual flood to 300 days. To these days one should add the successive 40 days (Gen. 8:6) during which the window of the Ark was closed, bringing the total to 340 days.

[10] The number 7 is one of the most famous numbers in the Bible. Here 7 serves as the gateway from normal life to chaos (for the other way around, compare Lev. 12:2; 13:4). The number 40 (from 4 denoting the cosmos multiplied by 10 denoting corporeality) denotes a cosmic transformation (as in Gen. 25:20; 50:3; Exod. 34:28; and more). The number 150 has no meaning by itself, as is clear by the fact that the number appears in the Bible only once more: 1 Kings 10:29 = 2 Chr. 1:17. This means that it denotes practical (if not historical) usage: 5 months of 30 days each. However, 2 times 5 (months x 30 days) denotes some kind of completeness, as in 2 x 5 that totals 10 fingers.

Contrary to appearances, at a tally of 340 we have not reached a dead end. Rather we are reminded of the four different occasions of Noah sending out his feathered friends, once the raven, and thrice the dove. The raven went back and forth around the ark, and no time need have elapsed at this point. However, in the case of the dove, while at first she only circled and returned, a second and third time she left the sphere of the ark after 7 day stretches. 2 x 7 = 14, bringing the total to 354 days. Furthermore, on the second sending of the dove it is stated that Noah waited to send the dove for seven "other" days. From this "other" we may infer that not only between the dove's first sending and her second was there a seven day wait, but also between Noah's sending of the raven and his first time sending the dove as well.[11] So the text, though in a concealed way, hints at yet another 7 days;[12] hence we have not 14 days after the 40, but 21, bringing the absolute final total to 361 days from the day the rains became the Flood to the day the waters "were dried up from the earth."

The bottom line of this tally, simply stated, is that the length of the Flood from beginning to end was one full year of 360 days. What to do with that extra one day? It is 361 days instead of 360 because the last day of the Flood is the first day of the new world. This even number denotes a solar year in particular, and if it is slightly shorter than we are used to (in our days: 365.2422d), it is because it does not include the days of intercalation. Moreover, the main two courses of the FN are of 150 days, which each denote 5 months of 30 days each, a division that only a solar calendar can bear. In other words, the solar calendar is evident in the quantitative numbers both in their total, and in their equal parts. To this one should add that the year of the Flood resembles the ancient Judaic calendar from the early days of the monarchy. As has previously been reasoned, the 12 officers serving King David (1 Chr 27:1-15), and the 12 officers of King Solomon (1 Kgs 4:7), each responsible for one month, denote a solar year with 12 months of 30 days each.[13] Now the 360 days' year of the Flood should be added to this fairly based calculation. Hence the 360 days of the FN reflect a solar year known elsewhere in the Bible.[14]

It should be noted that there is no one solar calendar. The adoption of a solar year allows that the months may be divided arbitrarily (unlike in a lunar calendar), and it also does not inherently point the way for how an intercalation should be calculated and instituted. The methods for intercalations are numerous, for example: 1) every year 5–6 designated days take the year off and are not included in the count; 2) every two years there are 10–11 days

[11] Compare to the use of '*aherim*' or '*aherot*' in other Biblical usages, such as: Gen. 29:27 or Gen. 41:3. It is evident that this word implies *another* sum of days (or some other thing) in addition to one that went before.

[12] These 7 days 3 times may denote, it appears, a kind of a gradual change. Compare: Ezekiel 45:18–20.

[13] Ellen Robbins, *Studies in the Prehistory of the Jewish calendar*, Ph.D. New York University 1989 (University Microfilms International, Ann Arbor, Michigan 1990), pp. 139–142.

[14] The advantage of a solar year to the throne is evident since the support of all the officers and ministers depends on agriculture and crop raising, which are done according to the solar year, not the lunar one. (The Arabs that calculate according to the lunar calendar even today were originally nomads, and there was no advantage for them in taking the more agriculturally oriented solar calendar).

off (reserved for the celebrations of a feast, for example); 3) every four months there is an additional day (the Qumranite calendar was reckoned thus); 4) every four years there is one missing day (the Gregorian calendar); etc. There is no need to explain each and every known or hypothetical system, since each has its own merits and drawbacks. The most important thing in the understanding of all these solar calendars is to appreciate that, upon coming across in various literatures a mere 360 day year, which alone cannot make calendrical sense, many times the unique system of intercalation that serves to bump the number up or shave it down is implied though not mentioned.

A numerologist worth his salt should add the following comment: 360 is a very round number (= 6 x 6 x 10). A calendar built upon a sexagesimal system, that is a system based upon the number 60, is divided into 6 periods of 60 days (12 of 30), or even better – 6 periods of six 10-day "weeks."[15] The roundness of 360 is furthermore known to all for the convention of the 360 degrees in the circle. It is pleasing to live in an orderly and mathematically elegant world, and as numbers are nothing but a reflection of this world, it is also pleasing to live in a world of orderly and elegant numbers (reflecting the order of God). This philosophy also reverberates, for example, in the circularity of the cosmos, among other things. Ponder the Qumranite calendar's symmetry as they would have – (30 + 30 + 31) x 4, and the whole idea of symmetry in the world gloriously manifests itself.

In our case the days are divided harmoniously into 12 months of equal length (and who cares about the leftovers?). The sexagesimal system is reflected in the age of Noah when the Flood began, 600 (= 6 x 10 x 10), and just before the Flood God decreed that man's life will henceforth be 120 years (= 6 x 10 x 2) (Gen. 6:3), echoing a Sumerian tradition.[16] The fact of the use of a multiple of 60 denotes in both cases some element of perfection. Therefore, in a text that contains the numbers 600 and 120 as significant in lives of people it is no surprise to find a year of 360 days. The effect of this numerological pattern is to show that God punished humanity and all creatures with a complete Flood, which took place around the world, in a round time: The Flood was complete and utter destruction.

Now, before ending this discussion of the quantitative numbers a note should be made in respect of former scholarship. Some scholars have claimed that there are two calendars embedded in the text, corresponding to two different source narratives. Some think that the first period of 150 days (Gen. 7:24) belongs to the J document, while the next one belongs to the P document.[17]

[15] 6 power 2 (= 6 x 6), is called a "dynamis" in Greek, that is power or strength, so the concept of 6 is strengthened by itself to yield the most powerful of all 6'es. Similarly in the Bible the best realization of 7 is in the product of 7 times 7; Lev 25:8). 10 is not explicitly stated in the FN, though it is concealed in the fact that Noah is the 10th generation of Adam (and Abraham is the 10th generation of Noah). That is to say, only the 10th is holy to God (Lev 27:32).

[16] J. Klein, "The 'Bane' of Humanity: A Lifespan of One Hundred Twenty Years," *Acta Sumerologica*, 12 (1990), pp. 57–70. While Klein takes 120 as derived from 2 x 60, it should rather be taken as 12 x 10. The meaning of 12 is an age of time, or even the whole issue is time (both in the Sumerian and the Biblical text). The meaning of 10 is corporeality as a concept, after the 10 fingers of man. Hence 12 x 10 denotes the corporeality of man in a complete age of time = 120.

[17] Niels P. Lemche, "The Chronology of the Story of the Flood," *JSOT*, 18 (1980), pp. 52–62.

Other scholars have seen the periods of 40 as derived from the Jahwist document while the periods of 150 are derived from the Priestly editor. However, numerological method speaks in a non-conditional language, looking at numbers while ignoring the rubric or any style in which the numbers are written. Only the classes that the numbers fall under are observed. Therefore, the numbers under discussion here are analyzed in relation to these classes, the quantitative and the relative.

Most of the Biblical scholars are aware of the fact that all the quantitative numbers come exclusively in texts that call God Jahweh (the J document in Biblical studies). In other words, the Jahwist version of the FN is based on quantitative absolute numbers, while the separate but intermingled Priestly version is based on relative calendrical numbers. The quantitative numbers total 361 days, denoting a 360 day (solar) year, which may be assumed to represent an ancient monarchic calendar. So far we have addressed only these quantitative numbers appearing in the FN, and this presents only half the picture. We commence discussion of a different set of numbers, the relative numbers in the FN, following this summary of our discourse so far:

```
J   |-|-----|--------------------|--------------------|-----|-|-|-|->t
     7  40        150                   150              40  7 7 7
        |__________________________________________________| =361 d (=S.Y.+1)
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(For full abbreviations see at the end of the paper. Note: bold denotes latent numbers in the text, those not explicitly mentioned).

C. Relative numbers

It is stated (Gen 7:11): "In the second month, on the seventeenth day of the month, on the same day were all the fountains of the great deep broken up..." The fact is that if we inspect the numbers 2 and 17 alone, they appear meaningless. Only when these numbers are given together (one for a day and the other for a month) as components in ratio form – 17/2 – do they become a meaningful concept. In other words, these numbers, and all like them, are relative to one another and constitute dates. This goes for the lot of them in the FN; they comprise a whole network of interrelated dates. No one of the components, that denoting day or that denoting month, can stand on its own for a measure of time. For this reason relative numbers are more sophisticated than quantitative ones, as they reflect a more sophisticated understanding of time (and numbers).

Now, when one reads the FN it becomes evident that each date, or relative number, denotes some kind of a station or a stop in the retelling of the history of the ark. These dates are as follows:

1) 17/2/600 – the beginning of the Flood
2) 17/7/[600] – the ark rested upon Ararat

3) 1/10/[600] – the tops of the mountains were seen
4) 1/1/601 – the waters were dried up
5) 27/2/[601] – the earth was dry

(the numbers in brackets denote self-evident years that do not appear in the text).

These dates, and the way they are attributed to the ark's exploit should be taken as a kind of log-book of Captain Noah who made registers in the log-book. One is apt to imagine that these dates were supplied not in vain, and that they have some meaning. Just as the narrative as a whole has its own meaning, the dates must have had their own meaning too. However, it must be admitted that *prima facie* the dates look as if they were plain and simply Noah's recordings.

Before continuing in the discussion of these dates, we should be reminded that the dates presented here go according to the Masoretic text (=MT), the *textus receptus* of the Jewish Bible. However, other versions of the text show differences in the beginning and the end of the Flood, and these dates must be discussed, though for the time being they will be ignored. In regards to these changes it will be put forward that just as the dates by themselves have meaning, so it is with the changes and variations; they did not just occur, rather they were deliberately changed. But all in its right time, and here we continue in examining these numbers according to the MT.

To start with in our examination of the relative numbers, unlike the former quantitative numbers they fall under no symmetry, a fact that denotes a more complex way of understanding the calendar (and the world in general). It may even be said that this asymmetrical calendar is in some way a more modern conception as well.

To better understand the relative numbers in the FN, a thorough differentiation between it and the first system, that reflecting quantitative numbers, is in order. First, as has already been stated, absolute numbers cannot be calendrical, as they rather denote an accumulation of days that stands by itself, and in relation to nothing (except day 0). They reflect not astronomy but merely an awareness of the passing of time. On the other hand, the relative numbers denote a calendar quite explicitly, and astronomical knowledge to some degree. Interestingly, in our case the absolute numbers are "round" or typological numbers, such as 7 and 40 – and 150, a multiple of 30, another round number. However the relative numbers in the calendar cannot be considered round (except 1/1 – but we will speak about this date later on).

The differences between the two systems of numbers are exemplified through another aspect, this time a textual one: the relative numbers are not dispersed equally throughout the text (neither through the year). There are 16 verses between the first and second date, no verse-separation between the 2nd and the 3rd dates, 7 verses between the 3rd and the 4th date, and there is no verse-separation between the 4th and the 5th date. Hence we see that the dates are stated in the text in an inharmonious way. In sum, the text reflects an idea that time and calendar are no harmonious matters.

At any event, the relative numbers denote not only a better understanding of calendar, but a more sophisticated and complex usage of numbers than is reflected in the quantitative numbers. Both systems however are embedded in the text, and they echo synchronization not only of different attitudes towards time and astronomy but of the utilization of different texts as well. As was said earlier, one should be aware of the fact that the relative numbers all come in texts that call God Elohim, the source document E known in modern scholarship as P, Priestly. Hence the more sophisticated and complex of the sources from a numerical perspective is the P version of the FN. It is a kind of re-manifestation and realization of the more ancient and primitive system of the quantitative numbers.

Looking at just the dates again it is easily understood why already the Tanaim, the sages of the Mishna, understood that the Flood lasted a complete year (m. Eduyot 2:10). Very basic astronomical knowledge yields a difference of 11 days between a solar and a lunar years, so if the Flood began on 17/2 and ends on the 27/2 of the next year, it means, no doubt, a full solar year was passed. In normal floods the last thing on sufferers' minds is the exact number of days their region of habitat was submerged; however the Biblical narrative has other things on its mind. The Bible portrays the Flood as no less than divine punishment. The Bible relates how "all flesh" was extinguished, according to a completeness or fullness in the dimension of life. The same completeness applies to the dimension of space ("all universe") and time: the punishment lasted no less and no more than a full year. As its creator, time is but another perceptual dimension at God's disposal.

The Sages of the Mishna furthermore made analogies between the Flood and other divine punishments in the Bible, such as the duration of the plagues of the Egyptians and the suffering of Job. Extra-Biblically there is the duration of the capital evildoers' sentence in hell. All of these terms lasted exactly 12 months, or a full solar year; a full punishment (in time) to the full world (in Space and living creatures).

D. The first date in the relative numerical system

The anonymous author of the *Book of Jubilees* (6:25) supplies the morsel that God spoke to Noah on none other than 1/1/600 (Gen. 7:1).[18] Accepting this old idea either as a commentary and innovation, or even as the preservation of an earlier text or tradition, helps to make sense of the quantitative numbers and of the relative numbers as well. Moreover, the effect is to attribute the words of God to Noah to a specific day, and an important one – the first day of the New Year, Day of Judgment according the Rabbis (probably preserving an old concept). This special date finds its continuation in the date that is specifically

[18] As a matter of fact, this author attributes other events to 1/1 such as: 1) Abraham built an altar ((13:8); 2) The wine was kept by Noah until 1/1 (7:2); 3) The Lord spoke to Jacob in Bet El (27:19); 4) Levi was born (28:14). In Pseudepigrapha, as well as in Rabbinic traditions, there were more events said to happen on this special date. See: M. Bar-Ilan, *Biblical Numerology* (sup. n. 2), pp. 53–54.

mentioned later in the FN as the date the waters finally dried from the earth (1/1/601, Gen. 8:13), which shows that the dates are related to each other in a way and given not in vain. The waters drying from the earth is an image that echoes the unfolding of events in the Creation story, as according to some of the Tannaim (1st–2nd centuries CE) the latter took place on 1/1, as these relative numbers denote (and not in 1/7 as in the Rabbinic tradition [b. Rosh Hashana 11a]).

The addition of the date to God's first speech to Noah goes very well together with dates that are given to prophecies of some of the later prophets. For example, Ezekiel gives the dates of 14 of his prophecies, for example: 29:1–12/10/10, 31:1–1/3/11; 32:1–1/12/12; 32:17-15/??/12 (but in the LXX–15/1/12 = On Passover – a prophecy on Egypt!); 40:1–10/7/14 ("At the beginning of the year").[19] More prophecies with dates one can find in the book of Hagai: 1/6/2, 21/7/[2], 24/9/2 (Hag 1:1; 2:1; 2:10, 2:20). Zechariah had a prophecy on 24/11/2 (Zec 1:7), and Daniel saw a vision on 24/1 (Dan 10:4). The dates of these prophecies have been brought to communicate the tendency of prophets to hear God (or the tendency of God to announce His decisions) on the first day of the month or the year. This was probably because while being in a feast of the new month or year, and praying to God and contemplating Him, the prophets were brought to a theophany or a revelation. All this background helps us to accept the author of Jubilee's claim concerning the date when Noah heard the Lord – 1/1/600.[20]

Above we raised the fact that the quantitative numbers form an older basis to the story while the relative numbers, the actual dates, came at a later stage of its development. These two sets of numbers are related to each other, not only in that they are combined together like the twisted limbs of two adjacent trees, but more so, on account of the older and later stages in which they were written, in that they seem as if one system was built upon the other. This can perhaps be likened to an ivy mass growing on top of the boughs of its host below. Now, we can in fact prove that God spoke to Noah of his design on 1/1/[600] by realizing this implementation of the relative system on top of the quantitative system. This is achieved by subtracting the lengths of days (quantitative) from the first actual recorded date in the text (relative), 17/2/600. On this date the Flood actually began; it followed however a 7 day period of warning and 40 days and nights of rain. Add 40 and 7 to get 47, and if we assume that like a good solar month contained 30 days, we easily subtract this number from 17/2 to derive the sought-after date 1/1.

God's message to Noah that He had decided to destroy the world, reminds of the teaching that God judges the world on the first day of the year; this is a well-known concept in Jewish Rabbinic thought, notwithstanding the fact

[19] J. Van Goudoever, *Biblical Calendars* (Second Revised Edition), eiden: E.J. Brill, 1961, pp. 71–86. There is no reason to assume the existence of a liturgical calendar, but the dates rather denote a deeper awareness of time than former prophets.

[20] When one imposes additional data on a given text, he should consider the benefit, and when one imposes the date of the beginning of the FN on the biblical text it indeed helps in a way. However, to impose the Sabbatical calendar on the FN does not help the text; rather it helps the modern scholar to claim that the Qumranic calendar is derived from the assumed Biblical one.

that Jewish tradition attributes such heavenly judgments to 1/7 and not to 1/1 (m. Rosh Hashana 1:2). God spoke to Noah on none other than the Day of Judgment: on this day God decided to destroy the world according to the behavior of its inhabitants.

So now we may proceed; the supposition of the exact date of the beginning of the FN being 1/1/600 gives a starting-point to the whole narrative. It corresponds to intra-Biblical ideas concerning the importance of the exact day of a prophecy, to the importance of this specific date in the Bible,[21] and to post-Biblical ideas concerning God's judgment at the beginning of the year. It also follows the recording of a possibly ancient dating from the *Book of Jubilees*, and can be logically and internally inferred from the text of the FN itself. This placement of the date is also a kind of a balance to the same date that is mentioned later in the FN.

Yet the most important thing in this supplemented date of 1/1/600, is that it begins a new epoch (=date 0) and so it improves the understanding of the FN from either side, both before and after (resembling the famous fulcrum Archimedes claimed could "move the world"). The date 1/1 helps to understand the calendar used in the FN, and it helps to understand the role the FN would possibly play in any (Temple) feast on New Year's. Anyone who was in attendance at the drama, if or however it was presented, or heard the giving over of the story when it was read, on the beginning of the new year would internalize the lesson that if he or anyone in his community should misbehave on that day or throughout the year, the legitimate punishment has already been introduced and demonstrated to all.[22]

This is a good start to understanding the MT, but we should not forget that there exist other versions of these relative numbers (but not of the quantitative ones),[23] such as that having the beginning of the Flood falling on 27/2, as it does according to LXX.[24] In other words, during the transmission process, one scribe or another changed a date or two given in the text. But the question remains: was this change done deliberately or by unfortunate chance? For example, when one compares numbers in two Biblical parallel texts, such as Ezra 2 and Nehemiah 7, it becomes evident that written numbers tend to be more corrupted under a scribe's hand than regular non-numerical words

[21] The most important event that happened on 1/1 was the inauguration of the Tabernacle in the desert (Ex. 40:17), but it was also the beginning of sanctifying the Temple in the days of King Hezekiah (2 Chr. 29:17). It was the date of Ezekiel's prophecy (Ezek. 29:17) and upon it also was a special Feast to purify the Temple (Ezek. 45:18). See also: sup. n. 18.

[22] Reading punishments to the public at the beginning of the year, though implicit, goes very well with Rabbinic tradition. See: M. Bar-Ilan, "Blessings and Curses are Read before Rosh Hashanah," *Sinai*, 110 (1992), pp. 29–35 (Hebrew).

[23] The reason why there is no textual fluidity in the quantitative numbers is possibly since the calendar is not manifested in these, and one can not see any calendar in such numbers (and see below).

[24] It should be noted that not only in the FN are there discrepancies between the numbers in the MT and the LXX. Throughout Genesis, and other books as well there are other deviations between the two versions. Therefore, any discussion of this phenomenon will not be completed until discussing the whole range of numbers. See, for example: B.Z. Wacholder, *Essays on Jewish Chronology and Chronography*, New York: Ktav, 1976, pp. 106–113.

(probably because originally they were written by a different set of notations).[25] If this is the case, that numbers were probably corrupted by the imperfect scribal transmitting technique, one may claim that all numerical changes in the FN are nothing but coincidences.

However, upon taking a close look at this problem it must be concluded that in the particular case of the FN the dates do seem to have been changed deliberately. There are several supports to this. First, it is the quantitative numbers that tend to be corrupted, more so than the relative numbers. Discrepancies between the quantitative numbers in parallel texts are (or seems to be) in most cases quite meaningless, such as whether Arah's children numbered 775 as in Ezra 2:5 or only 652 in Nehemiah 7:10. However, relative numbers are written as a string of words, as a phrase to itself, hence the chances that of such a combination a scribe was guilty of misreading or copying is less plausible.

Another observation pointing to the meaningfulness of the discrepancies between the dates in the MT Qumran and LXX is that these discrepancies appear only in two of the dates: the first and the last. The other three dates embedded in the text are the same in all versions. In explaining this observation one should consider the dates and reflect as follows: It is true that the FN is remarkable without turning to the dates, but as they are also in the text, we must assume they have importance – however which numbers are the more important ones?

Now, taking Noah's log-book in one hand consider your own experience, and think of your last journey abroad, for example. The first clarifying question that arises is, of course, "When was the vacation, and when did it begin and end?" It is evident to all that in any journey the most important dates are that of beginning and that of ending. They serve to mark and delineate the span of time under discussion. Moreover, an examination of the history of finding meaning in the numbers contained in the FN shows that, however briefly, only two dates out of the five were ever discussed within the Rabbinic circles down the ages. Again, these two are the first and last dates. (Here we disregard the different extra-Biblical versions.) The fact of the heightened concentration on these two relative numbers should lead us to the conclusion of the meaningfulness of their disparities in the opposing versions.

However, the main reason why a scribe would only change a date deliberately, while not taking away from the force of the previous two reasons, lies in the strong assumption that the scribe had a feeling, or a notion, that the dates have their own story. For example, when one reads that the Lord spoke to Haggai on 24/9/2 he may disregard the date since he believes, and it is quite reasonable to assume, that this date is a mere coincidence. Yet this is not the case of the log-book of Noah where five consecutive dates are embedded as telling an "inner" story in an "outer" one. These dates together manifest in a way of a calendar, and it is now proposed that it was in this way that those nearly prehistoric scribes understood them: the dates are telling the story of a calendar (and not the Flood only).

[25] H.L. Allrik, "The Lists of Zerubbabel (Nehemiah 7 and Ezra 2) and the Hebrew Numeral Notation," *BASOR* 136 (1954), pp. 21–27.

E. How and when dates are changed?

Understanding the concept of "calendar," any calendar depends on several issues, many of which are beyond the scope of this study. In the case of the FN there is no clear calendar but rather a number of dates. At best what we have are the imprints of a calendar. Nevertheless the presumption that an early scribe might have taken the dates as denoting a calendar is not a particularly daring one, since if modern scholarship attributes sophistication to the literary creativity of the ancient scribe there is good reason to believe that this scribe or another was aware of the unique calendrical aspect of the FN, just as modern scholarship is. That his plotting of this calendar would have proceeded lacking modern tools of study is immaterial. Moreover, the very facts that the text of the FN was subject to heavy redaction and that the dates are different in different versions are the best evidence that the ancient scribe understood the progression of dates not as several coincidences, but rather as a calendar.

Calendars suffer from at least two difficulties, and these problems should be seen as a background to the plotting of the dates of the FN and especially to their variations. The first problem is that the use of a particular calendar by a group does not last forever. Calendars change and are changed from time to time, and sometimes they are even replaced. It is obvious that there is no systematic rule that describes the history of a calendar, and certainly there is no measure of their evolution. Some calendars were used longer than others and though they were not changed every decade or century, they still discernibly developed. If there is a rule in the development and replacement of calendars it is the rule of precision. That is, a new calendar replaces an older calendar when the new is found to be astronomically superior and precise, or when it is found easier for daily use (or for both reasons). This rule is evident in all of the changes of calendars in the last two millennia and there is no reason to imagine that a more imprecise calendar would ever replace a more exact one. Calendars improve down the ages, and this phenomenon should be taken into account while considering the changes of a Biblical text containing calendrical records.

The other difficulty that calendars suffer from is the unique role they play in society and culture, or, in one word: religion. In modern life the calendar is nothing more than a device to count and measure days and years, and it has no inherent value aside from the utilitarian. However, in Antiquity calendars were not taken as mundane but rather as a Divine apparatus in the way God runs the world. If a priest wants to oversee a temple, for instance, he must be proficient in the calculation of the calendar. This is essential in order to observe many of the ritual commandments that depend on dates (such as Num. 28–29). The Sabbath is not dependant on the calendar, so there would be no need to make any connection between the Sabbath and the FN (though both are fixed and highly numerological in nature). Hence the use of a calendar in ancient times suffered two difficulties together: on the one hand it constituted and symbolized a religious institution, while on the other hand it developed and was subject to change. The compounding of these two difficulties together was the basis of the changes in the dates recorded in the FN.

The period during which the FN was first written dictated the manner of calendar that prevailed and was first imprinted in the FN. However, if and when this older calendar was replaced by a newer one, the replacement caused a dilemma to the scribe, who in most cases was a priest. On the one hand he wants the current text to be retained unchanged, in accordance with the rules of the scribal profession, copying with the greatest care. On the other hand, the scribe realizes that there is a discrepancy between his own daily calendar and the old calendar in the text. This discrepancy arouses in the scribe the desire to improve his text, and attempt to update it, since who does not want to improve on his own handiwork? Improving on the text in front of him he takes as a sign of his dedication to the profession. From now on the narrative will not disclose an old and, in the eyes of this younger scribe from a later era, mistaken calendar, but rather a more efficient and precise one, based on the calendar current in his time.

Found at Qumran were some 20 odd texts bearing calendrical issues, and this heavy literature from the 1st–2nd centuries BCE must be taken as reflecting a high awareness of these issues.[26] Moreover, comparing the calendar(s) in Qumran with the older Rabbinic calendar reveals several key differences, and there is good reason in general to conclude that the calendar was one of the main bases for sectarianism in Antiquity.[27] So it is not too difficult to assume that such polemical attitudes towards foreign or innovating calendars were in existence in earlier centuries. Witness especially the episode when King Jeroboam (later to be held up by the Rabbis as a sectarian archetype), is accused of inventing a month "devised of his own heart" (1 Kings 12:33). In other words, unlike other changes in the text that may have been caused more or less "naturally," the discrepancy of a date in the FN should be taken either as scribal adherence and faithfulness to an old calendar and the original text, or as the imposition on an old text of a new and more precise calendar.

F. Changed dates – changed calendars

While remembering all this in the background we may now look at the "problematic" dates, and try to explain for what reason one scribe would change a date, and what the direction was of the change, from A to B or from B to A.

The first of these variations to be examined is that in the LXX the Flood began on 27/2, not 17/2. Let us perceive what stands behind this change. As was demonstrated earlier, the date 17/2 can be calculated as being 7+40 days after 1/1. 27/2 on the other hand makes no sense, unless it is deduced from the last date of the FN progression – 27/2 of year 601. In other words, we may assume

[26] Sh. Talmon, "Calendars and Mishmarot", L.H. Schiffman and J.C. VanderKam (eds.), *Encyclopedia of the Dead Sea Scrolls*, Oxford: Oxford University Press, 2000, I, pp. 108–117.

[27] M. Bar-Ilan, "The Reasons for Sectarianism According to the Tannaim and Josephus's Allegation of the Impurity of Oil for the Essenes", L.H. Schiffman, E. Tov and J.C. VanderKam (eds.), *The Dead Sea Scrolls Fifty Years after Their Discovery – Proceedings of the Jerusalem Congress*, July 20–25, 1997, Jerusalem: Israel Exploration Society, 2000, pp. 587–599.

that the LXX scribe took the Flood's ending date and transposed it backwards to the first date, making it too 27/2. Thus he made the whole FN the length of a complete solar year (that might be derived from the twice 150 days), as served Egypt for millennia on end.

The MT gives a final date of 27/2, which on a first glance does not correspond with the set beginning of the Flood on 17/2. However a second look confirms that it does make sense. The gap between 17/2 and 27/2 is one of 11 days (since the last day is the first in the new era); and as was said earlier the two in successive years widens the time span from a lunar year (of 354 days) to a solar year (365 days). That is to say that all scribes intended to denote a full year though each of them had a different calendar in mind. 360 days a year reflect one solar calendar; the Flood that lasted from 17/2 to 17/2 (or from 27/2 until 27/2) of the next year reflects another solar calendar; and it is clear that a beginning in 17/2 and an end in the next year on 27/2 reflects a lunar-solar calendar. In order to more clearly evaluate these calendars as separate entities, we must consider the other dates as well. As listed above, these are 17/2/600, 17/7/[600], 1/10/[600], 1/1/601, 27/2/[601]. The questions to be asked are: which calendar was first in the narrative, and what was the original date of the Flood's end?

As has already been discussed, the first date in the FN is 17/2 and the second is 17/7. If the second date contains some meaning it is that it is 5 (30 days) months after 17/2, and therefore corresponds to the 150 days in the quantitative system, that is a solar year. As already stated the first date by itself is a tally from 1/1, since it reflects the 7+40 days of waiting and then rain from the beginning of the narrative until the actual beginning of the Flood. In all, the 3 consecutive dates: 1/1 (that is not in the text), 17/2 and 17/7 reflect a solar calendar, and these three points are the basis in analyzing the last date. This date is recorded in the MT as 27/2 though in the Qumran it is recorded as 17/2.[28] To evaluate this textual deviation let us not take theological concepts into account, nor philological concepts: only numerology and calendrical calculations may be used. Here we extend the three points to the fourth point, which is 17/2. In other words, three dates in the FN (1st, 2nd and 5th) with the "calculated" date of its beginning (date 0) reflect together a solar calendar.

It is a well-known fact that Jewish calendar is of a lunar-solar model and now it is evident that this calendar is not reflected in the FN. It is true that some Medieval Rabbis claimed that the Jewish calendar was given to Moses on Mount Sinai, though even from a traditional standpoint not everyone agrees on that. From a history of astronomy point of view, so far as one can tell, this type of lunar-solar calendar was conceived by Meton, an astronomer from Athens in the 5th century BCE.[29] Some modern scholars claim that it was not Meton who invented this calendar, rather he took it from earlier Babylonian astronomers.

[28] Timothy H. Lim, "The Chronology of the Flood Story in a Qumran Text (4Q252)," JJS, 43/2 (1992), pp. 288–298; Moshe A. Zipor, "The Flood Chronology: Too Many an Accident," DSD, 4/2 (1997), pp. 207–210.

[29] Alan C. Bowen and Bernard R. Goldstein, "Meton of Athens and Astronomy in the Late Fifth Century B.C.", E. Leichty, Maria deJ. Ellis, and Pamela Gerardi (eds.), *A Scientific Humanist: Studies in Memory of Abraham Sachs,* Philadelphia: Occasional Publications of the Samuel Noah Fund, 9, 1988, pp. 39–81.

With all the uncertainties of the origin of this lunar-solar calendar, it is clear both that it is a more modern calendar in comparison with that of the 360 day solar year, and that it is more precise. Given all the above data and analysis, it is now apparent that the original calendar employed in the FN was solar, and only after the Judaic calendar was changed (or improved) from solar to lunar-solar, was the last date of the FN changed from 17/2 to 27/2. By this change the scribe "improved" on the text. The slight change in the date was actually imposing the new calendar on the old text showing that even Noah had used it in his ark. Nothing is new under the Sun.

The Qumranite deviation can thus be explained as Qumran's inhabitants either having had among them an older and less corrupted (that is: improved) text, or having reverted back to the older textual tradition on the basis of a conservative mentality; or perhaps because those inhabitants of Qumran themselves had reverted back to the older calendrical tradition. The main point is to appreciate that the deviation of the last date, 17/2 or 27/2, was not random, rather it was a throwback to the one-time legitimate solar calendar.

The FN contains dates not only at its beginning and end but it has two more as well, 1/10/[600] and 1/1/601, and these deserve to be analyzed. They too are part of Noah's log-book, but they seem superfluous, especially upon observation that the story would have a perfectly good meaning, and retain its fluidity and direction, without them. Granting the observation that the Flood lasted a year is important, the question remains why the middle dates were supplied by the text. The two derive not necessarily from a solar calendar. The textual dates discussed heretofore end with 7 (or: 17), a phenomenon bearing the idea of circularity (such as in a concept of circular or round time). The two more dates we have to deal with here both fall on the first day of the month, so the two dates play the role of a smaller circle in a bigger one, made of five dates (with a different axis in time).

Priority of discussion should be given to 1/1, the beginning of the New Year. Now the great event that happened in 1/1 was that the water dried up or the earth dried up, as the two expressions of the text declare. In a real sense this event resembles the creation of the world when the Creator separated the water from the earth. So the story of the ark was not only the story of Noah but actually the story of the whole world: the Lord created the world twice, in the beginning and after the Flood, and both dates correspond to each other, though Gen. 1 does not give any date for its incidence (probably deliberately). Every year of every known calendar contains the date 1/1. Owing to the inherent circular nature of the year and the universe, it can be put that time so to speak returns to its very beginning once a year. This is the case in the FN of course: It is entirely natural and to be expected that God would re-create the world on the same date as that of his first creation of it. Since this original date is by its very nature 1/1, so too the date of recreation must necessarily be 1/1 as well.

Recall that "date 0," the date on which God told Noah of his design, was earlier determined to be 1/1, and that at no point in the determination was it necessary to rely on this fourth date in the FN. It is evident that the sameness of the dates does convey a meaning. Not only does 1/1/601 correspond to the beginning of the world, it also corresponds to the first cause of the

Flood incident and it further hints to the conjecture that the FN was retold in the Temple on the very same date in commemoration and for the moral lesson it could impart.

The third date recorded in the FN, 1/10, upon which the heads of the mountains were seen, remains to be discussed. This date seems to be the weakest date in the whole structure.[30] Its weakness is manifest in the fact that it does not stand out as a marker to any calendar, either solar or lunar-solar alike. However, the date is exactly 10 months after the beginning of the FN on 1/1/600; 10 months is 300 days, or 150x2. This 150 days twice would therefore seem to mirror that same denomination as recorded in the text in the context of the 150 days from 17/2/600, albeit the beginning dates of the Flood in particular and the FN in general are not the same.[31] In this case the date of the relative system was built upon the quantitative system, as it was previously. At any event, the whole calendrical use in the FN would not have suffered much if this date had not been given. Therefore it may be that 1/10 was given simply to be a counterpoint to 1/1, as two dates at the beginning of a "season." It should be noted that almost all Biblical stories are told without dates, such as the marriage of Rebecca and Isaac or Joseph and his brothers, so when a story is told with dates, such as the FN and Esther, more dates in the story make it more reliable and impressive (from the narrator's eye perspective).

Probably, the FN's calendrical and astronomical background was concealed for the greater part of its very existence owing to changes in the way time has been measured and calendars made up. The later scribe who adjusted the text to the current calendar of his own time, making end of the Flood fall on the 27th instead of the 17th, thought that changing this last date would suffice to reflect the lunar-solar calendar. Our ancient scribe (not later than the Hasmonean period) probably was not aware of the fact that all of the dates taken together as one serve as a kind of a fingerprint and changing only one date will be sure enough disclosed, some day or another. At any event, today and for millennia, the FN of the MT reflects the Rabbinic tradition, imprinted in a calendar that looks very similar to the one used in post-Biblical Judaism. In all, the calendar defeated the text.

Here is a summary of our discussion, in the form of a timeline:

```
E |-|-----|--------------------|---------|-----------|---------|->t
 1/1   17/2                  17/7     1/10      1/1      17/2 Q
       |_________________________________________|   =361d (=S.Y. +1)
                                                         27/2  MT
       |_____________________________________________| =365d (=S-L.Y.)
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(Note: bold denotes dates and amounts not explicitly mentioned).

[30] This date also appears in: 1) Ezra 10:16-17 (the end of separation connected to 1/1); 2) probably Esther 2:16; 3) Jubilees 33:1 while discussing the itinerary of Jacob.

[31] Some scholars made their own calculation, such as counting 73 days from 17/7/600 to 1/10/600. However, by doing this scholars do not serve the text but rather make hollow calculations that lead to nothing.

What is left is to realize that the FN is an amalgamation of E and J which means that this type of several traditions combined in one text can be discerned several times in the FN, not only by the names of God but in the usage of different numbers and calendars as well.[32]

Conclusion

The numbers in the FN contain a message all their own. They beckon to the scholar as if revealing in public a secret to the initiated. In Late Antiquity the calendar and the methods of its calculation were treated as an elite topic, and perhaps this topic ages earlier was still shrouded in secrecy. In plumbing the Narrative as it has been received and among its variations the current analysis of these numbers has exposes several strata of development embedded in the text: 1) In the first stage the FN was lain out lacking all numbers, probably in oral tradition only (a myth). 2) In the second stage, the FN was equipped with a quantitative numbering system to denote the current primitive solar calendar. 3) Next, the FN was revamped with an improved understanding of the solar calendar, and the relative numbering system was introduced, going from 17/2/600 to 17/2/601 (= Qumran).[33] 4) In the final step in the development of the MT the FN was refitted with an improved calendrical system, a lunar-solar calendar, and 17/2/601 was pushed forward to 27/2/601. It is this one that from which the modern Jewish calendar is a descendant. 5) The LXX text was a response to the "modernization" of the text (stage 4), and 27/2/601 caused the first date to be 27/2/600 so as to achieve a whole solar year. This though is an inferior text that suffers from incoherence with regards to its quantitative numbers.

When one reads the Bible's account of the Flood, not only does he bear witness to divine punishment and salvation; he may also become aware of the synchronization of different texts and calendars. Discussing the numbers therein opens the way for a new methodology of cross-referencing of the source-theory. Since numerology is a non-conditional language, it can be applied to text in whatever language (with whichever of God's names). Being blind to language and to different sources in the Narrative, has been found a useful tool in analyzing the FN, especially when the main concern of the scribe, in the final form of the text, is the calendar.

It is hoped that in the future more studies like this will be undertaken to re-evaluate old theories concerning the meanings of numbers as well as the document theory in which they go hand in hand. Quantitative and relative numbers play large parts in the Bible throughout, and we are just at the beginning of

[32] If one considers the theory that each source comes from a different region (J from Judea and E from the northern monarchy) he may take 1 Kings 12:33 as its support. That is to say, related monarchies, texts and calendars are reflected in the FN.

[33] One may claim that this stage of two different solar calendars reflected in one text is like what has been said on 1 Enoch 72–74 (360 and 364 day calendars). See: G. Boccaccini, "The Solar Calendars of Daniel and Enoch," John J. Collins and P. W. Flint (eds.), *The Book of Daniel Composition and Reception*, Leiden: Brill, 2001, pp. 311–328.

understanding their multileveled significances and meanings. May this paper contribute towards this end.

The numbers that are mentioned or discussed in this paper are:
2, 3, 4, 5, 6, 7, 10, 11, 12, 15, 30, 31, 40, 47, 60, 73, 100, 120, 150, 300, 340, 354, 360, 361, 364, 365, 365.2422, 401, 600, 652, 775.

The dates that are mentioned or discussed in this paper are:
1/1, 17/2, 27/2, 1/7, 17/7, 1/10.

Abbreviations

d	day
DSD	Dead-Sea Discoveries
E	Elohim, the name of God in the Biblical text. That documentary source that uses Elohim in particular to denote God is called the Priestly source by modern scholars.
J	Jahweh, the name of God in the Biblical text. That documentary source that uses Jahweh is called the Jahwist source by modern scholars.
JJS	Journal of Jewish Studies
L	lunar
LXX	Septuagint (The Greek Bible, named after its mythical 70 translators)
MT	Masoretic Text, the *textus receptus* of the Jewish Bible
P	Priestly
Q	Qumran
S	solar
t	time
Y	year

Sabbatical Calendar and Priestly Narrative

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Abstract: *A comprehensive study of the chronology of the Priestly Document demonstrates that the Sabbatical calendar (364-day year) is not a Qumran invention but was devised at the beginning of the Persian period. The Priestly Document (Genesis 1 to Joshua 5) is divided into 7 eras: creation, antediluvian, re-creation, exiles, Exodus, wandering and rest in the Promised Land. The chronological data contained in the narrative describes each element of the Sabbatical calendar, which sacredness is later upheld by the apocryphal books of Jubilees and Enoch and in Qumran texts. In spite of subsequent additions to superimpose other calendars upon the original Priestly Document, its narrative remains coherent enough to reveal even the use of intercalation.*

The Old Testament is replete with dates,[1] and its readers have calculated the date of many Biblical events, even the date of the creation of the world.[2] This has led enthusiastic theologians to exalt Biblical commitment to historical time against mythological cycles, history of salvation against mythological nature religions. Of course this is nonsense; time reckoning does not turn mythology into historical reports. The Biblical chronological data (at least in the Torah) have a different *raison d'être*. They are highly symbolic and are meant to be read so. However, it is difficult to make sense of these numbers, due to the sheer amount of data and to several complicating factors. The production of Biblical texts until their canonized final form is spread over ten centuries. During this time, groups with diverging theologies and political agendas introduced competing calendars. They left us with three main chronological systems representing three main centres of Biblical production: Alexandria's Septuagint (LXX), Jerusalem's Masoretic text (MT) and Samaria's Pentateuch (SP). In a fascinating study, Jeremy Northcote identifies eight revisions of an original Progenitor chronology.[3] However, this original chronology is established from the onset by choosing the lowest available figures, a rather simplistic criterion for identify-

[1] G. Larsson, *The Secret System* (Leiden: Brill, 1973), pp. 103–119 tabulates 300 entries between Genesis 1 and Ezra 3.

[2] On 3761 BCE according to the modern Jewish calendar, or 5200 BCE (Eusebius of Caesarea) or 4004 BCE at 6 pm according to Archbishop James Ussher.

[3] J. Northcote, "The Schematic Development of Old Testament Chronography: Towards an Integrated Model", *Journal for the Study of the Old Testament* 29 (2004), pp. 3–36, based on the Progenitor chronology of A. Jepsen, "Zur Chronologie des Priesterkodex", *Zeitschrift für die alttestamentliche Wissenschaft* 47 (1929), pp. 252–255.

Proceedings of the Conference "Time and Astronomy in Past Cultures", Toruń, March 30 – April 1, 2005, A. Sołtysiak (ed.), Warszawa – Toruń 2006, pp. 33–49.

ing the oldest chronological system of the Pentateuch that is likely to vitiate attempts to understand its modifications.

To unlock the chronologies of the Pentateuch, three keys are used here: the Sabbatical calendar, the Priestly Document and its overall weekly structure.

At this point, a word of caution is due. The reader should realize that these keys are largely based on minority views over the nature, length and date of the Priestly document, and over the origin of the seven-day Shabbat. Since new advances are only possible when treading new ground, with all the dangers involved, the results of this enquiry are speculative, which is not necessarily something new in Biblical studies. The following is a contribution to the debate over calendars in the Hebrew Bible, a debate that "has merely begun".[4]

1. First Key: the Sabbatical Calendar

The books of Jubilees (6:28–32.38) and of Enoch (1 Enoch 72–82) fervently uphold the value of a non-Babylonian way of reckoning time commonly referred to as the Jubilee or Sabbatical calendar.[5] This calendar is based on a 364-day year made up of 52 whole weeks and thus fixes the relationship of the days of the month with the days of the week (**Fig. 1**).

	Weekday	I, IV, VII, X					II, V, VIII, XI					III, VI, IX, XII				
4	Wednesday	1	8	15	22	29		6	13	20	27		4	11	18	25
5	Thursday	2	9	16	23	30		7	14	21	28		5	12	19	26
6	Friday	3	10	17	24		1	8	15	22	29		6	13	20	27
7	Sabbath	4	11	18	25		2	9	16	23	30		7	14	21	28
1	Sunday	5	12	19	26		3	10	17	24		1	8	15	22	29
2	Monday	6	13	20	27		4	11	18	25		2	9	16	23	30
3	Tuesday	7	14	21	28		5	12	19	26		3	10	17	24	31

Fig. 1. The Sabbatical Calendar 1.

Every year every Sabbath falls on the same date; which was precisely the purpose of such a calendar. The travels of the Patriarchs are planned to respect the seventh-day rest and during their exodus the children of Israel do not start off or arrive on a Sabbath day. In fact, most dated events in Hebrew Scriptures seem to have been calculated according to the 364-day calendar since they preserve the sanctity of the Sabbath.[6] Only two dates in the whole of the

[4] M.G. Abegg Jr., "The Calendar at Qumran", in J. Neusner & A.J. Avery-Peck (eds), *Judaism in Late Antiquity. Part five: The Judaism of Qumran: A Systemic Reading of the Dead Sea Scrolls. Vol. 1: Theory of Israel* (Leiden: Brill, 2001), pp. 145–171 (147).

[5] A. Jaubert, *La date de la cène* (Paris: Gabalda, 1957), pp. 32–38; English translation by Isaac Rafferty, *The Date of the Late Supper* (New York: Alba House, 1965). A. Jaubert. "The Calendar of Qumran and the Passion Narrative in John," in J.A. Charlesworth (ed.) *John and Qumran* (London: Geoffrey Chapman), 1972, pp. 62–75.

[6] R.T. Beckwith, "The Significance of the 364-day Calendar for the Old Testament Canon", in Beckwith (ed.), *Calendar, Chronology and Worship. Studies in Ancient Judaism and Early Christianity* (Arbeiten zur Geschichte des antiken Judentums und des Urchristentums 61; Leiden: Brill 2005), pp. 54–66.

Hebrew Scriptures fall on a Sabbath: Esther 9:15, the only Biblical book not attested in the Dead Sea Scrolls, and 2 Chron 3:2, the day Solomon started building his temple,[7] a nice way to underline that the whole project was doomed from the beginning.

Since several texts found in the caves near Qumran use this calendar and that one fragment even refers to it explicitly,[8] the Sabbatical calendar is viewed as an impractical invention of peripheral sectarian groups opposed to a so-called 'normative Judaism' as if such a thing ever existed.[9] The majority of scholars considers that it originated in the mid-third century BCE on the basis of the oldest manuscripts of the Astronomical Book.[10] This requires understanding that all the dates that avoid activity of the Sabbath day were added or modified then. The reverse argument is not considered, namely that *Jubilees* is not innovative but traditional in its defence of an older scriptural calendar. A schematic 364-day year is already attested in the Assyrian treatise MUL.APIN composed around the beginning of the first millennium.[11] Since the earliest known copy of this text dates to the seventh century BCE, this mean lunar/stellar year of 364 days was known to Ancient Mesopotamian astronomers no later than the 7th century. This schematic year is the most likely source for the 364-day calendar of the Bible.[12] Therefore, there is no need to wait until the third century BCE for its integration in Biblical texts. From 700 BCE onwards, Judah came under tighter control of Assyria and the Biblical version of MUL.APIN can safely be dated at any time after Sennakerib's campaign in the West. Therefore James VanderKam suggests that the 364-days calendar was in use in Jerusalem 'during the early centuries of the second temple'.[13] The aim here is to test this suggestion by seeking evidence of it during the Persian period. To do so, I search the original Priestly Narrative.

[7] B. Z. & S. Wacholder, "Patterns of Biblical Dates and Qumran's Calendar: The Fallacy of Jaubert's Hypothesis", *Hebrew Union College Annual* 66 (1995), pp. 1–40. Jubilees has 3 Sabbath violations: 5:3 (animals enter the ark); 18:1–15 (Abraham's return to Beer-sheva); 44:1 (Jacob's sacrifice at the Well of Oath).

[8] 4Q252 II 3 contains the only non-reconstructed reference to a 364-day year: G. Brooke, "4QCommentaries on Genesis A and Genesis D", in Brooke et al. (eds), *Qumran Cave 4, XVII, Parabiblical Texts, Part 3* (Discoveries in the Judean Desert XXII; Oxford: Clarendon Press, 2003), pp. 198–9.

[9] J.C. VanderKam, "The Origin, Character, and Early History of the 364-Day Calendar: A Reassessment of Jaubert's Hypotheses', *Catholic Biblical Quarterly* 41 (1979), pp. 390–411 = VanderKam, *From Revelation to Canon. Studies in the Hebrew Bible and Second Temple Literature* (Leiden: E.J. Brill, 2000), pp. 81–104 (97 n. 55); Abegg, "Calendar at Qumran",p. 150. The following Qumran texts reflect the 364-day calendar: 1Q32; 1Q34; 4QMMT; 4QShirShabb; 4Q252 frag. 1 ii.3; 4Q317–30; 4Q319–336; 4Q365; 4Q559; 6Q17; 11QTemple; 11QPs[a] Dav Comp 27.6; cf. S. Talmon, "Calendars and Mishmarot", in L.H. Schiffman & J.C. VanderKam (eds), *Encyclopedia of the Dead Sea Scrolls* (Oxford: University Press, 2000), vol. 1, pp. 108–117; T.H. Lim, "The Chronology of the Flood Story in a Qumran Text (4Q252)", *Journal of Jewish Studies* 43 (1992), pp. 288–298.

[10] Beckwith, "Significance", p. 56.

[11] H. Hunger & D. Pingree, *MUL.APIN, an Astronomical Compendium in Cuneiform* (Horn: F. Bergern & Söhne, 1989).

[12] W. Horowitz, "The 364 Day Year in Mesopotamia, Again", in *NABU* 1998–49 available at http://www.achemenet.com/recherche/textes/babyloniens/nabu/nabu.htm. Also W. Horowitz, "The 360 and 364 Day Year in Ancient Mesopotamia", *Journal of Ancient Near Estern Studies* 24 (1996), pp. 35–41. J.P. Britton, "Treatments of Annual Phenomena in Cuneiform Sources", in J.M. Steele & A. Imhausen (eds), *Under One Sky* (Münster: Ugarit Verlag, 2002), p. 24.

[13] VanderKam, "Origin", p. 103. This hypothesis is at least a century old: B.W. Bacon, "Calendar of Enoch and Jubilees", *Hebraica* 8 (1891–92), pp. 79–88 (124–131). See bibliography in VanderKam, "Origin", notes 9–10.

2. Second Key: the Priestly Document

In spite of various attempts to prove the contrary, the presence of a Priestly Document (*Priesterschrift Grundschicht*, henceforth P^g) as a narrative extending from Genesis 1 to Moses' death or into the book of Joshua has so far withstood the test remarkably well.[14] Early attempts to establish the textual limits of the *Priesterschrift* primarily on the basis of distinctive language[15] "have held their ground, and are, with a few minor exceptions, acceptable even today".[16] In fact, the demise of JE in the 70s[17] has consolidated P^g which increasingly appears as the first and possibly only continuous and coherent narrative of origins of the Pentateuch. Joseph Blenkinsopp argued that non-P^g material in Genesis 1–11 are additions to P^g, a hypothesis recently expended by Erich Bosshard-Nepustil.[18] The same can be argued for other parts of the Pentateuch.[19] Various shrinkings of P^g setting its end well before the book of Joshua have been published. However, the promise of the land to the Patriarchs, Abraham's purchase at Machpela and the sending of spies make no sense if P^g has no interest in the land and ends before the entry of the sons of Israel into the land of Canaan.[20] The proponents of a P^g limited to the Pentateuch have to maintain that in Pg the land is only a hope[21] or that it has an open end.[22] Without Joshua, Pg leaves

[14] In a recent onslaught against P, A.F. Campbell & M.A. O'Brien, *Rethinking the Pentateuch* (Louisville: Westminster/John Knox Press, 2005), claim that it is unlikely that Genesis 5:1–2 is a continuation of Genesis 1 and that the so-called P creation account and P Flood account are highly unlikely to have come from the same origin (p. 11). On the basis of a summary analysis of 25 words appearing in Genesis 1 (pp. 107–11) but not in the Priestly Flood narrative, they posit that there is no P text in Genesis 1–11, nor in Genesis at all: "Without the anchor of creation and flood at the beginning, it becomes difficult to make a case for a P document in Genesis" (p. 115). This conclusion is much broader than what the evidence adduced would allow. Proving that Creation is not from the same hand than the P flood does not exclude that one of the two belongs to P and does not destroy the possible presence of a P document in the rest of Genesis, never mind the rest of the Pentateuch. While creation and flood are important P elements, P^g is much broader and is based on a wide array of theological correspondences that unite it into a very coherent whole, without it being necessary to prove that it was all written by one single hand at one time.

[15] S.R. Driver, *Introduction to the Literature of the Old Testament* (Edinburgh: T.&T. Clark, 1894), pp. 118–50.

[16] B. Levine, "Leviticus: its Literary History and Location in Biblical Literature", in R. Rendtorff & R.A. Kugler (eds), *The Book of Leviticus. Composition and Reception* (Leiden: Brill, 2003), pp. 11–23 (14).

[17] See discussions in A. dePury (ed.), *Le Pentateuque en question. Les origines et la composition des cinq premiers livres de la Bible à la lumière des recherches récentes* (Genève: Labor et Fides, 1989); C. Gertz et al. (eds), *Abschied vom Jahwisten: die Komposition des Hexateuch in der jüngsten Diskussion* (Berlin: de Gruyter, 2002).

[18] J. Blenkinsopp, *Pentateuch. An Introduction to the First Five Book of the Bible* (New York: Doubleday, 1992), pp. 93–4; E. Bosshard-Nepustil, *Vor uns die Sintflut: Studien zu Text, Kontexten und Rezeption der Fluterzählung Genesis 6–9* (Stuttgart: Verlag W. Kohlhammer, 2005).

[19] In a Habilitation These for the University of Berne, I defend the attribution of larger elements of Leviticus into P^g.

[20] J. Blenkinsopp, "The Structure of P", *CBQ* 38 (1976), pp. 276–292 (287).

[21] R. Kilian, „Die Hoffnung auf Heimkehr in der Priesterschrift", *Bibel und Leben* 7 (1966), pp. 39–51.

[22] K. Elliger, "Sinn und Ursprung der priesterlichen Geschichtserzählung", *Zeitschrift für Theologie und Kirche* 49 (1952), pp. 121–143.

the reader at the borders of the promised land, with the *fiat*, but not the *lux*.[23] Hence Thomas Pola who closes Pg when the tabernacle is filled by the glory of Yhwh (Exodus 40:35) has to compensate this sharp reduction by equating Sinai with Zion so that upon reaching Sinai what is left of the narrative may find an appropriate closure.[24] Needless to say, the equation Sinai = Zion is not found in the text. Therefore a P^g reaching the end of Deuteronomy has been argued again recently.[25]

The date of P^g is also debated, the Kaufmann school favouring the eighth century BCE[26] while the Copenhagen school prefers the Hellenistic era.[27] Rather than forcing a chronological displacement on Wellhausen's arguments, it would be more profitable to put one's energy into a positive assessment of P based on a synchronic reading without reference to the circumstances of its composition.[28] The traditional date in the Persian era thus remains safely between extremes. Because P^g is the most recent 'source' or document of the Pentateuch (D notwithstanding), it constitutes the most reliable textual basis. In exegesis as in archaeology, the reliability of interpretation decreases as temporal distance increases.

I consider P^g as a consistent narrative, rather than a late redaction layer,[29] produced in the first part of the Persian era (5th century BCE).[30] Priestly texts are easily recognized thanks to a very particular vocabulary and well defined theological categories, thus providing a fairly reliable textual corpus.[31] P^g also presents a large amount of chronological data that may represent the original framework and chronology of the Pentateuch.[32] Despite such promising data,

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[23] R.S. Kawashima, "The Jubilee Year and the Return of Cosmic Purity", Catholic Biblical Quarterly 65 (2003), pp. 370-389 (381).

[24] Th. Pola, Die ursprüngliche Priesterschrift. Beobachtungen zur Literarkritik und Traditionsgeschichte von Pg (WMANT, 70; Neukirchen-Vluyn: Neukirchener Verl., 1995), pp. 320-335.

[25] Chr. Frevel, *Mit Blick auf das Land die Schöpfung erinnern. Zum Ende der Priestergrundschrift* (Herders biblische Studien 23; Freiburg im Breisgau: Herder, 2000).

[26] For instance J. Milgrom, "The Antiquity of the Priestly Source: A Reply to Joseph Blenkinsopp", *ZAW* 111 (1999), pp. 10–22.

[27] Th.L. Thompson, *The Bible in History* (London: Jonathan Cape, 1999), pp. 73–5.

[28] J. Blenkinsopp, "An Assessment of the Alleged Pre-exilic Date of the Priestly Material in the Pentateuch", *Zeitschrift für die alttestamentliche Wissenschaft* 108,4 (1996), pp. 495–518 (497).

[29] J.L. Ska, "De la relative indépendance de l'écrit sacerdotal", *Biblica* 76 (1995), pp. 396–415. W.H.C. Propp, "The Priestly Source Recovered Intact?", *Vetus Testamentum* 46 (1996), pp. 458–478.

[30] P. Briant, *From Cyrus to Alexander* (Winona Lake: Eisenbrauns, 1996), pp. 67–69. A. de Pury, "Der Priesterschriftliche Umgang mit der Jakobsgeschichte", in R.G. Kratz, Th. Krüger & K. Schmid (eds), *Schriftauslegung in der Schrift* (Berlin: W. de Gruyter, 2000), pp. 33–60 (39) claims that P^g must date before the conquest of Egypt by Cambyse when he assumed the Pharaonic title. P^g is often linked to the dedication of the new Jerusalem temple around 515 BCE: E.A. Knauf, "Der Exodus zwischen Mythos und Geschichte: Zur priesterschriftlichen Rezeption der Schilfmeer-Geschichte in Ex 14", in R.G. Kratz, Th. Krüger & K. Schmid (eds), *Schriftauslegung in der Schrift. Festschrift für Odil Hannes Steck zu seinem 65. Geburtstag* (Berlin: de Gruyter, 2000), pp. 73–84. In a revolutionary work, D. Edelman, *The Origins of the 'Second' Temple* (London: Equinox, 2005), dates the transfer of the capital back to Jerusalem and the building of its temple during the reign of Artaxerxes I (465–425 BCE).

[31] See list of verses in N. Lohfink, "The Priestly Narrative and History", in *Theology of the Pentateuch* (Edinburgh: T&T Clark, 1994), p. 145 n. 29.

[32] E.A. Knauf, "Die Priesterschrift und die Geschichten die Deuteronomisten" in T. Römer (ed.) *The Future of the Deuteronomistic History* (Leuven: University Press, 2000), pp. 101–118 (111 n. 45).

the meaning of Pg's chronology remains a mystery; studies either avoid it completely, focus on particular segments like the Flood chronology or on the final form of the Biblical text from Creation to Hanuka.[33]

Although Pg opens with a magnificent celebration of the seven-day week (Genesis 1), it has not yet been studied from the point of view of calendars. Among the three hypotheses concerning the end of Pg, I favour the long version that spans from Genesis to Joshua,[34] that is from creation to the first Passover in the land, the end of manna (Josh. 5:10–12) or even as far as the death notices of Joshua and Eleazar (Josh. 24:29–33). Pg provides a comprehensive presentation of the Hebrews' origin and the celebration of the beginning of a new era in Palestine, the transfer to Persian rule.

In this context, Pg marks the end of Babylonian hegemony that led to the destruction of Jerusalem, with the subsequent devastation of the whole of the area South and West of Jerusalem down to the Egyptian border, the transfer of this no-man's land to Edomite herders and the set up of a new administrative centre at Mizpah (Jeremiah 40).[35] The pro-Babylonians at Mizpah, the clergy at the ancient temple of Bethel and the whole of the Benjaminite population that remained in the area after the destruction of Jerusalem were far from enthusiastic with Persian rule, even less with the prospect of a massive return of deportees from Babylonia (a threat that did not materialize) and the possible rebuilding of the Jerusalem temple. However, a small group of Babylonian Jews secured official Persian backing to revive the Jerusalem cult, probably presented as a local form of the worship of the creator God. Pg was composed in this context and the notion that a new calendar would have been introduced at the same time does not seem extravagant. It would phase out the Babylonian lunar calendar and celebrate the demise of the Babylonians alongside the reconstruction of a Judaean political entity based in Jerusalem rather than Mizpah. In spite of some similarities with Mesopotamian calendars,[36] the seven-day week of Genesis 1 bears striking parallels to the Zoroastrian calendar with its four monthly weeks with four days (1st, 8th, 15th and 23rd days of every month) dedicated to the Creator Dadvah Ahura Mazda.[37]

Here, it becomes difficult to proceed further since the date of the Zoroastrian calendar is not established. Mary Boyce understood the parallel with Genesis 1 as the influence of the Semitic week on the Zoroastrian calendar.[38] However,

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33 Bibliography in Northcote, "Development", pp. 33–36.

34 N. Lohfink, *Les traditions du Pentateuque autour de l'exil* (Paris: Cerf, 1996); Knauf, "Priesterschrift", pp. 101–118. Others consider that the original document ended with the setting up of the tabernacle (Exodus 40): Th. Pola, *Die ursprüngliche Priesterschrift* (Neukirchen-Vluyn: Neukirchener Verlag, 1995); de Pury, "Umgang", p. 39; or at Moses' death (Exodus 34): E. Zenger et al., *Einleitung in das Alte Testament*, (Stuttgart: Kohlhamer, ²1996).

35 O. Lipschits, "The History of the Benjamin Region under Babylonian Rule", *Tel Aviv* 26 (1999), pp. 155–190.

36 In the seventh century BCE, Babylon reformed the Ashur hemerologies that counted nine unlucky days every month by reducing their number to the 7th, 14th, 19th, 21st and 28th days: R. Labat, *Nouveaux textes hémérologiques d'Assur* (Paris: 1957), pp. 306–307; E. Puech, "Requête d'un moissonneur du sud-judéen à la fin du VIIème siècle av. J.-C.", *Revue Biblique* 110 (2003), pp. 5–16 (note 19).

37 A. Panaino, "Calendars I: Pre-Islamic", in E. Yarshater (ed.), *Encyclopaedia Iranica* (London: Routledge & Kegan Paul, 1990), vol. IV, pp. 658–668 (661).

38 M. Boyce, *Zoroastrians, their Religious Beliefs and Practices* (London: Routledge & Kegan Paul, ³1985), p. 71.

the typical "Semitic" week as it is attested in the older Biblical strata divided the month in two parts, between the full and the new moon. On the basis of the modest influence of Jews within the Persian Empire and the very favourable depiction of Cyrus in Biblical literature (Isaiah 40–45), it is more likely that the direction of influence goes in the opposite direction, from the Zoroastrian calendar to the seventh day Shabbat of Genesis 1.[39]

Then another related problem arises, that of the religion of the first Persian rulers. Were the Achaemenids Mazdaeans? There is no evidence of it for Cyrus,[40] it is more likely in Cambyses' case: his mother was herself a Persian and the name of his sister Atossa appears to be the earliest trace of Zoroastrian influence among the early Achaemenids.[41] However, this does not prove that Cambyses used the Zoroastrian calendar. The evidence shows that Cambyses' administration used the Late Babylonian luni-solar calendar, stabilized by an octaeteris (three months intercalated during an 8-year cycle) in 527 BCE.[42] More Zoroastrian input is likely during the reign of Darius I.[43] In any case, Jews from the Babylonian Diaspora could have inspired themselves from a Zoroastrian model, whether or not the Achaemenid rulers worshipped Ahura Mazda. The early Persian period remains a convincing backdrop to design a new cultic calendar marking the end of the Babylonian rule, showing loyalty to the Persian benefactors, while the administration of the empire carried on using the Babylonian calendar. Although history provides no confirmation on this point, the early Persian period remains the most likely moment to introduce a new calendar in Jerusalem, a calendar independent of astral recurrent phenomena apart from the rising and setting of the Sun,[44] a calendar that steers clear of the lunar cycle to celebrate the Creator Ahura Mazda under the name of its local manifestation, Yhwh.

The new calendar is embedded into a narrative (P^g) presenting the mythological origins of Israel from Creation to Israel's entry into the land of Canaan. Within this narrative, secondary additions are easily recognizable. Its overall structure is built around numerous chronological indications, from the days of creation, the ages of ancestors, dates of the flood, Abraham's migrations, the Exodus and Israel's wanderings in the desert until their arrival to the

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[39] See A. Lemaire, "Le Sabbat à l'époque royale israélite", *Revue Biblique* 80 (1973), pp. 161–185; J.M. Sasson, "Time… to Begin", in M. Fishbane (ed.), *"Sha'arei Talmon": Studies in the Bible, Qumran, and the Ancient Near East* (Winona Lake: Eisenbrauns, 1992), pp. 183–194.

[40] Briant, *Cyrus to Alexander*, pp. 105–106.

[41] M. Waters, "Cyrus & the Achaemenids", *Iran* 42 (2004), pp. 91–102 (99); M. Boyce, *History of Zoroastrianism* (Leiden: Brill, 1982) II.41.

[42] A second reform was introduced by Darius I in 503 BCE, consisting of seven intercalary years in a 19-year period: G.R.F. Assar, "Parthian Calendars at Babylon and Seleucia on the Tigris", *Iran* 41 (2003), pp. 171–191 (171).

[43] J. Bremmer, "Canonical and Alternative Creation Myths in Ancient Greece" in G.H. van Kooten (ed.), *The Creation of Heaven and Earth. Re-interpretations of Genesis 1 in the Context of Judaism, Ancient Philosophy, Christianity, and Modern Physics* (Leiden: Brill, 2005), pp. 73–96 argues that Genesis 1:1 should be seen as a reaction to Darius' statements about Ahuramazda as the creator of heaven and earth in Persian inscriptions from the end of the sixth century BCE.

[44] J.M. Sasson, "Origins and Media. Creation Narratives in Ancient Israel and in Mesopotamia", in L.J. Bord & P. Skubiszewski (eds), *La création, liberté de Dieu, liberté de l'homme* (Paris: Cariscript, 2001).

Promised land.[45] But so far, the attempts to make sense of P^g's chronology have not gained much acceptance, due to the lack of reliable criteria to sort out the Samaritan, Greek and Hebrew data and because the wrong calendars have been used: previous studies remain stuck with solar and luni-solar categories.

3. Third Key: the Priestly Narrative as a Week of Seven Eras

Reflecting P^g's marked penchant for heptads,[46] the whole extent of P^g from Creation to the settlement in the Promised Land can be divided into seven eras. This system of eras is based on a sequence of creation periods which lengths are reckoned in sevens and multiples of seven. Periods of purifications[47] are intercalated between the creative eras.

The duration of each of these seven eras is designed to reveal key elements of the Jubilee calendar and its intercalation method as indicated in **Fig. 2**:

1 Creation Gen. 1:1-2:4	2 Violence Gen. 5:1-6:10	3 Recre-ation Gen 6:11-8:19	4 Exiles Gen. 9:1-11:31	5 Exodus Gen 12:1-Ex 40:35	6 Wandering Ex. 12:40-Josh. 4:19	7 Shabbat Josh. 18:1
7 days	600,000 days + 6 years + 6 months + 6 weeks + 59 days	7 months	365 years	14 Jubilees minus 40 years	3 days short of 40 years	For ever?
Cosmo-gony	Creation to Flood	Resting of the Ark to its opening	Arphaxad's birth to departure from Haran	Haran to Glory filling the tent	Sea to Jordan	In the land
Week	Time goes too fast	1 season = 91 days	1 week intercalated every sabbatical year	Jubilee	1 week intercalated every fifth sabbatical year	

Fig. 2. P^g divided into seven eras.

These keys provide a set of criteria to test P^g's chronological system and variant readings.

[45] 44 chronological indications: Gen. 1:14; 2:1; 7:6.11.12.17; 8:4.5.13.14; 11:10.26.32; 12:4; 16:3.16; 17:1; 21:5; 23:1; 25:7.17.20.26; 26:34; 35:28; 47:28; Exod. 7:7; 12:40; 16:1; 19:1; 24:16.18; 40:17; Lev. 9:1; Num. 1:1; 10:11; 13:25; 20:1.29; Deut. 1:3; 34:7; Josh. 4:19; 5:10.11. For a slightly different list see S.E. McEvenue, *The Narrative Style of the Priestly Writer* (Rome: Biblical Institute Press, 1971).
[46] W.H.C. Propp, *Exodus 1–18* (New York, Doubleday, 1998), p. 315.
[47] R.S. Kawashima, 'The Jubilee Year and the Return of Cosmic Purity', *Catholic Biblical Quarterly* 65 (2003), pp. 370–389.

4.1. Day 1: Creation, the first week

The basic unit of the calendar is spelled out: the seven-day week rendered sacred by its attribution to God. The Sabbatical calendar is the only truly perpetual calendar. Since its years are always made up of full weeks, all festivals are set once for all within the week; such a perfect regularity thus avoids calendar chaos that requires moving the date of festivals so that the days of preparation of the Passover do not fall on the Shabbat. The rejection of the monthly unit is clearly marked by the non-mention of months in Gen. 1:14 and the non-mention of Babylonian month names in P^g.[48] Although the Moon is created like the Sun and the stars and it is accepted as one of the providers of signs,[49] in fact it plays no role in the setting of the months which are based on a purely mathematical count (3 x 30 + 1 days). This is a likely reflection of Persian propaganda. After defeating the last Neo-Babylonian king (539 BCE), Cyrus claimed that he was sent by Marduk, Babylon's main divinity, to put an end to the heresy of Nabonidus. Cyrus gained the support of the Babylon clergy by interpreting Nabonidus' building activities at Harran, the sanctuary of the Moon-God Sîn, as the proof of his incompetence and the reason for his downfall.[50]

Rejecting Sîn also involved an etymological feat: the presentation of the Sabbath as a day of rest on the seventh day is in itself a major revolution compared to the Babylonian system based on lunar months: the new moon marked the beginning of the month and the full moon its middle. Each month was thus made of two weeks (new to full moon and full to new moon), the full moon bearing the Akkadian name *shapatum* from the root *shaba'* "to be full" and not from *sebet* "seven". The Hebrew term *shabbat* cannot derive from the root that provides the word *sheba'* "seven" because the transformation of the *ayin* into *taw* is impossible. The Hebrew Shabbat is thus directly borrowed from the Akkadian *shabatum* "full moon" since Akkadian regularly drops guttural letters, in this case the *ayin*. The Priestly writer(s) who composed Genesis 1 then transformed the Babylonian sabbath of the full moon into the seventh day. Such transformation could have been facilitated by the fact that the Babylonian Pleiades, the *sibitti* are pictured as seven dots.[51] Since the point of Genesis 1 is not teaching how the world was created but that the Sabbath is now a day of rest set on the seventh day, it is likely that the transformation of the Shabbat from the full moon to the seventh day was worked out by the

[48] As noted by F.H. Cryer, "The Interrelationships of Gn 5:32; 11:10–11 & the Chronology of the Flood (Gen. 6–9)", *Biblica* 66 (1985), pp. 241–261 (248). It is not impossible that P^g also introduced the numerical naming of months. Although they do not suggest it, see D. & Z. Talshir, "The Double Month Naming in Late Biblical Books: a New Clue for Dating Esther", *Vetus Testamentum* 54 (2004), pp. 549–555.

[49] Not necessarily calendar signs but omens and portents for coming events: E. Tigchelaar, "'Lights Serving as Signs for Festivals' (Genesis 1:14b) in Enūma Eliš and Early Judaism", in G.H. van Kooten (ed.), *The Creation of Heaven and Earth. Re-interpretations of Genesis 1 in the Context of Judaism, Ancient Philosophy, Christianity, and Modern Physics* (Leiden: Brill, 2005), pp. 31–48.

[50] W.W. Hallo, *The Context of Scripture* (Leiden: Brill, 2000), pp. 313–316.

[51] J. Black & A. Green, Art. "Seven Dots", in *Gods, Demons and Symbols of Ancient Mesopotamia – An Illustrated Dictionary* (London: British Museum Press, 1992), p. 162.

writers of Genesis 1. The subsequent Hebrew, Syriac and Arabic meanings 'to rest' all derive from this theological transformation carried out in Genesis 1 and Exodus 16 (the manna story). As such, it has no etymological basis.[52]

4.2. Day 2: Antediluvian Era

This period is marked by long life-spans and increasing violence (Gen. 6:11) underlined by the names of the last ancestors of the list.[53] The Flood begins when the rain starts (Gen. 7: 11) on 17 II 1307 (SP), 1656 (MT) or 2262 (LXX). I choose MT's date since it is the only one that makes sense within the framework of the criteria I selected. From creation to the 17th of the second month 1656, there is a total amount of 602,467 days: (1655 x 364) + 30 (month I of year 1656) + 17 (in month II). It is one day short of 600,000 days + 6 years + 6 months + 6 weeks + 60 days: 600,000 + 2,184 (6 x 364) + 182 (30 + 30 + 31 + 30 + 30 + 31) + 42 (6 x 7) + 60 = 602,468 days. Symbolically, this indicates that the flood resulted in the complete destruction of all breaths except one family (Gen. 6:19), since number six has destructive value.

This sum can only be reached with the Sabbatical calendar. There is no intercalation and for this reason years are too short. Consequently, people age too quickly. Hence the violence prevailing during the antediluvian era that P^g presents as the reason for the Flood (Gen. 6:11): violence against the sacred rhythm of time made explicit in Jubilees 6:32–38. High longevity underlines the need for intercalation.

One can argue that the week of creation should be subtracted from year 1 since it is already counted as a separate period. According to the Sabbatical calendar, New Year's Day is always on Wednesday (day four) because God created the calendar on the fourth day of creation when he created the heavenly luminaries. Thus three days should be removed from year 1 yielding a total of 602,464 days. In this case, the four days missing symbolize Noah and his three sons that did not perish in the Flood.

4.3. Day 3: Re-Creation

Contrary to all previous studies of the Flood chronology, I have been led to consider the actual period when the earth was flooded as a time gap, which in fact is clearly indicated by an oddity that has defied the sagacity of exegetes:[54] Noah is 600 years old when the Flood is on the land (Gen. 7:6), he lives 350 years after the Flood and dies at age 950 (Gen. 9:28–29). The period of actual flooding does not count. This solves the crux of Shem's age when he fathers Arphaxad "two years after the Flood" (Gen. 11:10). He is said to be 100 years

[52] Exod. 16:3 plays with the alliteration *yashab* "to sit" and *saba'* "to be full" to provide another (fake) etymology for the Shabbat.

[53] Genesis 5: Little smith (Kenan), Renders God mad (Mahalel), Going down (Jared), Spear thrower (Methuselah), Sword (Lamech).

[54] Cryer, "Interrelationships", p. 248 considers that Shem was born at some point after Noah's 500th year. K. Stenring, *The Enclosed Garden* (Stockholm: Almqvist & Wiksell, 1966), p. 89 explains that the 2-year difference indicates the use of different calendars.

old, but two years after the flood Shem should be 102 since Noah fathered him and his two brothers[55] when he was 500 (Gen. 5:32) and the flood came when Noah was 600 years old (Gen. 7:6). If the Flood is a time gap and a suspension of the calendar due to a return to chaos, Shem and Noah did not age during their stay in the ark. Shem is 100 years old before and after the Flood. The missing two years represent the rough duration of the Flood as it spans from the second month (Gen. 7:11) to the seventh month (Gen. 8:4) of the following year (Gen. 8:13). Indicating that Shem is still 100 years old after the Flood, P^g insists that the flooding period represents a time gap not reckoned by the calendar.[56] This is consistent with P's theology that considers the Flood as a return to the chaotic *tohu wabohu* before creation.

The consequence is that this period does not start at the beginning of the Flood but at the end. Mirroring the creation week, it takes exactly seven months between the "resting" of the ark on Mount Ararat and its opening (27 II to 27 VII) if LXX's 27 VII is chosen against MT's 17 VII in Gen. 8:4.[57] The choice of LXX against MT is of course in contradiction to the previous section where MT's Flood date was preferred to LXX's. However, the fact that the seven months thus achieved reflect the seven days of Genesis 1 is too striking to be dismissed for the sake of consistency. Both LXX and MT have been subjected to revisions and I do not believe that one should be preferred against the other in principle. On the contrary, the recovery of a meaningful system of dates can only be achieved by remaining flexible. I thus feel justified to select the LXX dates when they fit the hypothesis I am trying to demonstrate, even if this inevitably smacks of circular reasoning. However, this 10-day difference between LXX and MT can easily be explained as resulting from the introduction of a 360-day calendar year with all 30-day months (5 months = 150 days), probably during the Ptolemaic domination of Palestine (320–200 BCE). The LXX would have been translated into Greek before this change and it thus retained the older reading.[58]

The LXX's dates delineate the month-system of the Sabbatical calendar with its 30-day months except for months III, VI, IX and XII that have 31 days. This month system and the 40 days of rain before the actual flooding yields a sum of 36 full weeks or 6 x 6 x 7 days.[59]

[55] LXX solves the problem by considering Japhet as the older brother in Gen. 10:21: G. Larsson, "The Chronology of the Pentateuch: a Comparison of the MT and LXX", *Journal of Biblical Literature* 102 (1983), pp. 401–409 (405).

[56] For a similar phenomenon see F. Bovon, "The Suspension of Time in Chapter 18 of Protoevangelium Jacobi", in F. Bovon, *Studies in Early Christianity* (Tübingen: Mohr Siebeck, 1991/2003), pp. 226–237.

[57] S. Najm & Ph. Guillaume, "Jubilee Calendar Rescued from the Flood", *Journal of Hebrew Scriptures* 5 (2004), available at http://www.arts.ualberta.ca/JHS/abstracts-articles.html#A31.

[58] See Meir Bar-Ilan's contribution in this volume.

[59] To get this count, I integrate the 40 days of rain as the beginning of the Flood (Gen. 7:12) into P^g, *contra* Lohfink, "Priestly Narrative".

		Days	Dates
Gen. 7:11	Flood starts		17/II Sunday
Gen. 7:12	Rain	040	
Gen. 7:17	Ark afloat	000 Time gap	Calendar gap
Gen. 8:4	Ark rests	156 = 3 + 30 + 31 + 60 + 31 + 1	27/VII (LXX) Monday
Gen. 8:13	Ark uncovered		1/I Wednesday
Gen. 8:14	Ark opened	056 = 29 + 27 = 8 x 7	27/II Wednesday
Total		252 = 36 x 7	

Fig. 3. P^g's Flood chronology.

4.4. Day 4: Postdiluvian Era: orphans, barren women and exiles

The Postdiluvian era spans from the begetting of Arphaxad to Abram's 75^{th} year when he left Haran (Gen. 12:4). It is marked by a sharp reduction of life-span ending with the dislocation, the need to move out of one own land, in sharp contrast to the one people/one land principle featured by the table of nations (Genesis 10). Sarai is the first attested barren woman[60] and Lot is the first orphan (Gen. 11:28). Thus Terah move out of Ur of the Chaldeans after the death of his son and goes to Haran with his childless son Abram and his orphaned grandson Lot. Then Abram and Lot leave for Canaan without Terah. According to MT and LXX, Terah dies at age 205, remaining on his own in Haran for 60 years, thus underlining the negative aspect of the period, in sharp distinction from the next era inaugurated by Abram's departure. SP is clearly a *lectio facilior* since it has Abram leave when Terah died at age 145 but eliminates the extra 60 years, thus missing their symbolic value.[61] This time only whole years are accounted since there is no indication of days and months. Adding the begetting ages of the Postdiluvian ancestors, from Arphaxad to Terah, plus Abram's 75 years gives the length of this period: 35 + 30 + 34 + 30 + 32 + 30 + 29 + 70 + 75 = 365 years.

These 365 years contradict the notion that P^g is using the 364-day calendar, or they reveal that one week is intercalated every seven years. The intercalation on the sabbatical year yields an average year of 365 days while the calendar remains based on a 364-day calendar year. Intercalating a whole week at the time does not interfere with the sacred succession of the Sabbaths and thus does not modify the principle of the calendar.

These 365 years are also Enoch's life span (Gen. 5:23), and his very positive presentation (he walked with God and did not die) makes him stand out within the list of antediluvian ancestors. The Book of Astronomical Writings, one of the works defending the validity of the Sabbatical calendar was attributed to Enoch (1 Enoch 82:1). However, the Book of Jubilees only attributes to Enoch the invention of the art of writing (Jub. 4:17), and not the calendar. Jubilees dispute Enoch's contribution to the calendar precisely because Enoch's role in P^g is to introduce intercalation!

[60] Verse 30 may be post-P: E.A. Knauf, "Supplementa Ismaelitica 17. wld lh x1jn Gen. 11,30 18", *Biblische Notizen* 86 (1997), pp. 49–50; but Sarai's barrenness is nevertheless implied in v. 31.
[61] Why Acts 7:4 follows SP rather than LXX remains to be explained. Is Stephen a Samaritan?

4.5. Day 5: Exodic Era

Again, this era is calculated in full years, starting with Terah's death in Haran, a highly symbolic event since Haran was the location of the sanctuary of Sîn, the Assyro-Babylonian Moon-God, to whom Nabonidus the last Neo-Babylonian king was very devoted.[62] Terah's death in such a highly meaningful place underlines the rejection of the moon calendar already signified in Gen. 1:14 by the non-mention of months. Then, Yhwh appears for the first time in P^g to spur Abram's departure for Canaan at age 75. This new era spans the patriarchal period until the Exodus out of Egypt and the setting up of the tabernacle in the desert:

Abraham begets Isaac at 100 (Gen. 21:5), 25 years after leaving Haran (Gen. 12:4)	025
Isaac begets Esau and Jacob at 60 (Gen. 25:26)	060
Jacob enters Egypt at 130 (he died at 147 and stayed 17 years in Egypt Gen. 47:28)	130
The Israelites stayed 430 years in Egypt (Exod. 12:40) [1]	430
The glory fills the tabernacle on 1 I of year 2 after crossing the sea (Exod. 40:34)	001
Total	**646**

There are thus 646 years between Haran and the filling of the tabernacle with the glory of the Lord.[64] 646 years are 40 years short of 14 jubilees (14 x 49 = 686). These 40 years represent the duration of the last purification effected by the death of the exodus generation that slandered the Promised Land (Num. 12:32). The meaning of these 40 years is delineated in the next era.

4.6. Day 6: Wilderness

Having slandered the good land given by Yhwh, the people need to undergo a last purification: the entire generation that came out of Egypt (600,000 men) die in the wilderness (Num. 14:2.28–29). The exact duration of the purification, from the return of the scouts to the crossing of the Jordan is impossible to calculate since the day of their sending off is missing and the length of the journey from Sinai to Paran is not mentioned (Num. 10:12; 12:16b).[65]

Although the wilderness period is referred to as forty years (Exod. 16:35; Num. 14: 33–34; 32:13; Deut. 2:7; 8:2–3; 29:5; Josh. 5:6) it was actually about 3 days short of 40 years.[66] These three days correspond to the lag of the Sabbatical calendar against the solar year after 40 years, in spite of intercalation. But what

[62] See W.W. Hallo & K.L. Younger Jr. (eds), *Context of Scripture* (Brill: Leiden, 2000), 2.310–314.

[63] Again, I follow MT. SP and LXX include within these 430 years the sojourn of the patriarchs in Canaan: LXX^B = 435.

[64] This period is framed by the first two mentions of Yhwh's name (Gen. 12:1; Exod. 40:34) which will be fully revealed only to Moses (Exod. 6:2–3).

[65] Num 10:33 is not attributed to P.

[66] From the crossing the sea on 14th or 15th I (Exod. 12:6.41) to 10 I of the 41st year after coming out of Egypt (Deut. 1:3 and Josh. 4:19) when the generation born after the Exodus crosses the Jordan.

kind of intercalation? If the Postdiluvian era reveals an average year of 365 days (intercalating a week every sabbatical year), after 40 years the calendar is about 10 days behind the Sun. The reduction of these ten days into three by intercalation of another whole week supplies the intercalation rhythm favoured by the composers of P^g on the basis of their estimation of the length of the tropical year. If another whole week is intercalated into the fifth sabbatical year, the gap is reduced to less than 3 days:

364-day year:	40 x 364 =	14,560 days
Intercalation 1:	40 x 365 =	14,600 days
Intercalation 2:	14,600 + 7 =	14,607 days
Tropical year:	40 x 365.2422 =	14,609.688 days

I thus find no better explanation for the days that are missing to make up a whole 40 years in the wilderness apart from a concern to control the approximate lag of the calendar by intercalation. It is certainly less precise than the improved methods devised several centuries later in some Dead Sea Scrolls and thus reveals early stages in the formation of the Sabbatical calendar.[67] However, the lag-measurement indicates that the 364-day calendar was not theoretical, utopian or impractical as is often claimed.[68] Its creators were eager to keep it in step with the yearly solar cycle and P^g used the length of the Exodus to indicate it. Theology need not cut theologians from observable reality.

4.7. Day 7: Shabbat

The arrival in the land marks the celebration of the first Passover, the end of the manna (Josh. 5:10–12) and the establishment of the tabernacle in Shiloh, while the land was subdued (Josh. 18:1), establishing a neat inclusio with Gen. 1:28. Jubilees places the arrival in the land halfway through the total duration of the world of one century of Jubilees (4900 years) = 2410 + 40 = 2450 x 2 = 4900 years. It is doubtful that P^g envisioned an end to the good clockwork world created by God.[69]

[67] U. Gleßmer, "The Otot-Texts (4Q319) and the Problem of Intercalations in the Context of the 364-day Calendar", in H.-J. Fabry, A. Lange & H. Lichtenberger (eds), *Qumranstudien, Vorträge und Beiträge der Teilnehmer des Qumranseminars auf den Internationalen Treffen des Society for Biblical Literature, Münster, 25.–26. Juli 1993* (Göttingen: Vandenhoeck & Ruprecht, 1996), pp. 125–164; U. Gleßmer, "Calendars in the Qumran Scrolls", in P. Flint & J. VanderKam (eds), *The Dead Sea Scrolls after Fifty Years: a Comprehensive Assessment* (Leiden: Brill, 1999), pp. 213–278. U. Gleßmer, "Calendars", identifies two possible methods on the basis of the text of 4Q319: adding a week every sabbatical year plus an additional week every fourth sabbatical year or adding a week every six-year cycle plus an additional week in the fourteenth cycle.

[68] *Pace* Abegg, "Calendar at Qumran", p. 150; and B.Z. & S. Wacholder, "Patterns of Biblical Dates and Qumran's Calendar: The Fallacy of Jaubert's Hypothesis", *Hebrew Union College Annual* 66 (1995), pp. 1–40.

[69] In P^g, the world is created very good (Genesis 1). Instead of the story of the Fall (Gen. 2–3), P^g has a number of 'original sins', duly purified in order to preserve the world's goodness: N. Lohfink, "Original Sins in the Priestly Historical Narrative", in Lohfink, *Theology of the Pentateuch* (Edinburgh: T&T Clark, 1994), pp. 96–115.

5. Conclusion

Is it possible to ascertain on the basis of P^g's overall chronology that the 364-day calendar was used at the beginning of the Persian period?

In spite of uncertainties due to insertions that greatly expanded the size of the original narrative, it is still possible to identify a coherent pattern that is unlikely to be the result of chance. All the elements of the calendar are spelled out in the course of the narrative: the week as the fundamental element (Era 1), the month system (Era 3), the year and the jubilee (Era 5).[70] The clearest instance of the use of the 364-day calendar is the chronology of the recreation period after the Flood (Era 3). Only with the month system particular to the Sabbatical calendar (30 + 30 + 31 days) can an exact number of weeks be reached. That these 7 months not only contain a symbolic number of whole weeks (6 x 6) but also reflect the seven days of creation is not fortuitous, but denotes a coherent system that is preserved in spite of subsequent tampering to introduce other systems (150 days).

Intercalation is also indicated. The antediluvian Era 2 presents a "fast clock" stressing the need for intercalation so that humans may reach more "natural" ages. Reckoned in full years, Era 4 spells out the number of days per year after a first intercalation of a week every sabbatical year. Era 6 presupposes a second intercalation of another whole week in the fifth sabbatical year. The overlap between Eras 5 and 6 is a weakness of the system since Era 5 ends when the Tabernacle is filled with the Glory of the Lord while Era 6 starts one year earlier at the crossing of the sea. So far, I have no better solution to offer, due to the fact that the date of the arrival of the Hebrews at Paran is not recorded.

Rather than transmitting a secret system, P^g presupposes the prior knowledge of the calendar. The specifics of the calendar are never spelled out explicitly and P^g appears as a scribal compendium teaching Israel's mythological origins, its classical language and sacred calendar in narrative form. Admittedly, this remained rather basic compared to Babylonian science.[71]

As for the date of the Sabbatical calendar, it is highly unlikely that the sacred seven-day structure so obvious in Genesis 1 was not carried over into the other parts of P^g. The symbolic structure of Genesis 1 is reflected in the seven fold succession of eras. Since there is a rare scholarly consensus over a Late Babylonian or Early Persian date for P^g, it is hard to avoid the conclusion that its calendar is contemporary to P^g or earlier, at a point in time when the setting up of a non-lunar calendar makes the most political sense. Claiming that the Sabbatical calendar is later than P^g requires understanding Genesis 1 as the brilliant introduction of a calendar that was dropped as soon as it was invented only to be brought to the fore by the calendar disputes that tore Judaism in the last two centuries before the Common Era. Whereas Genesis 1:14 conceded a limited role to the Moon while considering the Sun as the chief regulator of the calendar, later works reflect entrenched positions. *Ben Sira* (ca.

[70] See R.S. Kawashima, "The Jubilee, every 49 of 50 years?", *Vetus Testamentum* 53 (2003), pp. 117–120.

[71] See D.W. Young, "The Sexagesimal Basis for the Total Years of the Antediluvian and Postdiluvian Epochs, *Zeitschrift für die alttestamentliche Wissenschaft* 116 (2004), pp. 502–527.

175 BCE) denies calendar significance to the Sun and favours the lunar calendar against *1 Enoch*, *Aramaic Levi*, *Jubilees*, and *Rule of the Community* that all reject the Moon's role to set the date of festivals.[72] Those polarized positions do not reveal the origin of the Sabbatical calendar but later developments. The texts that defend the Sabbatical calendar come from traditionalists reacting against innovations rather than from innovators themselves. *Ben Sira*, written in Alexandria,[73] represents the Diaspora's concern to keep the common luni-solar calendar against traditionalists of the "Holy land" who would have liked to celebrate the re-establishment of an independent dynasty in Jerusalem with a return to the Sabbatical calendar. What had been a fitting way to celebrate the end of Babylonian rule[74] was expected to be done again at the withdrawal of the Seleucids. But the Hasmonaean rulers decided against it. They did bring about some chronological changes in order to set Hanukkah on a symbolic date,[75] but these innovations did not re-establish the Sabbatical calendar. Why would the Hasmonaeans change the calendar? They entertained excellent relations with Egypt and thus retained the calendar of the Ptolemies. Hence the protests found in Jubilees and in the Dead Sea scrolls. However, despite their pleas, the traditionalists could not recover the tradition intact. Had they wanted to, the original Priestly chronology had been updated to take into account the numerous textual additions inserted into P^g, and it was thus impossible to go back to the original system. This point is best exemplified by the chronological system transmitted by the *Book of Jubilees* (ca. 150 BCE) which, in spite of the fact that it upholds the value of the Sabbatical calendar, is interested in chronology rather than in calendar;[76] thus the dates provided by *Jubilees* bear little resemblance with P^g's.[77] The calendars of the books of *Jubilees* and *Enoch* remember the principles of the Sabbatical calendar, but its principles only. Their chronologies reflect secondary developments[78] rather than the origin of the

[72] B.G. Wright, "'Fear the Lord and Honour the Priest': Ben Sira as Defender of the Jerusalem Priesthood", in P.C. Beentjes (ed.), *The Book of Ben Sira in Modern Research* (Berlin: de Gruyter, 1997), pp. 189–222 (204–208); J.C. VanderKam, *Calendars in the Dead Sea Scrolls: Measuring Time* (London: Routledge, 1998), p. 27; Tigchelaar, "Lights", pp. 37–46.

[73] P. McKechnie, "The Career of Joshua Ben Sira", *Journal of Theological Studies* 51 (2000) pp. 1–26.

[74] Ph. Guillaume, "Genesis 1 as Charter of a Revolutionary Calendar", *Theological Review* 14 (2003), pp. 141–148.

[75] J. Blenkinsopp, *The Pentateuch* (New York: Doubleday, 1992), p. 48.

[76] E. Wiesenberg, "The Jubilee of Jubilees", *Revue de Qumran* 3/9 (1961–2), pp. 3–40 (4).

[77] See comparative table in Northcote, "Development", p. 32. Flood in AM 1207, Exodus in AM 2410. Since Adam remained in the garden until the eighth year, there are 2401 years between his exit from the garden and the Exodus = 49 jubilees. Jubilees' Flood chronology is a composite of the final form of Genesis, with a keen awareness of the differences between MT and LXX for the date of the grounding of the ark on Ararat. Jub 5:29 avoids the problem by mentioning that "on the new moon of the 7th month, all the mouths of the deeps of the earth were opened". This omission is compensated by the addition of the 17th of the 7th month when the land was dry, before following again the Biblical text that sets the opening of the ark on the 27th of the same month. J.M. Scott, *On Earth as in Heaven: The Restoration of Sacred Time and Sacred Space in the Book of Jubilees* (Leiden: Brill, 2005).

[78] J.T. Rook, "A Twenty-eight-day Month Tradition in the Book of Jubilees", *Vetus Testamentum* 31 (1981), pp. 83–87.

364-day calendar. Hence, their chronologies disprove the notion that the Sabbatical calendar was invented around the second century BCE. Had a Maccabaean Sabbatical calendar been imposed on P^g's earlier chronology, greater similarities between *Jubilees* and P^g would be expected. On the contrary, the fact that they remember a calendar that does not fit the narrative they are transmitting points towards the antiquity of the Sabbatical calendar that derived from P^g before it was expanded. VanderKam's notion that the 364-day calendar was in use in Jerusalem 'during the early centuries of the Second Temple' should therefore be taken very seriously.[79]

[79] VanderKam, "Origin", p. 103.

Mesopotamian Influence on Persian Sky-watching and Calendar

Part I. Mithra, Shamash and Solar Festivals[1]

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Abstract: *There are numerous similarities between Mithra and Shamash, the Persian and Babylonian Sun-Gods. Many of them may be a result of cultural diffusion between Iran and Mesopotamia, chiefly directed from the west to the east. The comparison of the attributes of Mithra in* Avesta *and the attributes of Shamash in various Babylonian and Assyrian sources shows that in the 2nd half of the 2nd, and the 1st half of the 1st millennia BCE the Mesopotamian religion strongly influenced Persian idea of the Sun-God. This influence is particularly well visible in the symbolism of the solar festival during the VIIth month of both the Babylonian and the Persian calendars, the festival of the autumn equinox with its relation to the constellation* Libra. *The second phase of Mesopotamian influence on the attribution of Mithra may be more precisely dated to the reign of Artaxerxes II. This Persian king reformed the official pantheon and established the cult of the divine triad: the main god Ahuramazda, the Sun-God Mithra and Anahita, the goddess of planet Venus. Such a triad strongly resembles the planetary triad worshipped in Mesopotamia.*

Keywords: Mesopotamia, Persia, Sun-Gods, solar festivals

Introduction

When the priests of Marduk opened the gates of Babylon to Cyrus the Great and his troops in 539 BCE, the Mesopotamian lowland became a part of the Achaemenid Empire. Cyrus entered the temple of Marduk and grasped the hands of the main Babylonian deity. That gesture had not only symbolic implication but also became an element of legitimization of Persian authority over Babylonia. With that gesture Cyrus symbolically took possession of the whole Babylonian tradition and lore. Since that time this part of the Middle East became one of the most important satrapies in the Persian Empire. However, the influence of Mesopotamian civilization on the peoples inhabiting the Iranian plateau may be dated back much earlier; it is well attested at least from the 4th millennium BCE. The conquest of Cyrus was just the culmination of Persian fascination with Mesopotamia (Lamberg-Karlovsky 1985).

The Mesopotamian tradition was very attractive to the Iranians and had strong influences on almost all aspects of Persian life. It may be expected that

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also in respect to sky-watching – so important in the Mesopotamian tradition of the 2nd and 1st millennia BCE (cf. Koch, Westenholz 1995) – Persia owed a lot to the western neighbours.

This short paper will focus on the Persian Sun-God Mithra and the solar festivals in the Achaemenid period. Our question is how intensive was the transfer of attributes from the Babylonian Sun-God Shamash to Mithra and in which period or periods did it occur. This contribution is the first in a series of papers dealing with several aspects of Persian sky-watching and calendars supposedly of Mesopotamian origin.

Mithra and Shamash

The name of the god Mithra was mentioned for the first time in a treaty between the Hittite king Suppiluliumas I and the Mitannian king Shattiwaza (14th century BCE). Mithra's name appeared there together with Indra, Varuna and the Nasatya twins. All these gods are prominent in Vedic religion, and for that reason the whole text is well known in contemporary historiography as an evidence of early Aryan expansion to upper Mesopotamia (Dumézil 1977:18).

In the *Vedas* Mitra and Varuna are usually mentioned as a pair, although sometimes Varuna appears by himself or coupled with Indra (e.g. RV 17). Both gods are called the guards of the Law (e.g. RV 2:8, 23:5), the Righteous Ones (RV 151:4+8), helpers of all mankind (RV 151:1), Heroes (RV 151:9), Bounteous Ones or the Watchful Twin (RV 136:1). They appear to be the divine judges, protecting the pious and punishing the sinners: "All falsehood, Mitra-Varuna! ye conquer, and closely cleave unto the Law Eternal" (RV 152:1), "Mitra and Varuna they guard from censure: Aryaman too, discovers worthless sinners" (RV 167:8). Sometimes Mitra and Varuna are connected with Aryaman (RV 41, 90:1, 136:2) or Agni (RV 115:1, 136:7) and in those cases the whole triad is associated with the Sun (Surya) which represents their eye. However, Mitra by himself was never treated explicitly as a solar deity.

The direct relation between Mithra and the Sun is attested very rarely in *Avesta*, the sacred text of the Zoroastrian religion. It is clear, however, that the Iranian Mithra and the Vedic Mitra originate from the same prototype. In this earliest common Indo-Aryan tradition Mithra/Mitra was a god of cosmic law and protector of mankind, but their subsequent evolution was independent. In many respects Mithra resembles the Babylonian Shamash and, since even some secondary similarities are striking, it may be hypothesized that the evolution of Mithra proceeded under Mesopotamian influence, possibly since the period of the Mitanni kingdom.

There is an abundance of Mesopotamian texts mentioning the attributes of Shamash (and Utu, the older Sumerian Sun-God who had been identified with the Semitic Shamash) in various phases of the evolution of Mesopotamian religions. On the other hand we have *Avesta*, the single Persian text preserved in relatively late manuscripts only although composed before the foundation of the Achaemenid dynasty. For this reason the search for similarities can only be directed from the later *Avesta* to the earlier Mesopotamian sources. Analyzing possible influences, three types of similarities must be distinguished: natural analogies relating to the general features of the Sun, homologies resulting from cultural diffusion, and accidental analogies. Practically, the reliable classification of similarities is difficult and must be discussed carefully.

Mithra is called in the *Avesta* the Lord of all countries (MN 12, MY 145), "the lord of wide pastures, who is truth-speaking, a chief in assemblies, with a thousand ears, well-shapen, with ten thousand eyes, high, with full knowledge, strong, sleepless, and ever awake" (MY 7, 10, 12, 17 etc). Such a list of general epithets is repeated many times and relates to the general symbolism of the Sun-God who travels over the whole world and observes all human deeds. It is stated explicitly in another passage, that he is the god "whom Ahura Mazda has established to maintain and look over this entire moving world, and who maintains and looks over all this moving world; who, never sleeping, wakefully guards the creation of Mazda" (MY 103).

The task of Mithra as the Sun-God is to protect the cosmic law. Mithra shares this attribute both with the Vedic Mitra and with Shamash, but in the case of the latter, this feature is much more emphasized. It may be explained by the henotheistic nature of Mazdaic religion where the cosmic law is under Ahura Mazda's control. However, Mithra is the leader of the mankind in the way to *asha*, who "keeps in his hands both peace and trouble for nations" (MY 29), punishes the sinners and protects the righteous ones. Thus, even if the cosmic law was not set by him, Mithra guards it in the same way as Utu/Shamash does in the Mesopotamian tradition. In late Sumerian tradition Utu is responsible for the whole world as the messenger of gods, the judge and the executor of gods' decisions (Kramer 1963:181). Shamash announces the future events both by solar omina and by hepatoscopy (Langdon 1915:189, Rochberg-Halton 1984:136); also the great assembly of gods takes place upon the mountain of sunrise where Shamash departs from the Underworld and enters the sky to announce the future (cf. Seux 1976:223). Both Mithra and Shamash were thought to be the judges in the Underworld as the gods who disappear during the night below the horizon (cf. Alster 1991:30). Both are also responsible for the alternations of days and nights, as well for the sequence of seasons.

The judicial symbolism of Mithra and Shamash concerns not only the Underworld but also mundane affairs. The Sun-Gods were thought to know all human affairs and be the best guarantors of contracts, testaments and treaties. Shamash is called "the upright judge of gods and human beings" (cf. HSM 7494 in Starr 1983:37), the term "judge" is one of his common epithets. Also in mythology he is frequently mentioned as the god in whose name all oaths are taken and who punishes those who break them (e.g. the eagle that had betrayed the snake in the story about Etana). In the treaty of Asarhaddon and Ramataia (6th c. BCE) Shamash threatens the traitor with blindness (Wiseman 1958:59–60). Also Mithra hates liars: "On whatever side there is one who has lied unto Mithra, on that side Mithra stands forth, angry and offended, and his wrath is slow to relent" (MY 19) or "Thou bringest down terror upon the bodies of the men who lie unto Mithra" (MY 23). Both Mithra and Shamash are protectors against the attacks of evil spirits. In many rituals of exorcism Shamash is invoked to repel demons (e.g. VAT 5 in Seux 1976:364–365; Scurlock 1988:207). Mithra, just as Shamash, always helps the sufferers: "whom the poor man, who follows the good law, when wronged and deprived of his rights, invokes for help, with hands uplifted" (MY 84).

Avesta mentions Mithra's two companions: Sraosha (Chista) and Rashnu (MY 100, 126). Both are the divine judges supporting Mithra in the last judgment close to the Činvat bridge. Also Utu and Shamash are supported by two lesser deities of justice: Nigzida ("divine justice") and Nigsisa ("divine uprightness") in Sumerian (Alster 1991:74), Kettu and Mesharu in Akkadian (Douglas Van Buren 1944:284).

Both Mithra and Shamash are represented as the warrior–gods setting the battle against evil. The *Avesta* calls Mithra "a warrior with strong arms" (MY 25), "who stands against (armies) in battle" (MY 36), "whom wide–hoofed horses carry against havocking hosts, against enemies coming in battle array" (MY 47), who "smites the foe in battle" (MY 71), "a stout and strong warrior" (MY 140). On the other hand, Shamash is very frequently called "the Warrior", especially in exorcistic sources (eg. *Shurpu* II 179 (Reiner 1958:18)) or the hemerologies (Wiseman 1969: 179–180). His attribute is *šaššaru*, a deified saw–like sword depicted in the hands of the Sun-God from Early Dynastic (VA 2952) till the Isin–Larsa period, and especially on Old Akkadian cylinder seals (Douglas Van Buren 1945:180, Dombart 1928). Analogically, Mithra is armed with a silver spear, arrows with golden arrowheads, axes, mace heads, and daggers and wears golden armour. The mace heads deserve our special attention; as they are usually used in combat against disloyal men and especially against Angra Mainju. One of such brass molted mace heads had a hundred knobs and a hundred edges which awoke fear even in the Devil Spirit (Angra Mainju) (MY 96, 141). In the same *Yasht* Mithra is described as a warrior driving a golden chariot made of a heavenly substance with four swift white horses (MY 52, 67, 124, 143). Here an obvious difference between Mithra and the Mesopotamian Sun-God may be observed, because only in a Sumerian source do we find Utu driving a chariot with four lions (Alster 1991:74) and this attribute is not witnessed in later Akkadian documents.

Mithra as the Sun-God was connected also with fire and light: "his face is flashing with light like the face of the star Tistrya" (MY 143). Moreover, he was a protector of the morning hours, which is directly connected with his solar aspect. He appeared each morning with the first rays of the Sun and symbolically illumined the world, and chased away all evil spirits, which could threaten people. Analogically, Shamash is provided with a fiery *melammu* (divine aura) which makes the stars invisible (Horowitz 1993:54); he is also called the Lord of Light (KAR 223; Łyczkowska 1995:50). Mesopotamian gods of fire, Gibil/Bilgi and Nusku, are frequently called the Comrades of Shamash (K 8583; cf. Livingstone 1986:31, Lewy, Lewy 1948:148, Seux 1976:376, Weidner 1915:87–88).

Both Mithra and Shamash are sometimes related to the water flow and to abundance. Mithra "makes the waters flow forward, (...) makes the waters run and the plants grow up" (MY 61). In late sources Shamash is associated with the upper sea (i.e. the sky) and with the Euphrates (Livingstone 1986:77). There is also a text describing the cosmic tree *kiškanu* growing between the rivers of abundance, between Shamash and Dumuzi (Langdon 1928:847). Shamash, as the god of abundance, is always connected with Enki/Ea, the god of fresh water. Mithra is also the divine protector of cattle and called "the lord of wide pastures" (MN 10, MY 3, 10), whom "the cow driven astray invokes for help" (MY 86). In Mesopotamia the god of cattle was the Moon-God Nanna/Suen/Sin and this symbolism was related to two observations: the crescent resembles the horns of cattle, and the whole sky was called the cattle pen (cf. Hall 1986:155–158, Horowitz 1998:255, Heimpel 1989:250–251, Reiner, Pingree 1981:42). Only in the Sumerian tradition of Girsu the festival of the VIIth month included offerings for Utu and the Moon-God Suen in the cattle pen (Cohen 1993:74), but the relation of Utu and the cattle is secondary here. Cattle and birds were the animals sacrificed for Mithra (MY 119); also in rituals of Shamash the doves were set free to the west and to the east (K 2438, ARAK 38 = K 115; Livingstone 1997:216, Hunger 1992:21).

Possibly the most important attribute of Mithra as the Sun-God is his omnipresence: "his dwelling, wide as the earth, extends over the material world, unconfined, and bright, a far-and-wide-extending abode" (MY 44), "Whose long arms, strong with Mithra-strength, encompass what he seizes in the easternmost river and what he beats with the westernmost river, what is by the Sanaka of the Rangha and what is by the boundary of the earth" (MY 104), "Who goes over the earth, all her breadth over, after the setting of the sun, touches both ends of this wide, round earth, whose ends tie afar, and surveys everything that is between the earth and the heavens" (95). However, the proper abode of Mithra is mount Hara, "the bright mountain around which the many (stars) revolve where come neither night nor darkness, no cold wind and no hot wind, no deathful sickness, no uncleanness made by the Daevas, and the clouds cannot reach up unto the Haraiti Bareza" (MY 50, cf. MY 13), "a dwelling that all the Amesha-Spentas, in one accord with the sun, made for him in the fullness of faith of a devoted heart, and he survives the whole of the material world from the Haraiti Bareza" (51).

Shamash also dwells in the Eastern Mountain (cf. Heimpel 1986:128). There are many representations of Mesopotamian Sun-God arising from the mountain (Douglas Van Buren 1955:1) and the Mountain of Sunrise takes a very important place in Mesopotamian religion as the point of connection between the heaven and the underworld. The place where the assembly of gods sets the destiny of the land is located upon it. This mountain is sometimes (e.g. in Lugalbanda epic) called the mountain of the *hašur*-tree (Heimpel 1986:143–145).

Summing up, there are many similarities between Mithra and Shamash, most of them resulting from the common observations of the Sun, but some should probably be treated as homologies. It is especially the judicial attributes, the bird offerings, and the symbolism of the Mountain of Sunrise, which should be most probably the results of cultural diffusion between Mesopotamia and Iran before the times of Achaemenid dynasty. Perhaps that exchange of ideas is rooted as early as in 3rd millennium BCE when the relations between two regions started to become very close.

The reform of Artaxerxes II

The position of Mithra in the Persian pantheon was changing in the Achaemenid period. We have no information about this god in the official documents until the time of Artaxerxes II (404–359 BCE). He was the first Achaemenid king to mention Mithra together with Ahuramazda and Anahita (Boyce 1982: 89–90). It was during his reign that the triad of these most powerful deities was established. Nevertheless, it may be supposed that even before, from the reform of Zoroaster on, the cult of Mirtha remained an important part of common Iranian beliefs, especially among the ordinary people. Several tablets found in the fortification and treasury of Persepolis contain lists of goods used during rituals dedicated to Mithra. It is possible that those offerings could be associated with unknown rituals preceding Nou Ruz, or even performed during that festival, as will be discussed below (Frye 1975:63).

It is likely that what was called the religious reform of Artaxerxes II could be associated with the political situation in Persia after the battle of Cunaxa where Artaxerxes had to fight against his brother Cyrus the Younger to save his throne (Xenophon, *Anabasis*. I.8; Briant 2002:627–630). During the conflict between the two brothers both sides used similar, pure Persian ideology, in which the right to the Persian throne was strongly associated with *chwarenah*, and heroism displayed on a battlefield. Because Cyrus the Younger had quite a massive support among the Persian aristocracy, who believed in his right to the throne, consequently, Artaxerxes II needed to find additional support for his victory that could be associated with some religious aspects. The best solution appeared to be the promotion of two Persian deities that had still remained outside the orthodox Zoroastrian official religion, i.e. Mithra and Anahita. Both deities were certainly frequently worshiped by the common people. Mithra, being a solar god, had the already mentioned aspects, which could be useful in the re-modeled royal ideology. His attributes were extremely helpful for Artaxerxes II who needed to support and legitimize his victory in religious terms. In other words, his victory in the battlefield was presented as the result of a support given to him not only by Ahuramazda but also by two important warlike deities Mithra and Anahita. Especially Mithra could give not only support in the battle, but also the right judgment, causing the Cyrus the Younger's death.

The main elements of the new aspects of the royal ideology were similarly based on the Babylonian background. The worship of these two new deities was probably proclaimed in a special royal edict mentioned by Berossus and later quoted by Clement of Alexandria (Clement of Alexandria, *FGrH* 680 F11; Briant 2002:676). If our assumption is right, the Great King would find the help among Babylonian priests, who could provide the base for the triad of the Persian deities, which was clearly based on the Babylonian triad Sin–Shamash–Ishtar. The similarities of both triads were so striking that supposedly the cult of the new one became very popular not only in Persia, but particularly in Mesopotamia, where the old traditional religion had still survived.

Sin was the most important astral deity in Babylonian religion, often linked with the Sun-God Shamash and Ishtar, the goddess of the planet Venus. This planetary triad is abundantly witnessed in Mesopotamian iconography (e.g. on *kudurrus*) and texts (cf. BM 91000, Douglas Van Buren 1945:87–88; Seidl 1968; Reiner 1996:311). Artaxerxes II may have exploited this well-recognized motif deeply rooted in the Mesopotamian tradition. The Moon-God has been substituted here by Ahuramazda, and the remaining two deities of the triad had united Persian and Mesopotamian elements. It is also possible that the Persian king intended to make Persian religion more understandable for the Babylonians to use it for the religious unification of the empire. It may be noted that the Moon-God was almost not present in Persian religion and probably Ahuramazda had taken his position in the triad, but without any lunar attribution.

There is another piece of evidence for a conscious reform: Artaxerxes II was also the first Persian king who built temples for Iranian deities: Ahuramazda, Mithra and Anahita. It is quite unlikely that there were anthropomorphic statues located in temples dedicated to Ahuramazda and we can assume them to be the first temples of fire in Persian history. In the case of Mithra and Anahita it is more probable that, besides the sacred fires, also their statues could have been situated inside the temples, although there is no direct evidence. Nevertheless, the idea of the temple was clearly of Mesopotamian origin.

Solar festivals in Persian calendar

Mesopotamian influence on Persian religion is clearly indicated in the solar festivals. Mithra was linked to the middle of the year: the first month of the second half-year bore Mithra's name – *Mitrahe* in the *Avesta* (Partner 1985:760, Blois 1996:39–50). Mithra occupied the same position not only during the course of the year, but also the sixteenth day of each month was dedicated to him. For both reasons Mithra was sometimes called the Lord of Division. The most important festival dedicated to Mithra, which was called *Mithrakana*, was organized on the sixteenth day of the seventh month of the year. According to the account of Duris of Samos (ca. 280 BCE) during that festival the Persian king drank and danced (Frye 1975:64; Boyce 1975:106–118). The drink was most probably *haoma*. The *haoma* ritual and king's dance were only a part of this ritual, although their significance remains obscure.

The New Year festival was related to Mithra's judicial attribution. During one night of the year, the last night before the Nou Ruz festival, the dead ancestors were able to visit their houses, but had to go away with the first rays of the rising Sun. That night was called *hamaspatmaedaja* (Boyce 1979:29, 31, 53, 142–3). Also after death the deceased stays for four days among his relatives and departs with the first rays of the rising Sun on the fifth day, to be judged by Mithra and his comrades Sraosha, and Rashnu. After that day the dead have no possibility of coming back into the world of living, except during the night before the New Year.

All these elements in the festivals of Mithra may be traced back to Mesopotamian tradition. In Mesopotamia as early as in the 3rd millennium BCE the year was divided into two parts, starting with the equinoxes and the *akiti*/*akitu* festivals of the I[st] and VII[th] month (Cohen 1993:400). During the I[st] month, Nisannu (in the standard Babylonian calendar), the New Year festival took place and was the most important festival in many Mesopotamian traditions. The VII[th] month, Tashritu (possibly from Akkadian *šurrû* "to begin"), was dedicated to Shamash (Cohen 1993: 326, 330). The late document NCBT 1132 contains the record of sesame oil quantities used during rituals in Uruk; among them we can find the *tallu* festival of Shamash during the fourth month (Du'uzu), the seventh (Tashritu) and the twelfth (Addaru) (Beaulieu 1993:82–84).

In astronomical sources from the late 2[nd] and 1[st] millennia BCE the month Tashritu was associated with the constellation *Libra* (called "The Scales" in Babylonia), which was the astral attribute of Shamash related to his judicial function. *Libra* was called "the house of Shamash", the "star of Shamash's justice" (Reiner 1995:141) and was associated with the planet Saturn, also the planetary attribute of Shamash (ARAK 48; Hunger 1992:24, 28). This complex of associations refers to the autumn equinox (Hunger, Pingree 1989:147; cf. Oelsner, Horowitz 1998: 179). In late sources the constellation *Libra* was related also to the cult centers of Shamash: Sippar, Larsa, Girsu and Pashe (Pettinato 1998:249–250). Its representation appears on stamp seals produced in the Seleucid period (Wallenfels 1993:285).

According to the series [mul]Apin the constellation *Libra* rises heliacally on the 15[th] day of Tashritu (Ap I iii 1, iv 25, II i 14). A. Wolters associates this date with the motif of scales appearing in the *Book of Daniel* 5, 27 in the well-known passage where Daniel forecasts the end of the Babylonian kingdom and the invasion of the Persian king. The chronicle states that the priests of Marduk opened the gates of Babylon on the 16[th] day of Tashritu (12 October, 539 BCE in Julian calendar) and the motif of scales may be here an allusion to the fall of the unjust king (Wolters 1993).

The relation of Shamash and the month Tashritu is thus very firmly established in the Babylonian tradition. Much less frequently Shamash appears in the rituals of the New Year festival, although the most important motif of this festival is the great assembly of gods on the Mountain of Sunrise. Only in the late 3[rd] millennium in Eshnunna (Central Mesopotamia) the *humṭum* festival dedicated to Shamash took place on the XII/I month of the year (Cohen 1993:396–397).

The relation of Shamash to the middle of the month (i.e. the full moon) is rather vague in Mesopotamian tradition. Only in the late tradition of Larsa during the full moon Shamash was provided with new clothes (Beaulieu 1993:79). The middle of the month was dedicated chiefly to the Moon-God (cf. Koch-Westenholz 1995:108) or to the main gods of the local pantheon. For example the 16[th] or 17[th] day of the month was dedicated to Ištar and Baal in Emar (Cohen 1993:357), to Anu in the late tradition of Uruk (Reiner 1995:139), to Dumuzi during the IV[th] month Du'uzu in Assyria (Gurney 1962:157), to Marduk in Babylon (Pettinato 1998:263). However, there is a strong connection between the Mesopotamian Sun-God and the 18[th] day of the month. In the standard Assyrian calendar during the 18[th] day of the I[st] month Nissanu, the *huntu* festival of Shamash was organized (Wiseman 1969:181, Pettinato 1998:258). In Mari, Shamash's ritual took place in the 18[th] day of the IV[th] and VII[th] month (Cohen

1993:290); in Sippar, the city where Shamash headed the whole local pantheon, probably the 18^{th} day of each month was dedicated to him (Cohen 1993:275). It may be hypothesized that this 2-day difference between Mesopotamian and Persian tradition was a result of the much lower position of the Moon-God in Iran, that simply was not considered to take a more prominent place in the course of the month.

The association of Shamash with the Underworld is also attested in the Mesopotamian tradition where the Sun-God is the judge of the dead. Shamash frequently appears as the god entering the Underworld and who (together with chthonic gods), protects mankind against evil demons leaving later the kingdom of death (cf. Seux 1976:431–432). In the well-known *Epic of Gilgamesh* the Sun-God opens the gate of the Underworld and enables the Sumerian hero to speak with his dead friend Enkidu.

The solar festivals in Mesopotamia and Persia are so similar that their homological character is not in doubt. The attribution of the VII^{th} month to the Sun-God was adopted by Iranians from Mesopotamia and this borrowing may be dated back to the late 2^{nd} or early 1^{st} millennium BCE, well before the conquest of Mesopotamia by Cyrus the Great.

Conclusion

Far-reaching similarities between Shamash and Mithra may be treated as support for the thesis that Mesopotamian religion influenced Iran as early as in times of the *Avesta*. Later their intensity weakened due to henotheistic trends and the exaltation of Ahuramazda. However, the reform of Artaxerxes II again used the Mesopotamian model of a planetary triad Sin–Shamash–Ishtar, where Ahuramazda took the position of the Moon-God, though deprived of lunar attributions. It may be concluded that there are two distinct phases of Mesopotamian influence on Iranian concept of the Sun-God: the first dating back to Avestan times or even earlier, the second related to the imperial unifying policy of Artaxerxes II.

Abbreviations

AfO	Archiv für Orientforschung, Horn
AnOr	Analecta Orientalia, Roma
Ap	^{mul}*APIN* series
ARAK	H.C. Hunger, Astrological Reports to Assyrian Kings
AS	Acta Sumerologica
BiM	Bibliotheca Mesopotamica, Malibu
BM	British Museum, London
CHI	Cambridge History of Iran
CM	Cuneiform Monographs, Groningen

CNI	The Carsten Niebuhr Institute of Near Eastern Studies Publications, Copenhagen
GMS	Grazer Morgenländische Studien, Graz
HSM	Harvard Semitic Museum
JAOS	Journal of the American Oriental Society
JCS	Journal of Cuneiform Studies
JNES	Journal of Near Eastern Studies
JRAS	Journal of the Royal Asiatic Society of Great Britain and Ireland
JSOR	Journal of the Society of Oriental Research
JSS	Journal of Semitic Studies
K	Kuyunyik (the inventory number)
KAR	Keilschrifttexte aus Assur religiösen Inhalts, ed. E. Ebeling
MCiv	Mesopotamian Civilizations, Winona Lake
MN	Mihr Niyayesh (Avesta)
MY	Mihr Yasht (Avesta)
NABU	Nouvelles Assyriologiques Brèves et Utilitaires
NCBT	Newell Collection of Babylonian Tablets
ONS	Orientalia – Nova Series
RA	Revue d'Assyriologie et d'Archéologie Orientale, Paris
RV	Rig Veda
SAA	States Archives of Assyria, Helsinki
SNKF	Occasional Publications of the Samuel Noah Kramer Fund, Philadelphia
TAPS	Transactions of the American Philosophical Society, Philadelphia
VA	Vorderasiatische Abteilung, Staatliche Museen, Berlin
VAT	Vorderasiatische Abteilung Tontafel
ZA	Zeitschrift für Assyriologie

Bibliography

Alster B.
1991: *Incantation to UTU*, AS 13, pp. 27–96.

Beaulieu P.A.
1993: *The Impact of Month-lengths on the Neo-Babylonian Cultic Calendar*, ZA 83, pp. 66–87.

Blois de F.
1996: *The Iranian Calendar*, "Iran" 34, pp. 39–53.

Boyce M.
1975: *Mihragan among the Irani Zoroastrians* [in:] "Mithraic Studies, Proceedings of the First International Congress of Mithaic Studies", ed. J.R. Hinnells, vol. I, London, pp. 106–118.
1979: *Zoroastrians, Their Religious Belifes and Practices*, London.
1982: *History of Zoroastrianism*, vol. 2: *Under Achaemenians*, Leiden.

Briant P.
2002: *From Cyrus to Alexander. A History of the Persian Empire*, Winona Lake.

Cohen M.
1993: *The Cultic Calendars of the Ancient Near East*, Bethesda.

Dombart Th.
1928: *Das babylonische Sonnentor und die "Säge" des Šamaš*, JSOR 12, pp. 1–24.

Douglas Van Buren E.
1944: *The giš-ti and the giš-ka-an-na*, ONS 13, pp. 281–287.
1945: *Symbols of the Gods in Mesopotamian Art*, AnOr 23, Roma.
1955: *The Sun-God Rising*, RA 49, No. 1, pp. 1–14.

Dumézil G.
1977: *Les dieux souverains indo-européens*, Paris.

Frye R. N.
1975: *Mithra in Iranian History* [in:] "Mithraic Studies, Proceedings of the First International Congress of Mithaic Studies", ed. J.R. Hinnells, vol. I, London, pp. 62–67.

Gurney O.R.
1962: *Tammuz Reconsidered: Some Recent Developments*, JSS 7, pp. 147–160.

Hall M.G.
1986: *A Hymn to the Moon-God, Nanna*, JCS 38, No. 2, pp. 152–166.

Hartner W.
1985: *Old Iranian Calendars*, CHI 2, pp. 714–792.

Heimpel W.
1986: *The Sun at Night and the Doors of Heaven in Babylonian Texts*, JCS 38, No. 2, pp. 127–151.
1989: *The Babylonian Background of the Term "Milky Way"* [in:] "DUMU-E_2-DUB-BA-A. Studies in Honor of Åke W. Sjöberg", ed. H. Behrens, D. Loding, M.T. Roth, SNKF 11, Philadelphia, pp. 249–252.

Horowitz W.
1993: *A Parallel to Shamash Hymn 11–12 and the* Melammu *of the Sun*, NABU, No. 3, pp. 54–55.
1998: *Mesopotamian Cosmic Geography*, MCiv 8, Winona Lake.

Hunger H.C.
1992: *Astrological Reports to Assyrian Kings*, SAA 8, Helsinki.

Hunger H.C., Pingree D.
1989: *MUL.APIN. An Astronomical Compendium in Cuneiform*, AfO Bh. 24, Horn.

Koch-Westenholz U.
1995: *Mesopotamian Astrology. An Introduction to Babylonian and Assyrian Celestial Divination*, CNI 19, Copenhagen.

Kramer S.N.
1963: *The Sumerians, Their History, Culture, and Character*, Chicago – London.

Lamberg-Karlovsky C.C.
1985: *The longue durée of the Ancient Near East* [in:] "De l'Indus aux Balkans. Recueil a la mémoire de Jean Deshayes", ed. J.-L. Huot et al., Paris, pp. 55–72.

Langdon S.
1915: *A Fragment of a Series of Ritualistic Prayers to Astral Deities in the Ceremonies of Divination*, RA 12, pp. 189–192.
1928: *The Legend of kiškanu*, JRAS, pp. 843–848.

Lewy H., Lewy J.
1948: *The God Nusku*, ONS 17:1948, pp. 146–159.

Livingstone A.
1986: *Mystical and Mythological Explanatory Works of Assyrian and Babylonian Scholars*, Oxford.
1997: *How the Common Man Influences the Gods of Sumer* [in:] "Sumerian Gods and Their Representations", ed. I.L. Finkel, M.J. Geller, CM 7, Groningen, pp. 215–220.

Łyczkowska K.
1995: *Babilońskie zaklęcia magiczne*, Warszawa.

Oelsner J., Horowitz W.
1998: *The 30-Star-Catalogue HS 1897 and the Late Parallel BM 55502*, AfO 44–45:1997–1998, pp. 176–185.

Pettinato G.
1998: *La scrittura celeste. La nascita dell' astrologia in Mesopotamia*, Milano.

Reiner E.
1958: *Šurpu. A Collection of Sumerian and Akkadian Incantations*, AfO Bft 11, Graz.
1995: *Astral Magic in Babylonia*, TAPS 85, part 4, Philadelphia.
1996: *Suspendu entre ciel et terre...* [in:] "Collectanea Orientalia. Histoire, arts de l'espace et industrie de la terre. Études offertes en hommage à Agnès Spycket", ed. H. Gasche, B. Hrouda, Paris, pp. 311–313.

Reiner E., Pingree D.
1981: *Babylonian Planetary Omens. Part Two: Enuma Anu Enlil, Tablets 50–51*, BiM 2:2, Malibu.

Rochberg-Halton F.
1984: *New Evidence for the History of Astrology*, JNES 43, pp. 115–140.

Scurlock J.A.
1988: *KAR 267/BMS 53: a Ghostly Light on bit rimki?*, JAOS 108, pp. 203–209.

Seidl U.
1968: *Die babylonische Kudurru-Reliefs*, "Baghdader Mitteilungen" 4, pp. 1–220.

Seux P.J.
1976: *Hymnes et prieres aux dieux de Babylone et d'Assyrie*, Paris.

Starr I.
1983: *The Rituals of the Diviner*, BiM 12, Malibu.

Turcan R.
1993: *Mithra et le mithriacisme*, Paris.

Wallenfels R.
1993: *Zodiacal Signs among the Seal Impressions from Hellenistic Uruk* [in:] "The Tablet and the Scroll. Near Eastern Studies in Honor of William W. Hallo", ed. M. Cohen, D.C. Snell, D.B. Weisberg, Bethesda, pp. 281–289.

Weidner E.F.
1915: *Handbuch der Babylonischen Astronomie*, Leipzig.

Wiesenhöfer J.
2002: *Das Antike Persien*, Düsseldorf – Zürich.

Wiseman D.J.
1958: *The Vassal-Treaties of Esarhaddon*, "Iraq" 20, No. 1, pp. 1–99.
1969: *A Lipšur Litany from Nimrud*, "Iraq" 31, No. 2, pp. 175–183.

Wolters A.
1993: *An Allusion to Libra in Daniel 5** [in:] "Die Rolle der Astronomie in den Kulturen Mesopotamiens. Beiträge zum 3. Grazer Morgenländischen Symposion (23–27 September 1991)", ed. H.D. Galter, GMS 3, Graz, pp. 291–306.

The Philosophy of Time and Time Telling Devices in the Early Islamic World[1]

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Abstract: *This paper aims to survey and discuss the conception of time in the Early Islamic world (7th century AD onwards), with special reference to its manifest role in a religious framework that permeated every aspect of daily life. Special focus is set to socio-historical reasons for an Islamic lunar-based chronological conception and the practical problems that arose when Islam went beyond the geographical boundaries of the Arabian peninsula. Later developments (Mir Damad and the School of Isfahan) are surveyed briefly with regards to how 'Islamic' philosophy of time handled the authority of the Koran. The final part is devoted to the discussion of selected time-telling devices from early Islamic contexts.*

Keywords: History of Arabia, Islam, Time, Koran, Mir Damad, Waterclocks

The physical essence of time – since it leaves no mark of its own as it passes – is still a borderline problem both natural scientists and humanities scholars have to struggle with. Proverbial accounts on the phenomenon of time are countless, but one of them characterises the paradox of our situation quite to the point, as St. Augustinus stated in his "Confessiones" (11,14); *Quid est ergo tempus? si nemo ex me quaerat, scio; si quaerenti explicare velim, nescio* – What then is time? If no one asks me, I know what it is. If I wish to explain it to the one who asks, I do not know.

Apart from the manifold mathematical and physical attempts to find a satisfying explanation for the phenomenon of time, a more humanities-based research outline seems to be equally challenging: that is the question how and why different cultures or societies in different ages managed to visualize time, to make it conceivable, and to translate this 'invisible' or 'intangible' phenomenon into concrete monuments comprising clocks, calendars, almanachs, thus time-telling devices in their broadest sense. The replication of stellar phenomena through abstract devices is likewise specific for every culture, raising the questions of how, why and to what degree different conceptions of time were adopted under what historical, social and ideological circumstances. Thus, a conception of time – though different in expression – is a consistent feature of every pre- or early historic society – and something not restricted to Western

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civilisation, a position that was still defended in the 'advanced' 20th century by several scholars (cf. Breasted 1935).

However, in the words of the sociologist and philosopher Norbert Elias, time can be understood as a sophisticated act of human synthesising that can be only deciphered through contextualising socio-historical evolution (Elias 2000). The following contribution tries to discuss these issues in the context of the advent of Early Islam in the Near East.

In order to investigate the philosophy of time and early time-telling devices in the Early Islamic world, one should first survey the political and socio-cultural basis of the Arabian Peninsula in the early first millennium AD.

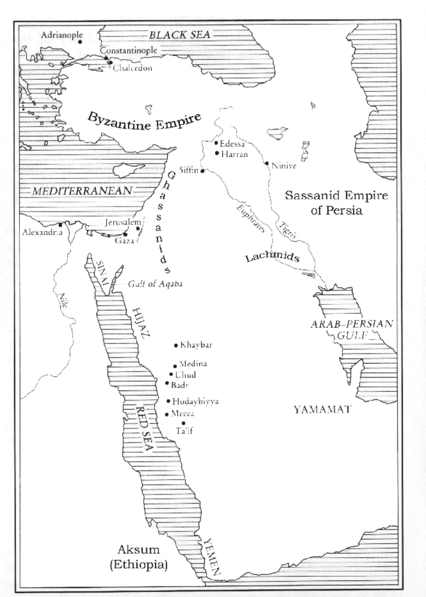

Fig. 1. The Near East in the early first millennium AD (after Mernissi 1991, with additions).

Since the third century AD, the Near Eastern world had suffered from a severe economic downturn, especially a recession in trade. One reliable archaeological indicator for this decline is the rapid decrease in numbers of Roman coinage, but it is also archaeologically attested by recent survey projects (Bobzin 2000, 590; Lewis 1997, 61; Kennet 2005, 116).

The economic situation apart, the political situation was uncertain. The two main powers in the region, the Byzantine world in the West, comprising large parts of Asia Minor, the Levant, Northern Africa and Southeast Europe, and the Neo-Persian Sassanid realm, were constantly at war in the early centuries AD. However, from about AD 384–502, both empires remained – at least from a broad historical perspective – peaceful neighbours, with no far-ranging conflicts recorded. They both had buffer-states in the Northern fringes of the Arabian peninsula: the Ghassanides (Banu Gassan) in the northwest, Byzantine vassals; and the Lachmides on the Lower Euphrates, loyal retainers of the Persians.

This fairly stable political construct was challenged by the so-called Himyarites regime in Northern Arabia and the emerging early Christian monarchy of Aksum in Ethiopia, whose ruler king Ezana converted to Christianity in the middle of the 4th century AD (Bobzin op. cit.; Lewis op. cit.).

Yet for the Arabian peninsula, the main focus of our considerations, these local political developments were nevertheless of minor importance. Prior to the rise of Islam, and partly due to the more than 100 years of peace between the Byzantium and the Sassanid realm, the region had become economically almost isolated. Most of the formerly flourishing surface trade networks collapsed, as neither empire showed any great interest in reviving trade with Arabia. The traditional caravan routes leading through the peninsula were considered as being too expensive to maintain, thus too insecure to risk the loss of precious goods trafficked across the desert from oasis to oasis (Lewis op. cit.). Ironically enough, the period of peace seemed to have a profound negative effect on Arabian culture and economy: Arabia, already a region with a long-lasting semi-nomadic tradition, slowly regressed into a landscape populated mainly by mobile Bedouin clans, with camel-breeding as one the most efficient ways to earn a living (Bobzin op. cit.; Peters 1973, 41).

That said, there were times when Arabia strongly featured in Byzantine-Sassanid affairs. For example, at the time when Mohammed, a member of the Quraish clan and the future prophet of Islam, was born around AD 570/571 in a small oasis village called Mecca, war has broken out again between Byzantium and Persia. Both were again trading with the Arabian peninsula, which once more became strategically important for both sides. Nevertheless, the bulk of the population in both Northern and even the traditionally better developed Southern Arabia remained largely mobile, only slowly recovering from the economic and cultural isolation that had lasted more than one century (Lewis op. cit.).

While the region of Arabia was in this state of social, economic and political flux, it was natural that competing religious beliefs should appear. A map displaying the geographical distribution of different religious communities in Arabia at the time is still not an easy task to accomplish, even more so if one tries to measure the unprecedented success of the new Islamic religion and its enormously quick spread in the Near Eastern world, a phenomenon that still needs some fully convincing historical explanation (Bobzin 2000, 51).

Some parts of the region, however, and especially the Arabian peninsula, was one early focus for Christian missionaries. One of the oldest documents to prove a Christian impact on Arabia (or at least the region South of Damascus) seems to be the "Letter to the Galatians", assigned to the Paul the Apostle, in which he states that he stayed in "Arabia" after his conversion (Gough 1961, 108).

As it was, at this time 'Arabian' Christians had already split from the Byzantine mother church, to form two main branches – Jacobites and Nestorians – after quarrelling over theological issues, mainly concerning the 'real nature' of Christ. Nevertheless, since the Holy Koran labels Christians several times with the 'Syrian' clerical expression "Nasārā", we have good reason to assume that the Central and Southern parts of the Arabian peninsula were converted by Syrian Christians (Trimingham 1990, 243; Cragg 1991, 71; Bobzin 2000, 55).

Either way, by the 7th century, most Arabs in the border regions were fully Christianised, and Early Christian communities were settled in Nadjran and Yemen. There was also a significantly high Jewish presence in the region.

The early presence of people with Jewish beliefs is best attested for Al-Madina, the later 'city of the prophet'. Formerly known as Yathrib or "Yrthrb", or, according to the Roman geographer Ptolemy "Yathrippa" (Newby 1988, 11, 24; Bobzin 2000, 59), this was inhabited by mainly Jewish tribes by the time of the flight of Mohammed in AD 622. Other early centres like Mecca yield likewise evidence for Jews, since "Al-Yahud" and Israelites ("Banu Isra'il") are mentioned in those parts of the Koran revealed there to Mohammed (Bobzin 2000, 59). The Jewish presence in Arabia is to be linked to three main historical events, which saw large scale migration of Jewish people from their homeland. The first was after the Babylonian king Nebukadnezar conquered Jerusalem in 586 BC. The second followed the profound Roman devastation of Jerusalem in AD 70. The third wave of immigration can be seen in the context of the Bar Kochba upheaval in AD 135 (Newby 1988, 28).

Whatever the impact of Judaic and Christian beliefs in the region was at this time, paganism probably predominated. Pagan religion in Central Arabia was – in our modern understanding – polytheistic, hence a primary task for the prophet was to fight against pagan beliefs. Paganism comprised local cults, but some centres of regional importance were dedicated to one major or primary deity ("Hochgott") or minor subordinated ones. The best known is the Kaa'ba ("cube") whose original focus of worship was a small meteor and the statue of Hubal, and Al'Uzzā (a Venus equivalent?), with its worship centre in the Nachla valley neighbouring Mecca (Gese/Höffner/Rudolph 1970, 237; Bobzin 2000, 54; Müller 2002, 175; Seidensticker 2002). Indeed, most recent research even advocates that the older parts of the Koran are not as harsh in their monotheistic vigour as was formerly attested (Seidensticker 2002, 243).

In sharp contrast, Persian religion (Zoroastrism) stayed exclusively accessible only for native Persians and could therefore not be adopted by other ethnicities (Lewis 1997, 46).

Muslim conception of time and sociological/theological approaches

More than any other region in early medieval times, Mesopotamian and Arabian conceptions of time, in the age of Early Islam, were embedded in a religious "framework". As a matter of fact, in Early Medieval Arabic context the Moon appears to be the most important celestial body and the one paid most respect to especially from the 7th century AD onwards (Vogtherr 2001, 55). Our hypothesis comprises a threefold explanation for this phenomenon: firstly, that the Early Islamic lunar conception of time is firstly rooted in the geographical setting of the primary heartland of Islam; that secondly it should be related to the social structure of the region; and thirdly and most crucially, it should rest on theological foundations.

Regarding the geographical location of the Arabian peninsula, its climate allows the different stages of the lunar cycle to be observed much more clearly, and generally not obstructed by the clouded skies we know from the northern hemisphere.

The lunar predominance as a time-telling celestial body is a well-known phenomenon in Mesopotamian societies from at least 3.000 BC onwards, though a luni-solar calendar system developed as early as the end of the 3rd millennium BC. The Moon as being the 'master of time' may be partly related to the fact that the Sun in equatorial regions could have some negative effects, being responsible for drought periods and resulting catastrophes like dryness, bad harvests and famine (Bickerman 1980, 16; Vogtherr 2001, 9).

Drought conditions encouraged nomadism, and Near Eastern society in the age of Mohammed was dominated by the dichotomy of sedentary ("hadar") and mobile, nomadic ("badu") population, a dichotomy which could be characterized as a stressful "dependent-on-each-other" relationship. The severe economic decline mentioned above, starting in the first millennium AD, resulted in a profound transformation of Arabia's social structure, disturbing the equilibrium of settlements and existing nomadic tribes. Nomadic lifestyle was continuously on the rise, counteracting the decline of permanent settlements (Kennet 2005, 114).

Since the temperature in an arid region like the Arabian peninsula can rise to exhausting levels, the growing number of organised caravan treks was careful enough to keep their daytime activity to a minimum, preferring to travel overnight, avoiding the dangerous heat of the desert sun (cf. Aydüz 2004, 73). Thus, this may be understood as an "eco-social" reason that the Moon should take precedence over the Sun.

Even so, the lunar-based conception of time with its concrete displays in forms of calendars used by the pre-Islamic Arabic nomadic or semi-sedentary societies continued to be widely used (Vogtherr 2001, 17). Furthermore, as an 'ideological' but most crucial argument, the precedence or – even better – the sanctity of the Moon has to be seen in context of a theological dogma. In several Verses – 'Surah' – of the Koran, the Moon is characterised and defined as being the master of time:[2]

> *(Surah 19) –Yunus/Yonah*
> *[10.5] He it is Who made the Sun a shining brightness and the Moon a light, and ordained for it mansions that you might know the computation of years and the reckoning. Allah did not create it but with truth; He makes the signs manifest for a people […].*
>
> *(Surah 36) Ya-Seen/Yasin*
> *[36.40] Neither is it allowable to the Sun that it should overtake the Moon, nor can the night outstrip the day; and all float on in a sphere.*
>
> *(Surah 6) Al-Anaam/Cattle*
> *[6.77] When he saw the Moon rising in splendor, he said: "This is my Lord." But when the Moon set, He said: "unless my Lord guide me, I shall surely be among those who go astray."*

Finally, the by far most significant verse to illuminate the theological linkage with a lunar-based calendar is:

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[2] The following approved English translations/transliterations of several Surah are taken from the Islamic Q'ran and Hadith database hosted by the University of South Carolina (http://www.usc.edu/dept/MSA/quran).

(Surah 9) Al-Tawba/Repentance
Verily the transposing (of a prohibited month) is an addition to Unbelief: the Unbelievers are led to wrong thereby: for they make it lawful one year, and forbidden another year, in order to adjust the number of months forbidden by Allah and make such forbidden ones lawful. The evil of their course seems pleasing to them. But Allah guideth not those who reject Faith.

Concerning our analysis these verses could be conclusively understood as an ideological barrier to prohibit the squeezing in of days, weeks, or months to make the lunar-oriented Muslim year equal to the 'occidental' solar year. As a logical consequence, the independent Muslim lunar year with its 354 days, 12 months and alternating 29/30 days would float through the astronomical solar year in 33 'solar' years (cf. Vogtherr 2001, 55), totally ignoring changing seasons, periods of sowing and harvest whose 'solar' timeframe is logically essential for sedentary life.[3]

Muslim time is therefore declined with a stable precision that is hard to find comparisons for in any other monotheistic religion.[4] The duration of a month is precisely visible – and understandable – for every member of the Muslim community through the waning and waxing of the Moon. The single day – the only chronological unit that respects the Sun as a time-telling device in Muslim temporal conception – is broke down into the five well-known prayer times, standardised in the apocryphal *hadiths* from the 8th century AD. Time, besides space with its 'holy' direction (*qibla*) facing Mecca, seems therefore to have a more pronounced sacred dimension than in any other comparable religion or ideology, though early Christian timekeeping was likewise linked to religious duties, albeit more restricted to life in monasteries. This way of thinking is deeply embedded in the 'last revelation', the Koran, permeating not only every religious but also profane aspect of daily life (cf. King 1990, 245; King 1999, 57).

This strictly lunar-based chronological framework with all its astronomical problems and shortcomings – since the Muslim lunar year is third a day shorter than the astronomical lunar year, additional days had to be added in a 30-year cycle – worked out well for semi- or non-sedentary nomadic groups, but met its limits when time advanced, being forced to respect the demands of sedentary farming societies.

The spread of Islam in the Near Eastern world and beyond, permeating the beliefs of sedentary agricultural communities as well, demanded a modification of the calendar with the introduction of calculations based on the solar year. As early as the 10th century AD we have evidence for attempts to harmonize the Muslim with the occidental time frame, going along with a profound

[3] The starting point for the Muslim calculation of time is the Hijra, the flight of Mohammed from Mecca to Medina in the year 622 AD. To be more precise, the exact day for the beginning of the Muslim calendar was fixed by caliph Omar I (634–644 AD) for Friday, 16 July 622. As one of the main modern consequences Friday still obtains a special position as the "day of gathering" (cf. King 1990, 249; Vogtherr 2001, 58).

[4] It should be noted here that original Jewish timekeeping was also based as well on a lunar calendar, but is now intercalated on a regular basis (cf. Vogtherr 2001, 49).

socio-cultural reorientation. The underlying, quite profane reason was the sheer impossibility of coordinating the trafficking of goods as well as an efficient taxation system for agricultural products with a 'floating' lunar year. The so-called Harag-year, adopted from the Julian calendar system was valid from AD 976 until 1107, while the fiscal year, known as "Maliya", existed from 974/992 parallel to the lunar cycle of the Koran until the 19th century (Vogtherr 2001, 56).

These two totally incompatible timeframes – the lunar and the Maliya – stood opposed to each other, and Islam scholars rejected the acceptance of the fiscal timeframe as an insult to the indisputable truth of Holy Koran (ibid.).

In contrast, Islamic sciences flourished from Medieval to Renaissance times, specifically enriching the fields of mathematics, astronomy and – less well known – philosophy. The phenomenon could be described as an astonishing task to keep some 'creative equilibrium' between the demands of scholarly research and the dogmatic framework of the Koran. The contributions to e.g. mathematical astronomy are well attested and passed far beyond the common intellectual horizon of the Medieval Near Eastern world (cf. Sayılı 1980; King 1987; King 1990), but a late vintage of Islamic philosophy from the 17th century AD is worth having a closer look at in the context of our paper. Mir Burhan al-Din Muhammad Baqir Damad (in short Mir Damad, d. AD 1631), who was born in Astarabad (Persia), and is alternatively known with his honorary title Sayyid al-Afadil ('Prince of the Most Learned'), represents a distinctive type of universal Muslim scholar in Late Renaissance times. Being active both as a jurist and a philosopher, his philosophical accounts in general give us a precise idea about what diverse intellectual sources Muslim scholars incorporated in the context of the dogmatic duties a faithful Muslim had to carry out (cf. Dabashi 1996, 597). Mir Damad's Gnostic philosophical framework was nurtured both by Aristotle and the later Neoplatonist movement, combined with Islamic mystic traditions, strictly respecting the intellectual intangibleness of his confession. This approach likewise permeates his specific accounts on the philosophy of time.

Mir Damad provides us with a threefold hierarchical conception, with the ultimately, everlasting unit on top ('sarmad'), illustrating the relation of permanent to permanent, followed by the atemporal ('dahr' – permanent to changing) and time itself ('zaman' – changing to changing). These spheres are one integral part of Mir Damad's trilateral idea of creation, being distilled into another tripartite definition of 'worlds', again built in hierarchical order: the Everlasting space for divine presence ('al-'alam al-sarmadi), is followed by space for archetypes (al-mujarradat), and the weakest at bottom, the temporal world ('al-'alam al-zamani') with all its shortcomings and corruption (Rahman 1980, 139; Dabashi 1996, 611).

Mir Damad's most brilliant achievement, from both a contemporary and remote perspective, seems to be his accomplishment to install God as the initial 'mechanic' on top of the tripartite chronological hierarchy, not interfering with aspects of the 'temporal' timeframe or world and its imperfectness, thus "establishing a compromise between […] religious law and reason" (op. cit.; A.M. Bihbahani in Mir Damad 1977, lxix) – a characteristic feature of Islamic scholars on the fringe of modern times?

The abstraction of time – A brief survey on early Islamic time-telling devices

Early Medieval time made visible through stunning accomplishments in mechanical engineering, comprised trick vessels, automata, fountains and – in the first instance – clocks working with different, rather complicated mechanisms (cf. Al-Hassan/Hill 1992, 55). Most of these machines were constructed not only as time-telling devices, but to serve aesthetic pleasure.

Like their philosophy colleagues, the most ambitious engineers amongst Muslim scholars could rely on occidental Hellenistic or Roman treatises as source material. A fair number of sources date to the late centuries of the 1st millennium BC. Amongst the most reliable were Vitruvius, who mentions an Egyptian engineer, Ctesibius (working in Alexandria in approx. 300 BC) who was the inventor of the monumental water clock. Another source that definitely nurtured Islamic engineering was "The Pneumatics" of Philo of Byzantium (about 230 BC), known to us only from a number of Arabic translations (ibid.; Hill 1993, 122).[5] Two more works directly related to engineering and used by Islamic scholars were "The Pneumatics" and "The Automata", compiled by Hero of Alexandria in the 1st century AD. But of particular interest for us is a book "The Water Clock" or "On the construction of Water Clocks" assigned to Archimedes, another document that survived only in its Arabic translations, highly likely done in the 9th century AD (the Arabic originals are still available in libraries of London, Paris and Oxford). It has to be noted that only a part of the manuscript – namely the first two chapters – is assigned to Archimedes' authorship: the following chapters may be Hellenistic, Byzantine and especially Islamic additions (ibid.).

One of the important original Islamic sources that remains available is the "Book of Ingenious Devices", written by the Banu Musa in Baghdad in the mid-9th century AD.

In addition, there is a quite non-technical treatise – in terms of being written in an easy or "profane" style for an engineer – written by Ridwan b. al-Saati ('the clockmaker') in 1203, describing maintenance work to a large water-clock built by his father at the Jayrun-Gate, the main entrance of the Ummayad-mosque in Damascus (Hill 1993, 124).

Another Islamic masterpiece of pre-Renaissance times is the book on machines written 1206 AD by Ibn al-Razzaz al-Jazari, perhaps from Diyarbakır, or, as his name indicates, from a village called Jazar (ibid.; Hill 1981).

By contrast, occidental (European) science and technology remained backward compared with the intellectual standards in the Early Islamic world.

[5] This is just one example to show how beneficial the early Islamic scholars behaved towards Latin and Greek originals for the preservation of ancient knowledge, as many antique documents are only known to us because of translations prepared in the Muslim world.

This is well illustrated by the following example: a chronicle reports that Charlemagne was granted a gift from Sultan Harun al-Rashid of Baghdad in the year AD 807. The famous Western emperor was sent "a brass clock, a marvellous mechanical contraption", greatly admired by the Charlemagne's court, but his court proved unable to maintain this exotic mechanical device (cf. Dohrn-van Rossum 2004, 10). Most unfortunately, none of these masterly constructions – or even parts of it – survived as an artefact, leaving us with only scant accounts and descriptions to reconstruct these devices.

Conclusion

Time, its calculation and abstraction in (Early) Islam was strictly based on a lunar-based chronological framework, any intercalations, adjustments or whatever modifications to harmonize it with a solar-oriented annual conception being theologically forbidden, thus providing Muslim chronology with a rather unique sacred dimension.

Intellectual attempts to overcome the discrepancy of free philosophical reasoning about time and its essence opposing the intangible theological framework, as exemplified by Mir Damad of the School of Isfahan, should furthermore highlight the scholarly dimension of Islamic conception of time.

The Koran itself – both as a law code and a spiritual guide – nevertheless neither forbids nor condemns ancient accounts on technology. This made it possible for Early Islamic scholars not only to refine ancient technologies from the Hellenistic/Roman times, but to contribute astonishing mechanical time-telling devices, using the scholarly foundation of the Classical writers: thus the accomplishments in Islamic astronomy to survey and interpret the celestial mechanisms, paying respect to both religious authority and the intellectual stimulation of ancient Oriental and Occidental heritage.

Bibliography

Al-Hassan A.Y., Hill D.R.
1992: *Islamic Technology. An Illustrated History,* Cambridge/Paris.

Aydüz S.
2004: *Calendars and Almanacs in Islamic Culture*, "P-Art and Culture Magazine" 11, pp. 72–85.

Bickerman E.J.
1980: *Chronology of the Ancient World*. 2nd Edition, New York.

Bobzin H.
2000: *Mohammed,* Munich.

Breasted H.J.
1935: *The Beginnings of Time Measurement and the Origins of our Calendar*, "Scientific Monthly" 41, pp. 289–304.

Cragg K.
1991: *The Arab Christian. A History in the Middle East*, Louisville.

Dabashi H.
1996: *Mir Damad and the Founding of the "School of Isfahan"*. In: S. H. Nasr/O. Leaman (eds.), "History of Islamic Philosophy", London/New York, pp. 597–634.

Dohrn-van Rossum G.
2004: *Time Experienced Time Measured*, "P-Art and Culture Magazine" 11, pp. 4–17.

Elias N.
2000: *Über die Zeit*, Frankfurt/M.

Gese H., Höfner M., Rudolph K.
1970: *Die Religionen Altsyriens, Altarabiens und der Mandäer*, Stuttgart.

Gough M.
1961: *The Early Christians*, New York/Washington.

Hill D.R.
1981: *Arabic Water Clocks*, Aleppo.
1993: *Islamic Science and Engineering*, Edinburgh.

Kennet D.
2005: *On the Eve of Islam: Archaeological Evidence from Eastern Arabia*, "Antiquity" 79, pp. 107–118.

King D.
1987: *Some Early Islamic Tables for Determining Lunar Crescent Visibility*. In: D.A. King/G. Saliba (eds.), "From Deferent to Equant: A Volume of Studies in the History of Science in the Ancient and Medieval Near East in Honour of E.S. Kennedy", New York, pp. 185–225.
1990: *Science in the Service of Religion: the Case of Islam*, "Impact of Science on Society" 159, pp. 245–262.
1999: *Time and Space in Islam*. In: K. Lippincott/U. Eco/E.H. Gombrich (eds.), "The Story of Time", London, pp. 56–59.

Lewis B.
1997: *Stern, Kreuz und Halbmond. 2000 Jahre Geschichte des Nahen Ostens*, Munich.

Mernissi F.
1991: *The Veil and the Male Elite*, Reading, Mass.

Mir Damad, Muhammed Baqir
1977: *Kitab al-qabasat*, M. Mohaghegh/T. Izutso/A.M. Bihbahani/I. Dibaji (eds.), Tehran.

Müller W.W.
2002: *Religion und Kult im antiken Südarabien*. In: M. Krebernik/J. van Oorschot (eds.), "Polytheismus und Monotheismus in den Religionen des Vorderen Orients". Alter Orient und Altes Testament, Vol. 298, Münster, pp. 175–194.

Newby G.D.
1988: *A History of The Jews of Arabia. From Ancient Times to their Eclipse Under Islam*, Columbia.

Peters F.E.
1973: *Allah's Commonwealth: A History of Islam in the Near East, 600–1100 AD*, New York.

Rahman F.
1980: *Mir Damad's Concept of Huduth Dahri: A Contribution to the Study of God-World Relationship Theories in Safavid Iran*, "Journal of Near Eastern Studies" 39, pp. 139–151.

Richards E.G.
1998: *Mapping Time. The Calendar and its History*, Oxford.

Sayılı A.
1988: *The Observatory in Islam and its Place in the General History of the Observatory*, Ankara.

Seidensticker T.
2002: *Der Islam: Vom "Hochgottglauben" zum Monotheismus*? In: M. Krebernik/J. van Oorschot (eds.), „Polytheismus und Monotheismus in den Religionen des Vorderen Orients". Alter Orient und Altes Testament, Vol. 298, Münster, pp. 235–244.

Trimingham J.S.
1990: *Christianity Among the Arabs in Pre-Islamic Times*, Beirut.

Vogtherr T.
2001: *Zeitrechnung. Von den Sumerern bis zur Swatch*, Munich.

On Timekeeping by the Lunar Mansions in Medieval Egypt

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Abstract: *Astronomy in medieval Islamic society knew different astronomical traditions, from a highly sophisticated scientific and mathematical astronomy to a simple popular and folk astronomy. One topic in this folk astronomical tradition was timekeeping by the lunar mansions, an approximate but useful method of determining the hours of night described in several calendars, almanacs, and other folk astronomical treatises written during the Middle Ages in the Islamic World. One of these treatises is preserved in Dublin, Chester Beatty Library 4538, written by al-Ṣiqillī and containing short texts with tables and schemes. Besides its content – a common method of approximate timekeeping in medieval Islamic astronomical traditions – the remarkable form in which the data is presented is of interest: While the method al-Ṣiqillī uses is folk astronomical, his presentation with tables and schemes is more typical of the scientific tradition of astronomy.*

Keywords: Egypt, Islam, lunar mansions, Middle Ages, timekeeping by night

> „It is He who has made the sun to be a light (of glory at day) and the moon to be a lustre (of beauty at night), and ordained for it stages, that you might know the number of the years and the determination (of time).“ (Qurʾān, Sūra 10,5)

This paper introduces a treatise on the lunar mansions written by al-Ṣiqillī in Egypt possibly around 1300.[1] It deals with a method of timekeeping by night, common in medieval Islamic folk astronomy and unique in its mode of presentation.

1. The method

Timekeeping by night by means of the lunar mansions is widely described in folk astronomical sources not belonging to the highly sophisticated tradition of

[1] On the dating of the treatise and the manuscript see below nn. 9 and 11. The author is working on a detailed study of al-Siqillī's text including edition, translation, and commentary.

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mathematical – or scientific – astronomy in medieval Islamic societies.[2] To understand this approximate method some preliminary remarks about the lunar mansions are required.

Table 1. The lunar mansions.

No.	Name	Modern Designation[3]
(1)	*al-sharaṭān*	βγ Ari or βα Ari
(2)	*al-buṭayn*	εδϱ Ari
(3)	*al-thurayyā*	the Pleiades (M 45 with η Tau)
(4)	*al-dabarān*	α Tau
(5)	*al-haqʿa*	λφ^{1,2} Ori
(6)	*al-hanʿa*	γξ Gem
(7)	*al-dhirāʿ*	αβ Gem
(8)	*al-nathra*	ε Cnc or εγδ Cnc
(9)	*al-ṭarf*	δ or χ Cnc and λ Leo
(10)	*al-jabha*	ζγηα Leo
(11)	*al-kharātān*	δθ Leo
(12)	*al-ṣarfa*	β Leo
(13)	*al-ʿawwāʾ*	βηγε Vir, sometimes additionally δ Vir
(14)	*al-simāk*	α Vir
(15)	*al-ghafr*	ικλ Vir or ικ Vir
(16)	*al-zubānā*	αβ Lib
(17)	*al-iklīl*	βδπ Sco
(18)	*al-qalb*	α Sco
(19)	*al-shawla*	λν Sco
(20)	*al-naʿāʾim*	γδεη Sgr and σφτζ Sgr
(21)	*al-balda*	an empty region without any stars
(22)	*saʿd al-dhābiḥ*	α^{1,2} νβ Cap
(23)	*saʿd bulaʿ*	με Aqr, sometimes additionally Fl. 7 Aqr or ω Aqr
(24)	*saʿd al-suʿūd*	βξ Aqr and c^1 Cap
(25)	*saʿd al-akhbiya*	γπζη Aqr
(26)	*al-fargh al-muqaddam*	αβ Peg
(27)	*al-fargh al-muʾakhkhar*	γ Peg and α And or γδ Peg
(28)	*baṭn al-ḥūt*	β And

[2] For examples see Forcada, *Mīqāt*, 1990; Ibn ʿĀṣīm (Forcada), *Kitāb al-Anwāʾ*, 1993, p. 117f; Schmidl, *Dusk and Dawn*, 2004, p. 397f; Schmidl, *Volksastronomische Abhandlungen*, 2005, 'O,33b–36a: Über den Anbruch der Morgendämmerung während des Aufgangs einer der Mondstationen', 'B,39b–71b: Über die Mondstationen', and 'M,24a–27b: Der achte Abschnitt über die Bestimmung des Anbruchs der Morgendämmerung'; for the terminology folk astronomy versus scientific or mathematical astronomy see below n. 25.

[3] Following Kunitzsch, *al-Manāzil* in EI[2], S. 374b f; for additional and different information see Varisco, *Islamic Folk Astronomy*, 2000, p. 621; and Schmidl, *Volksastronomische Abhandlungen*, 2005, p. 632ff (3.0.2 Astronomische Grundlagen).

1.1. The lunar mansions in Islamic astronomy

The lunar mansions of medieval Islamic astronomy comprise 28 stars and groups of stars in a belt around the ecliptic (see **Tab. 1**).

Every night of its monthly journey the Moon stays in or near one of these stations. While the 12 zodiacal signs divide the ecliptic in 12 equal parts of 30°, the lunar mansions imply a smaller and finer division into 28 segments usually of 12° or 13°. Common opinion states that the lunar mansions go back to Indian sources; in medieval Islamic astronomy they were associated with the *anwāʾ* stars, a system based on the acronychal setting and heliacal rising of a group of stars used in pre-Islamic Arabia probably for calendrical purposes, and for weather predictions.[4]

1.2. Timekeeping by night by means of the lunar mansions

Besides their meteorological, astrological, and magical significance the lunar mansions were used in the Islamic Middle Ages – as were the decans in Egyptian astronomy (up to before the New Kingdom, c. 1530 BC) for calendrical purposes and timekeeping by night.[5] On the one hand, roughly every 13th day a new lunar mansion rises at daybreak. These heliacal risings divide the year in 28 equal parts.[6] On the other hand, within this space of 13 days specific lunar mansions rise in the east, set in the west, or culminate at different moments of one night; 12 hours are equivalent to the time of the rising, the setting, or the culmination of 14 lunar mansions. Starting with sunset a given lunar mansion rises in the east, sets in the west, or culminates. After six-sevenths of an hour (about 50 minutes), the following lunar mansion rises, sets, or culminates.[7]

Technical terms are applied to some of these lunar mansions which rise, set, or culminate during a given night. These designations mostly reflect the time when a lunar mansion becomes significant – i.e., daybreak, sunrise, etc. – and sometimes their state – i.e. rising, setting, etc. Usually these specific lunar mansions were counted beginning with the Mansion of Daybreak, i.e. the

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[4] For a general introduction to the lunar mansions and the *anwāʾ*-system see Kunitzsch, *Manāzil* in EI²; and Pellat, *Anwāʾ* in EI².

[5] For the origin of the *anwāʾ*-system see also Varisco, *Origin*, 1991; for the use of the lunar mansions see al-Bīrūnī (Sachau), *Chronology*, 1879, p. 335ff, and Varisco, *Magical Significance*, 1995; for the use of the decans for timekeeping by night see Neugebauer, *Decans*, 1960.

[6] Only *al-jabha* has 14 days to fill up the 365 days of a regular solar year (cf. al-Bīrūnī (Sachau), *Chronology*, 1879, p. 339: "The interval between the risings of two consecutive Lunar Stations is 13 days, except the interval between the rising of *Aljabha* (the 10th Station) and the following Station, which is 14 days.") For an example of the calendrical use of the lunar mansions see the shadow observations done by al-Aṣbaḥī in 13th c. Yemen (see Schmidl, *Volksastronomische Abhandlungen*, 2005, 'O,51a–52a: Über den Mittagsschatten in al-Janad').

[7] This method is shortly explained in Forcada, *Mīqāt*, 1990, p. 63f, and Schmidl, *Dusk and Dawn*, 2004, p. 397; it is fully discussed in Schmidl, *Volksastronomische Abhandlungen*, 2005, esp. 'O,33b–36a: Über den Anbruch der Morgendämmerung während des Aufgangs einer der Mondstationen', 'B,39b–71b: Über die Mondstationen', and 'M,24a–27b: Der achte Abschnitt über die Bestimmung des Anbruchs der Morgendämmerung'.

mansion which rises at daybreak. Starting there, other specific mansions follow accordingly.[8] With these premises the lunar mansions can be used as a simple star clock (see **Fig. 1**).

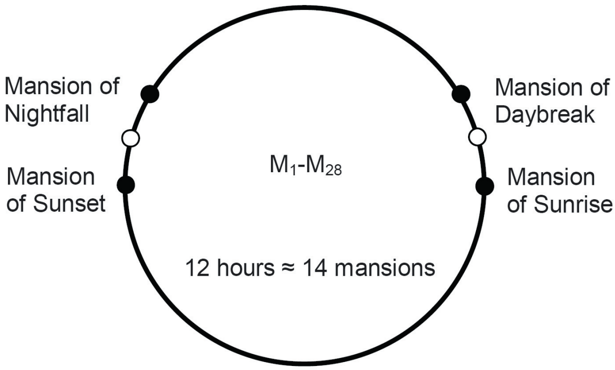

Fig. 1. The lunar mansions used as a star clock.

1.3. al-Ṣiqillī's treatise on timekeeping by means of the lunar mansions

One treatise where we find this approximate method of timekeeping by night by means of the lunar mansions is written by a certain al-Ṣiqillī, otherwise unknown. Besides this text we lack further information about the author. The name al-Ṣiqillī – which means literally 'the man from Sicily' – indicates that he or his family came from Sicily. Where and when he flourished is uncertain. According to David A. King, al-Ṣiqillī worked in Egypt about 1300.[9] Fifty years

[8] For example, the 11th-century Hijazi author Ibn Raḥīq mentions several specific mansions with their interdependence in his folk astronomical treatise: the Mansion of Daybreak, the Descending Mansion which is opposite, the Mansion of Sunrise which rises two mansions later than the Mansion of Daybreak, and the mansion opposite the Mansion of Sunset (see Schmidl, *Volksastronomische Abhandlungen*, 2005, 'B,39b–71b: Über die Mondstationen').

[9] See King, *SATMI* 1, 2004, p. 512. According to the values of the maximum and the minimum solar altitude given in al-Ṣiqillī's treatise (H_{max}=84° and H_{min}=36°) we assume a terrestrial latitude of φ=30° and an obliquity of the ecliptic of either ε=24° or ε=23°35'. φ=30° for Egypt is for example also used by Ibn Yūnus (Egypt, 10th c.) in his *al-Zīj al-kabīr al-ḥākimī* and by al-Fārisī (Yemen, 13th c.) in his *al-Zīj al-Muẓaffarī* (cf. Kennedy & Kennedy, *Coordinates*, 1987, p. 111f). For the obliquity of the ecliptic ε=24° is a common approximate value, Ibn Yūnus uses ε=23°35', as well as al-Fārisī and others (cf. Kunitzsch, *Minṭaḳat al-burūdj* in EI², p. 86, tab., and King, *SATMI* 1, 2004, p. 486). The examination of the midday shadow values given in al-Ṣiqillī's treatise by King, *SATMI* 1, 2004, p. 512f supports this assumption (read for M=4 with Z=1;15 Z=1;50, for M=15 with Z=11;07 Z=10;07).

Based on φ=30° we guess a date of the vernal equinox between the 15th and 18th of March, probably the 16th of March appropriate for the 10th century (cf. Michel, *Traité de l'astrolabe*, 1947, p. 137). Because of the spread of possible dates there is no evidence for dating by means of the date of the vernal equinox. Additionally the dates do not necessarily intend a value observed in the appropriate time. It is quite possible that the values stem from an earlier source or an inaccurate calculation (cf. Poulle, *Dater les astrolabes*, 1956, and Turner, *First Point of Aries*, 2000).

For the heliacal rising of *al-sharaṭān* al-Ṣiqillī mentions the 18th of *Nīsān*; the same date is also used by al-Fārisī (Yemen, 13th c.), al-Qalqashandī (Egypt, 14th c.), al-Maqrīzī (Egypt, 14th/15th c.), and probably by Ibn Raḥīq (Hejaz, 11th c.) (cf. Schmidl, *Volksastronomische Abhandlungen*, 2005, 'M,24a–27b: Der achte Abschnitt über die Bestimmung des Anbruchs der Morgendämmerung').

before, Egypt saw the transition of power from the Ayyubids with their well-known and outstanding representative Saladin to the Mamluks. Under their rule Egypt became the hegemonial power in the Near East virtually untouched by the Mongol invasion. The Mamluks kept up close connections with the Rasulids, the ruling dynasty in the Yemen.[10]

Al-Ṣiqillī's treatise on timekeeping by the lunar mansions is known only in one manuscript, now in the Chester Beatty Library in Dublin (No. 4538). It comprises ca. 28 fols., and is undated.[11] The title page is in a very poor condition. The name of the author, the title of the treatise, and further information such as notes of former owners are barely legible. We can read Abū Aḥmad (?) … b. (?) Hārūn al-Ṣiqillī as the name of the author, and … *Anwāʾ* … as a part of the title.

Julio Samsó suggested recently that this al-Ṣiqillī might be identical with one Abū 'l-Qāsim b. ʿAbd Allāh b. ʿAbd al-Raḥsmān b. Ḥasan al-Qurashī al-Ṣiqillī who made twilight measurements in Cairo and Alexandria, and wrote an astronomical treatise bearing the title – not literally translated – 'Selection of Jewels on Timekeeping' (*al-Intiqāʾ min al-yawāqīt fī ʿilm al-mawāqīt*), otherwise unknown.[12] This text seems to include more subjects and does not appear to be identical with the treatise on timekeeping by the lunar mansions discussed here.

In his treatise al-Ṣiqillī gives on two facing pages information about one specific lunar mansion at the time containing a table on the right, *verso* page, and comprising a scheme in the upper half, and a text in the lower half of the left, *recto* page (see **Fig. 2** and Appendix). The material for each of the lunar mansions is organized in a similar way. Two folios are missing including the scheme and the text for *al-iklīl*, the table, scheme and text for *al-qalb*, and the table for *al-shawla*.

The scheme for each of the lunar mansions shows the stars of the lunar mansion itself and other stars and star groups in their neighbourhood represented by dots and stars of different size.[13] Probably it is relevant for calendrical purposes – to decide in which mansion the moon currently resides – but not for timekeeping by night.

In the text associated with each of the lunar mansions al-Ṣiqillī gives information very similar to the data mentioned in the table. He informs about the date of the heliacal rising of the lunar mansion, and how many days it rises with daybreak. al-Ṣiqillī adds some specific lunar mansions useful for timekeeping by night. Only the Mansion of the Crescent[14], and the lengths of the midday shadow are not mentioned in the tables.

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[10] For a first introduction see the articles by Wensinck et al., *Miṣr* in EI^2; Smith et al., *al-Yaman* in EI^2; Cahen, *Ayyūbids* in EI^2; Holt, *Mamlūks* in EI^2, and Smith, *Rasūlids* in EI^2.

[11] King, *SATMI* 1, 2004, p. 512 suggests "ca. 1300"; Arberry, *Handlist Dublin* 6, 1955ff, p. 12 suggests "10th/16th century".

[12] See Samsó, *Astronomical Observations*, 2001, p. 174, and King, *SATMI* 1, 2004, p. 512. It is very common in treatises on timekeeping in medieval Islamic astronomy to rhyme the word *yawāqīt* (jewels) with *mawāqīt* (timekeeping) (see Schmidl, *Winde*, 1999, p. 136, esp. n. 4).

[13] For simpler graphical representations of the lunar mansion in texts and on instruments see the examples listed in Schmidl, *Volksastronomische Abhandlungen*, 2005, p. 1010, n. 63; and Ackermann, *Path of the Moon*, 2004. For the neighbourhood of the lunar mansions and the interstices see also the sources mentioned by Kunitzsch, *Manāzil* in EI^2, p. 375.

[14] See below **Tab. 2** and n. 23.

The table for each of the lunar mansions in al-Ṣiqillī's treatise is divided into two: the left side serves for calendrical purposes. al-Ṣiqillī mentions the number of the day within the lunar mansion – usually 13 days except for *al-jabha*[15] – and the dates belonging to them in different calendars. The right side is conceived for timekeeping by night. Al-Ṣiqillī subdivides the 12 hours of the night into 14 specific lunar mansions. But what is this detailed subdivision for? John North believes: "Any society that carries out ritual acts by night is likely to devise ways of judging the passing of the night."[16]

The ritual acts and duties most important and most fundamental to Islamic faith and Muslim worship are collected in the five pillars of Islam. They comprise the profession of faith, the pilgrimage to Mecca, worship consisting in the form of the five daily ritual prayers, the fast in Ramaḍān, and alms-giving.[17] Two of these pillars are connected with the hours of the night. During fasting in Ramaḍān eating, drinking and sexual intercourse are forbidden by day, and allowed during the night. It is recommended for the person who is performing the fast to take the *faṭūr*, the meal marking the end of the fast in the evening, as soon as he is sure that the sun has set, and the *saḥūr*, the meal taken after midnight, as late as possible, but before – as the Qurʾān says – "the white thread (of dawn) appears to you distinct from its black thread" (Sūra 2,187).[18] Both of these ritual duties demand some concern for timekeeping by night.

But only the prayer times require an elaborated method of timekeeping by night. Islamic worship involves five daily prayers. There are the daylight prayers at midday and in the afternoon with beginning and end of their times defined by shadow increases, and the twilight prayers in the evening, at night, and in the morning described by twilight phenomena. The evening prayer begins after sunset; the night prayer begins with the disappearance of the red evening twilight, and ends when one third or one half of the night has passed; the morning prayer begins with morning twilight, and ends shortly before sunrise.[19]

In his treatise on timekeeping by night al-Ṣiqillī uses the method by the lunar mansions described above, but without explaining it – a further hint that this method was widespread in medieval Islamic folk astronomy.[20] Al-Ṣiqillī mentions several moments of the night, and the ascending, descending, culminating, and opposite lunar mansion belonging to it (see **Tab. 2**). In the following summary 'M' stands for 'lunar mansion', the first index for the point of time (e.g. 'A' for 'daybreak'), the second index for the status (e.g. 'a' for 'ascending'); $M_{A(a)}$ is the ascending lunar mansion at daybreak.

[15] See above n. 6.
[16] North, *History of Astronomy*, 1994, p. 13.
[17] For a short overview see *Rukn 1. In Religious and Legal Usage* in EI²; see also Juynboll, *Handbuch*, 1910, p. 57ff.
[18] See Berg (ed.), *Ṣawm* in EI², esp. p. 94b.
[19] See Schmidl, *Dusk and Dawn*, 2004, p. 394ff.
[20] For example Ibn Raḥīq (Hijaz, 11th c.), and al-Fārisī (Yemen, 13th c.) explain this method (see Schmidl, *Volksastronomische Abhandlungen*, 2005, 'B,39b–71b: Über die Mondstationen', and 'M,24a–27b: Der achte Abschnitt über die Bestimmung des Anbruchs der Morgendämmerung').

Tab. 2. Specific lunar mansions used for timekeeping by night in al-Ṣiqillī's treatise.

$M_{A(a)}$		Mansion of the Morning Twilight (Mansion of Daybreak), the mansion rising at daybreak (heliacal rising)	Morning Prayer
$M_{T(a)}$	$M_{T(a)} = M_{A(a)} + 1$	Mansion of the Shadow	Morning Prayer
$M_{S(a)}$	$M_{S(a)} = M_{A(a)} + 2$	Mansion of the Sun, the mansion rising with sunrise (cosmical rising)	Morning Prayer
$M_{1(a)}$	$M_{1(a)} = M_{A(a)} - 3$	Mansion of the First Call for Prayer (*adhān awwal*)	Morning Prayer (?)
$M_{2(a)}$	$M_{2(a)} = M_{A(a)} - 2$	Mansion of the Second Call for Prayer (*adhān thānī*)	Morning Prayer (?)
$M_{B(a)}$	$M_{B(a)} = M_{A(a)} - 12$ or $M_{B(a)} = M_{A(a)} + 16$	Mansion of the Beginning of the Night, the mansion rising with sunset	Evening Prayer
$M_{W(a)}$	$M_{W(a)} = M_{A(a)} - 11$ or $M_{W(a)} = M_{A(a)} + 17$	Mansion of the Evening Twilight	Night Prayer
$M_{¼(a)}$	$M_{¼(a)} = M_{A(a)} - 10$ or $M_{¼(a)} = M_{A(a)} + 18$	Mansion of the Quarter	–
$M_{⅓(a)}$	$M_{⅓(a)} = M_{A(a)} - 9$	Mansion of the Third	–
$M_{½(a)}$	$M_{½(a)} = M_{A(a)} - 7$	Mansion of the Half	Night Prayer (?)
$M_{⅔(a)}$	$M_{⅔(a)} = M_{A(a)} - 5$	Mansion of Two Thirds	Night Prayer (?)
$M_{¾(a)}$	$M_{¾(a)} = M_{A(a)} - 4$	Mansion of Three Quarters	–
$M_{M(a)}$	$M_{M(a)} = M_{A(a)} - 1$	Mansion of the Meal *al-ṣaḥūr*	Fasting in Ramaḍān
$M_{N(a)}$	$M_{N(a)} = M_{A(a)} + 3$	Mansion of the Crescent	Fasting in Ramaḍān (?)

The Mansion of the Morning Twilight ($M_{A(a)}$), the Mansion of the Shadow ($M_{T(a)}$), and the Mansion of the Sun ($M_{S(a)}$) belong to the Morning Prayer.[21] They mark the beginning, the middle, and the end of its time. The Mansion of the first Call for Prayer (*adhān awwal*) ($M_{1(a)}$) and the Mansion of the Second Call for Prayer (*adhān thānī*) ($M_{2(a)}$) define a moment most probably also connected with the Morning Prayer. There are two possible explanations, neither really satisfying: First, the names of these two lunar mansions could refer to the call for prayer, which is repeated by the Muslim who hears it. But these repetitions follow closely one each other – it appears obviously that the rising between one and the following lunar mansion needs more time. Second, they could be related to the *adhān*, the first – and actual – call for prayer, and the *iqāma*, the second call for prayer which takes place in the mosque shortly before the beginning of the prayer. But there is no gap between the *iqāma* and the beginning of

[21] See Schmidl, *Dusk and Dawn*, 2004, p. 398.

prayer – evidently there seems to be not enough time for the rising of the next lunar mansion.[22] In any case it should not be forgotten that timekeeping by the lunar mansions is an approximate and simplified method.

The Mansion of the Beginning of the Night ($M_{B(a)}$) marks sunset and the beginning of the evening prayer, the Mansion of the Evening Twilight ($M_{W(a)}$) marks the end of the evening twilight and the beginning of the night prayer. The Mansions of the Quarter ($M_{1/4(a)}$), the Third ($M_{1/3(a)}$), the Half ($M_{1/2(a)}$), of Two Thirds ($M_{2/3(a)}$), and of Three Quarters ($M_{3/4(a)}$) may specify the amount of time of the night that has passed – but it is not appropriate; probably the Mansion of the Third and the Mansion of the Half mark the end of the night prayer.

The Mansion of the Meal *al-saḥūr* ($M_{M(a)}$) has nothing to do with prayer times but with fasting in Ramaḍān as mentioned before. The Mansion of the Crescent ($M_{N(a)}$) only appearing in the textual parts of al-Ṣiqillī's treatise is connected with the determination of the new month, especially important for the beginning of the month of fasting, Ramaḍān.[23]

In his treatise al-Ṣiqillī subdivides the night by specific ascending, descending, culminating, and opposite lunar mansions, apparently intended to fulfil religious obligations. He uses the lunar mansions as a star clock – a typical folk astronomical method. His information is presented in tables.

2. The presentation

Tables are widely used in mathematical – or scientific – astronomy in medieval Islam but unknown in folk astronomical sources.[24]

2.1. Folk astronomy and scientific astronomy in medieval Islamic societies

In medieval Islamic societies there were two astronomical traditions, a more popular one, and a scientific one. Folk astronomy uses only arithmetical methods, observations were made by the naked eye. It is collected in books on the *anwa*ʾ and books on the seasons, in calendars and almanacs, in folk astronomical books on the *qibla* – the direction to Mecca – and on the prayer times written mainly by jurists, and philologists, and read by the same circle of educated people, not too familiar with mathematical astronomy. Scientific, mathematical astronomy is characterized by systematic observations, formulae and trigonometric methods, and the use of instruments. It is found in tables, treatises on different astronomical topics, and *zījes* (astronomical handbooks with tables). Their authors were astronomers and astrologers, their readers too.[25]

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[22] See Juynboll, *Adhān* in EI^2; and Juynboll, *Iḳāma* in EI^2.

[23] For further explanations of some of these specific lunar mansions and their connections with the twilight prayers see Schmidl, *Volksastronomische Abhandlungen*, 2005, 'O,19a–19b: Über die wohlgefällige und die straffreie Zeit für das Abend- und das Nachtgebet', 'O,19b–20a: Über die wohlgefällige und die straffreie Zeit für das Morgengebet' and 'B,39b–71b: Über die Mondstationen'.

[24] See King & Samsó & Goldstein, *Zij Report*, 2001.

[25] The designations 'folk astronomy' versus 'mathematical' or 'scientific astronomy' are quite un-

2.2. Al-Ṣiqillī's arrangement of the material

In a typical folk astronomical treatise timekeeping by night is given in textual form.[26] Al-Ṣiqillī's treatise also contains a text, but most of the information necessary for timekeeping by night is given in tabular form – a presentation belonging to the scientific tradition of astronomy in medieval Islamic societies, while his method is folk astronomical. Al-Ṣiqillī's mode of presentation of his material is unique and unusual but strictly arithmetical. The method he uses is a simple way of timekeeping by the lunar mansions, common, but skilled and perfected, well known and described in detail in several folk astronomical treatises – although modern research has mostly ignored it – and probably serving religious purposes. The importance of al-Ṣiqillī's treatise and the difference to other folk astronomical texts is also founded in its length and its presentation: he uses elaborated tables to display the lunar mansions as a star clock. Al-Ṣiqillī's treatise bridges the often launched gap between folk and scientific astronomy – at least in Mamluk Egypt. It is a successful attempt to present folk astronomical material in a scientific form, complete and self-consistent.

happy but well established (see for examples the two articles in Selin, *Astronomy across Cultures*, 2000: *Mathematical Astronomy in Islamic Civilisation* by David A. King and *Islamic Folk Astronomy* by Daniel M. Varisco). On the one hand, folk astronomy does not comprise the astronomical lore of the people but what scholars collected; on the other hand, mathematical astronomy also includes descriptive elements (see also Schmidl, *Volksastronomische Abhandlungen*, 2005, p. 1003, n. 1).

[26] See the examples given in Schmidl, *Volksastronomische Abhandlungen*, 2005, passim.

3. Appendix: The Pleiades

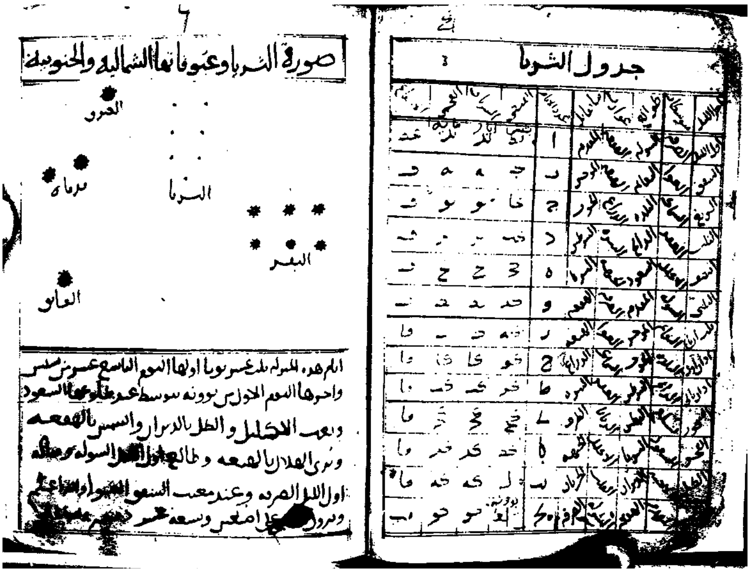

Fig. 2. The two facing pages for *al-thurayyā* (Pleiades) in al-Ṣiqillī's treatise on timekeeping by the lunar mansions (Chester Beatty Library, Dublin, No. 4538; courtesy of the Chester Beatty Library, Dublin).

3.1. Table

end of the night	culminating mansion	**ascending mansion**	descending mansion	what is opposite	number of days	Coptic	Syrian	Julian	altitude
beginning of the night	12	**19**	5	26	1	19.09.	14.08.	14.05.	79
evening twilight	13	**20**	6	27	2	20.09.	15.08.	15.05.	80
quarter	14	**21**	7	28	3	21.09.	16.08.	16.05.	80
third	15	**22**	8	1	4	22.09.	17.08.	17.05.	80
half	17	**24**	10	3	5	23.09.	18.08.	18.05.	80
two thirds	19	**26**	12	5	6	24.09.	19.08.	19.05.	80
three quarters	20	**27**	13	6	7	25.09.	20.08.	20.05.	81
adhān awwal	21	**28**	14	7	8	26.09.	21.08.	21.05.	81
adhān thānī	22	**1**	15	8	9	27.09.	22.08.	22.05.	81
al-ṣaḥūr	23	**2**	16	9	10	28.09.	23.08.	23.05.	81
morning twilight	**24**	**3**	**17**	**10**	**11**	**29.09.**	**24.08.**	**24.05.**	**81**
shadow	25	**4**	18	11	12	30.09.	25.08.	25.05.	81
sun	26	**5**	19	12	13	??.10.	26.08.	26.05.	82

3.2. Scheme

star names			number of stars	size of stars	arrangement of the stars
al-thurayyā[27]	Pleiades	M 45 with η Tau	7	very small	in the shape of a 'U': 2 parallel and vertical lines of 3 dots, 1 dot below and between these 2 lines
al-ʿayyūq[28]	Capella	α Aur	1	big	–
f-r-qālu[29]	–	–	2	big	in 1 line, gently oblique, the left stars a little bit lower than the right
al-ʿātiq[30]	–	–	1	big	–
al-baqar[31]	–	λαγδνμ Cet	6	middle (?)	in the shape of a rectangle: 2 parallel and horizontal lines of 3 starlets

3.3. Text

The days of this lunar mansion are thirteen days, the first of it the nineteenth day of *Bashans*, the last of it the first day of *Baʾūna*. At daybreak (of the nineteenth day of *Bashans saʿd*) *al-suʿūd* culminates, and *al-iklīl* sets. The (ascending lunar mansion of the) shadow is in *al-dabarān*, the (ascending lunar mansion of the) Sun is in *al-haqʿa*; the lunar crescent is seen in *al-hanʿa*. The ascending (lunar mansion) at the beginning of the night is *al-shawla*, its opposite at the beginning of the night *al-ṣarfa*, and at nightfall it is *al-ʿawwāʾ*[32] – and God knows best. The Sun declines (after noon) during (this lunar mansion) by (a shadow length of) two digits and 17 (?) parts – and God knows best.

[27] See Kunitzsch, *Sternnomenklatur*, 1961, p. 114f, No. 306.
[28] See Kunitzsch, *Sternnomenklatur*, 1961, p. 46, No. 47 and 48.
[29] There are two conceivable readings either *farqālu* 'its two partings' or *firqālu* 'its two flocks' (see Kunitzsch, *Sternnamen*, 1959, p. 112f, No. 19). Because of the vicinity of the Pleiades it appears impossible that these two stars are identical with *αβ* Cep (cf. Kunitzsch, *Sternnomenklatur*, 1961, p. 59, No. 100: "*kawkabā al-frq* – Ṣūfī 46, 11 (Yehuda IV, 1) identifiziert die beiden Sterne, die diesen Namen trugen, mit dem 3. und 4. im ptolemäischen Bild Kepheus = *β α* Cephei.").
[30] Cf. Kunitzsch, *Sternnomenklatur*, 1961, p. 44, No. 41: "*al-ʿātiq* – 'das Schulterblatt [der ausgestreckten Hand der ṯurayyā]'".
[31] Kunitzsch, *Sternnomenklatur*, 1961, p. 48f, no. 58a: "*al-baqar* – 'die Kühe'. […] Sterne rechts unterhalb von *al-kaff al-ǧaḏmāʾ* = λ *α* γ δ ν *μ* Ceti […]".
[32] Neither 'opposite' has here the same meaning than in the table nor 'opposite' designates 'opposite to the ascending mansion' – being the descending mansion. According to the table *al-îarfa* is the culminating lunar mansion at the beginning of the night, *al-ʿawwāʾ* the culminating lunar mansion at nightfall.

Bibliography

Ackermann, Silke
2004: "The Path of the Moon Engraved. Lunar Mansions on European and Islamic Scientific Instruments". *Micrologus* 12: 135–164.

ʿAlī, ʿAbdullah Yūsuf
2002: *The Meaning of the Holy Qurʾān*. 10th ed. Beltsville, Maryland.

Arberry, Arthur John
1955–1966: *The Chester Beatty Library. A Handlist of the Arabic Manuscripts*. 8 vols. Dublin.

al-Bīrūnī (Sachau)
1879: see Sachau, *Chronology of al-Bīrūnī*.

EI² – *The Encyclopaedia of Islam*, New Edition. 11 vols. Leiden 1960–2002.

Forcada, Miquel
1990: "Mīqāt en los calendarios andalusíes". *al-Qantara* 11:(1): 59–69.

Ibn ʿĀṣim
1993: *Kitāb al-Anwāʾ wa-l-azmina – al-qawl fī l-šuhūr* – (Tratado sobre los anwāʾ y los tiempos – capítulo sobre los meses –). Estudio, traducción y edición crítica por Miquel Forcada Nogués (Fuentes arabico-hispanas 15). Barcelona.

Juynboll, Th.W.
1910: *Handbuch des islamischen Gesetzes*. Leiden, Leipzig.

Michel, Henri
1976: *Traité de l'astrolabe*. Paris 1947. Repr. Paris.

Kennedy, Edward S.; Kennedy. Mary H.
1987: *Geographical Coordinates of Localities from Islamic Sources*. Frankfurt am Main.

King, David A.
2000: "Mathematical Astronomy in Islamic Civilisation". In: Selin (ed.), *Astronomy across Cultures*, pp. 585–613.
2004: *SATMI* 1, 2004 – idem: *In Synchrony with the Heavens. Studies in Astronomical Timekeeping and Instrumentation in Medieval Islamic Civilization*. Volume One: *The Call of the Muezzin (Studies I–IX)* (Islamic Philosophy, Theology, and Science. Texts and Studies, ed. by H. Daiber and D. Pingree, 55). Leiden, Boston.

King, David A., Samsó, Julio, Goldstein, Bernard R.
2001: "Astronomical Handbooks and Tables from the Islamic World (750–1900): An Interim Report". *Suhayl* 2: 9-105.

Kunitzsch Paul
1959: *Arabische Sternnamen in Europa*. Wiesbaden.
1961: *Untersuchungen zur Sternnomenklatur der Araber*. Wiesbaden.

Neugebauer Otto
1960: "The Egyptian 'Decans'". *Vistas in Astronomy* 1: 47–51.

North John D.
1994: *The Fontana History of Astronomy and Cosmology*. London.

Poulle Emmanuel
1956: "Peut-on dater les astrolabes médievaux?". *Revue d'histoire des sciences et de leurs applications* 9:(9): 301–322.

Sachau C. Edward
1879: *The Chronology of Ancient Nations. An English Version of the Athâr-ul-Bâkiya of Albîrûnî, or "Vestiges in the Past"*. London. Repr. Frankfurt 1984 and Frankfurt 1998 (Islamic Mathematics and Astronomy 31).

Samsó Julio
2001: "Astronomical Observations in the Maghrib in the Fourteenth and Fifteenth Centuries". *Science in Context* 14: 165–178.

Schmidl Petra G.
1999: "Zur Bestimmung der Qibla mittels der Winde". In: Eisenhardt, Peter; Linhard, Frank; Petanides, Kaisar (eds): *Der Weg der Wahrheit*. Aufsätze zur Einheit der Wissenschaftsgeschichte. Festgabe zum 60. Geburtstag von Walter G. Saltzer. Hildesheim, New York, pp. 135–146.
2004: "Dusk and Dawn in Medieval Islam. On the Importance of Twilight Phenomena with Some Examples of Their Representations in Texts and on Instruments". In: Campion, Nicholas (ed.): *The Inspiration of Astronomical Phenomena. Proceedings of the Fourth Conference on the Inspiration of Astronomical Phenomena, Magdalen College, Oxford, 3–9 August 2003* (Special Issue of "Culture and Cosmos", 8:1 and 8:2). Bristol, pp. 393–412.
2005: *Volkstümliche astronomische Abhandlungen aus dem mittelalterlichen arabisch-islamischen Kulturraum. Zur Bestimmung der Gebetszeiten und der Qibla bei al-Aṣbaḥī, Ibn Raḥīq und al-Fārisī*. Frankfurt (doctoral thesis, publication in preparation).

Selin Helaine (ed.)
2000: *Astronomy across Cultures. The History of Non-Western Astronomy*. Dordrecht et al.

Turner, Gerald L'E.
2000: "A Critique of the Use of the First Point of Aries in Dating Astrolabes". In: Folkerts, Menso; Lorch, Richard P. (ed.): *Sic itur ad astra. Studien zur Geschichte der Mathematik und Naturwissenschaften – Festschrift für den Arabisten Paul Kunitzsch zum 70. Geburtstag*. Wiesbaden, pp. 548–554.

Varisco, Daniel Martin
1997: "The Origin of the Anwāʾ in Arab Tradition". *Studia Islamica* 74 (1991): 5–28. Repr. idem: *Medieval Folk Astronomy and Agriculture in Arabia and the Yemen*. Aldershot, I.
1994: *Medieval Agriculture and Islamic Science.* The Almanac of a Yemeni Sultan. Seattle, London.
1995: "The Magical Significance of the Lunar Stations in the 13th Century Yemeni Kitāb al-Tabṣira fī ʿilm al-nujūm of al-Malik al-Ashraf". *Quaderni di Studi Arabi* 13: 19–40.
2000: "Islamic Folk Astronomy". In: Selin (ed.), *Astronomy across Cultures*, 2000, pp. 615–650.

Music in the Iconography of Venus' Children

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The extraordinary popularity of astrology during the Renaissance, as reflected in the intellectual life of the era, gave rise to a wealth of astrological themes and motifs in literature and the representational arts. It was at this time that the theme of the children of the planets was born, i.e. the graphical representation of a system for classifying people according to their planetary affiliation. The idea most probably came from the East. Stereotypical connections between people's professions, actions and preferences, on the one hand, and the character ascribed to a given planet, on the other, were shown by astrologists of the Arab-Muslim world in the form of synoptic tables, such as B.N. Ms. Suppl. Turc 242 (**Fig. 1**). These tables became a model for iconography of the children of the planets in Europe.[1] One of the oldest renderings of the subject of the children of the planets according to this compositional conception is the early fourteenth-century fresco in the 'Salone' in Padua (Palazzo della Ragione), attributed to Giotto, the modern-day form of which is dated by art historians to the year 1420 (**Fig. 2**). In the West, this tabular composition was transformed in such a way that the planetary divinity was placed at the top of the picture in the company of the zodiacal signs pertaining to him or her, and at the bottom were groups of children, whose multifarious actions clearly displayed what kind of protection was given by the particular planet.[2]

Of the seven planets depicted together with their children in fifteenth-and sixteenth-century planetary cycles, three have a constant link with music. They are the Sun, Mercury and Venus. There is no difficulty in explaining the musicality of the 'children of the Sun'; the mediaeval representation appears to refer to the classical myth of Apollo, who drank nectar and ambrosia as soon as he was born, and chose the lyre and the bow as his attributes.[3] Also familiar is the tale of how Apollo, the Sun god, on arriving on Olympus aroused in all the gods an irresistible urge to make music and sing. Standing among them, Apollo

[1] Erwin Panofsky and Fritz Saxl, 'Classical Mythology in Mediaeval Art', *Metropolitan Museum Studies*. Separately reprinted from vol. IV, Pt. 2. (Mar. 1933), 228–279.
[2] Cf. Gwendolyn Trottein, *Les enfants de Venus. Art et astrologie a la Renaissance*. Lagune. Paris 1993, 15–49.
[3] Karl Kerényi, *Mitologia Greków* [Die Mythologie der Griechen], trans. Robert Reszke. Wydawnictwo KR, Warsaw, 2002, 113–114.

Proceedings of the Conference "Time and Astronomy in Past Cultures", Toruń, March 30 – April 1, 2005, A. Sołtysiak (ed.), Warszawa – Toruń 2006, pp. 89–99.

struck the strings of his lyre, beautiful and authoritative, radiating his splendour. His feet and his robe shone celestial. Thus he revealed himself as Musagetes and Kitharodos, guide to the Muses, singer to the strains of the lyre.[4]

It is not surprising, therefore, that in Renaissance iconography the personification of the Sun holds in his hand a harp, and his children are often portrayed as musicians. One such example is an image by the Master of *The Housebook*, who, referring at once to both biblical tradition and classical myth, portrays the Sun as a king, and his children as court musicians.[5] (**Fig. 3**)

The Renaissance links of Mercury with music refer to the familiar Greek myth of Hermes as the inventor and builder of the lyre. Hardly had he leapt from the immortal body of his mother than he found a turtle, and from this find he was able to derive inestimable benefit. He took the turtle in his hand and carried it to his grotto, upon which he cut it up, for in his speech as in his deeds he was as quick as thought. He took two reeds and attached them to the shell, tied them at the top and did everything necessary to create an instrument, stretched on it seven strings and with a wand tested their sound. The instrument sounded forth loudly in his hand. The god improvised beautifully, training himself in the art of producing sweet sounds, the same in which young men compete during a feast.[6]

The wise, inventive, knowledge-seeking lyre maker is the patron of inventors, craftsmen, merchants, artists, travellers and thieves. In *The Housebook* from 1480 Mercury says:

> My children faithfully instill,
> With lust for beauty, greed for skill.
> No long journey for them too hard,
> Strange new knowledge is their
> reward. Their faces are full and
> Palle and round, their bodies white,
> Their limbs unsound. Their clocks
> And organs are the best, excellent
> Scribed, they take no rest.
> Dexterous goldsmith, painters
> Good, people praise them, and they
> Should. They are a smart, hard
> Working lot, but asked for help.
> They give it not.[7]

The iconography of the children of Mercury always features an astronomer measuring the distances between stars with an astrolabe. Yet the central figure is that of an organ builder and tuner, as Mercury is the patron of harmony, and

[4] Ibidem, 126.
[5] The Children of the Sun, *The Housebook*, 1480, fol. 14r, Wolfegg, Kunstsammlungen. After Christoph Graf zu Waldburg Wolfegg, *Venus and Mars. The World of the Medieval Housebook*. Prestel Munich. New York 1998, 34.
[6] Karl Kerényi, *Mitologia Greków...* op. cit., 137–138.
[7] Cited after Christoph Graf zu Waldburg Wolfegg, *Venus and Mars...* op. cit., 38.

of the omnipresent mathematical regularity in nature, symbolically represented by organ pipes (**Fig. 4**). The idea of the commonality between music and the order in nature can be found in Titian's *Venus and Cupid with an Organist*, from 1548.[8] The orderly arrangement of organ pipes clearly suggests analogy with a line of trees arranged in perspective along an avenue leading to some unknown destination (**Fig. 5**).

The intellectualism and prudence of the children of Mercury stand in contrast to the depictions of the children of Venus, emanating emotionality and carefree joy. Of the three 'musical planets', Venus is distinguished by the degree of complexity to the iconographic structure and the depth of its symbolic meanings. In addition, the children of Venus are undoubtedly among the most musical of all the children of the planets in general. The medieval Housebook says (cf. **Fig. 6**):[9]

> Lightly loving, full of mirth,
> My children are happy here on earth.
> Merry when rich and merry poor,
> None can compare, you may be sure.
> Pipe and tabor, harps and lutes,
> They play organs, horns and flutes.
> With singing and with dancing too,
> Embrace their lovers, liss and woo.
> They rejoice to hear fair music's sound,
> Their mouths are darling faces round.
> Beautiful bodies, parched by lust's heat,
> My children find love's duties sweet.[10]

However, it is worth mentioning that the source of the musical connections attributed to Venus cannot have been classical Greek mythology. No Greek tale refers to any particular interest in music on the part of Aphrodite, nor does any account bestow upon her any kind of musical attribute, as other Greek deities could boast. The origins of the goddess's musicality should rather be sought, therefore, in the astrological traditions of the East, and of the Arab-Muslim East in particular. One of the most eminent Arabian astronomers and astrologers, al-Biruni, wrote the following about Venus in the *Book of Instruction in the Elements of the Art of Astrology*:

> Activities & Morals: Lazy, laughing, jesting, *dancing*, fond of wine, chess, draughts, cheating, takes pleasure in every thing, not quarrelsome, a sodomite or given to excessive venery, well-spoken, fond of ornaments, perfume, song, gold, silver, fine clothes.[11]

[8] Museo del Prado, Madrid.
[9] Christoph Graf zu Waldburg Wolfegg, *Venus and Mars...*, op. cit., 37.
[10] ibidem., 36.
[11] Abu Rayhan al-Biruni, *The Book of Instruction in the Elements of the Art of Astrology*, trans. R. Ramsay Wright (London, 1934) [430 – Indications as to conditions of life and activities], 251.

> Professions: Works of beauty and magnificence, fond of bazaars, commerce, measuring by weight, length and bulk; dealing in pictures and colours, goldsmiths work, tailoring, manufacturing perfumes, dealing in pearls, gold and silver ornaments, musk, white and green clothes, maker of crowns and diadems, *accompanying singing, composing songs, playing the lute*, feasts, games and gaming.[12]

Arabic iconographic sources invariably show Venus as a musician or dancer. Venus with an instrument is portrayed by an illustration in the manuscript of Abu Ma'shar (Albumasar, *c*. 787–886) *Liber astrologiae*, from *c*. 1320/1325–1350.[13] Venus in Taurus and Virgo sits on her throne in her crown playing an Arabic trapezoidal psaltery (*qanun*), flanked by two other stringed instruments: the bowed *rabab* and the *al'ud*, or lute (**Fig. 7**).[14] Venus as lutenist is shown on an illustration in the manuscript *'Aja'ib al-makhluqat wa-ghara'ib al-mawjudat (Marvels of Things Created and Miraculous Aspects of Things Existing)* of Zakariyya ibn Muhammad al-Qazwini (d. 1283), produced in Herat in the years 1503–1504. The figure kneeling below represents her lover.[15]

Let us stress here, that from time immemorial in Arabic tradition a woman playing a musical instrument and a female dancer were unequivocally associated with the profession of courtesan. In pre-Muslim Arabia, music was cultivated mainly by women, and especially by *qainat* (singing girls) – prostitutes employed in brothels. These girls played on a tambourine called a *mizhar* (from the word *zahara*, meaning 'to shine', unquestionably in honour of Venus, known in Arabic as Zuhra, literally 'shining one'.[16] Let us add that in the early period of Islam, the *qainat* and their musical art were deemed immoral and numbered among the *malahi*, or forbidden pleasures.[17]

In other words, in the hands of Arabian astrologers music functions as a symbol of Venus' unbridled eroticism, of her irrepressible sexual desire, which also characterised the most archaic incarnations of this astral goddess. In Arabic astrology Venus ultimately became dancer and musician, passing on her fondness for music to their children. In a miniature illustrating a Turkish manuscript from the sixteenth century,[18] (**Fig. 8**) Venus is a dancer, and all her children are musicians. On the illustrations we see: Venus (*Zuhra*) as a dancer, musicians playing consecutively on a lute (*al'ud*), harp (*chang*) and flute (*nai*), a dancer (*raqqas*), and further musicians playing on a tambourine (*daf*), drum (*tabla*) and drum (*dawul*).

Yet the 'non-musical' Venus of Greco-Roman tradition was notforgotten. Al-Biruni, in the work already quoted above, offers a different description of

[12] Ibidem [435 – Indications as to trades, professions], 254.

[13] Fendulus' version, cf. Marie-Thèrése and Jean-Pierre Verdet, *Georgius Zothorus Zaparus Fendulus: Liber astrologiae*. Herscher Paris: 1989.

[14] British Library Sloane Ms 3983.

[15] British Library Or. 12220, fol. 12.

[16] Henry George Farmer, *The Music of Ancient Mesopotamia* (in:) Egon Wellesz (ed.), "New Oxford History of Music", vol. I. Oxford University Press. London 1957, 238–239.

[17] Henry George Farmer, *The Music of Islam* (in:) Egon Wellesz (ed.), "New Oxford History of Music", vol. I. Oxford University Press. London 1957, 427.

[18] B.N. Ms. Suppl. Turc. 242, fols. 32v–33r.

her appearance, devoid of musical attributes: 'woman seated her hair unloosened the locks in her left hand, in the right a mirror in which she keeps looking, dressed in yellowish green, with a necklace, bells, bracelets and anklets'.[19] Under the influence of Arabian astrologers, this description of Venus became permanently fixed in Renaissance astrological iconography. Its perfect model is a Roman mosaic from the third century AD (**Fig. 9**).[20] Around the mid-fifteenth century, an image of Venus usually portrayed in the company of Libra and Taurus, with a bouquet of flowers, a mirror in her hand and loosened hair, a symbol of dissipation, became established as the standard portrayal. One such example is a miniature most probably produced by Cristoforo de Predis in the astrological treatise *De Sphaera*, from the fifteenth century (**Fig. 10**).[21]

In accordance with their astrological characteristics, practically all Venus' 'children' are musicians. In the foreground of a drawing in a xylographical book from Berlin[22] (**Fig. 11**) we see singers accompanied by a group of wind instruments ('alta'), typical of the period. The ensemble comprises a trumpet and two shawms. In the background, other 'children' are playing on a flute-tabor, a harp and a lute. Others still are fervently engaged in love-making. Representations of the children of Venus are characterised by the wealth and directness of erotic scenes, which can be particularly admired in the foreground of a drawing in a xylographic book from Basle (**Fig. 12**).[23] Erotic scenes do not seem strange in the context of the goddess of love, similarly to bathing scenes. Water, in small, natural (lakes, ponds, pools) and artificial (ponds) bodies or in vessels, e.g. washtubs and baths,[24] always combined with naked bathing couples, constitutes a fixed element of these images. The bathing couples are most commonly served fruits, and drinks (water?) in jugs. The eating of fruit and drinking of beverages during or after bathing appears so frequently in sources that it can be regarded as an essential structural element of the iconography of the children of Venus.[25]

What we have recounted here reveals that depictions of the children of Venus are assembled from four principal thematic components: 1. Sex and erotica, 2. Music, dance and poetry, 3. Bathing, 4. Feasting (eating and drinking). The sense of the structure organised in this way is interpreted through the mutual relations between the particular components, with the assumption that their grouping together is not merely fortuitous. It should be emphasised that the elucida-

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[19] Al-Biruni, *The Book of Instruction in the Elements...*, op. cit. [Indications as to religions; pictorial representations of the planets 433–434], 253.

[20] After Warren Kenton, *Astrology. The Celestial Mirror* (London: Thames and Hudson, 1991), il. 12.

[21] Cristoforo de Predis (?), *The Children of Venus*, miniature from *De Sphaera*, *c*. 1466–1475. Codex Ms. lat. 209, fol. 9v. Biblioteca Estense, Modena.

[22] Cited after Zdravko Blazekovic, 'Variations on the Theme...', op. cit., 267. Xylograph preserved in Berlin from *c*.1470, fol. 28v, Berlin, Staatliche Museen.

[23] Ibidem, 266. Xylograph held in Basle, *c*.1470, fol. 164r, Basel, Offentliche Bibliothek.

[24] Al-Biruni draws attention to the fact that Venus' domain is 'Lofty houses, vessels which hold much water'. *The Book of Instruction in the Elements...*, op. cit. [indications as to places, buildings and countries 407–408], 242.

[25] This observation would appear to be confirmed by Abraham Ibn Ezra (1089?–1167?), a Jewish astrologer from northern Spain, who stated that Venus 'also indicates eating and drinking'. See *Sefer Reshit Hokhma* [The Beginning of Wisdom], trans. and ed. R. Levy. Baltimore, 1939, 81.

tion of the significance of music in this composition would appear to open up a particularly interesting perspective for understanding Venusian iconography in general. On the surface level of the astrological images of the children of Venus, music can be understood simply as one of the four pleasures to which people subject to the influence of this planet render themselves; or else as a relatively insignificant embellishment for the sex, bathing and feasting. Seen as such, these images would represent the most pleasant aspect of life, which the children of Venus spend solely in uncontemplative, physically-orientated amusement. One can also look at these representations from the perspective of Venusian mythology, based on dualisms, whose axis was formed by the opposition between life and death. As we know, ancient Venusian goddesses personified the dramatic appearance and disappearance of Venus in the sky, as a metaphor for death and rebirth.

As the mistress of life and death, Venus is also the goddess of sex and erotica. In all corners of the ancient Near East, the cult of the Venusian goddesses was associated with ritual prostitution. Hierodules were generally protectors of music and poetry. The Sumerian-Babylonian priestesses of Ishtar, or *kedeshot* (literally 'self-sacrificing'), were trained singers, musicians and dancers. Their heiresses during the Achemenian era (sixth century BC) were the *kinati*, from which were derived the above-mentioned Arabian *qainat*, i.e. prostitutes, singers and dancers in one. In the temples of the Phoenician Astarte, rituals, dance and music were the responsibility of countless hosts of prostitutes (*ambubiae*), and their favourite instruments were the *abub* (an oboe-type reed pipe) and the *trigonon* (a small, triangular harp).

The Venusian triad of death, erotica and music is very well documented in templar mysteries and initiation rites in various pre-industrial cultures. There is no doubt that the foundation for these relations was a similar or identical emotional state, in all instances, enabling individuals to open themselves up to a reality different to that which is experienced in normal consciousness. The deep involvement of sexual energy in the process of psychical rebirth through death is beyond dispute, and can be illustrated with numerous examples from the fields of anthropology, history, mythology and clinical psychiatry. In many archaic and traditional cultures, also indisputable is the power of music and poetry in attaining states of ecstasy connected with sexual and religious stimulation. Music and singing always constituted an important element of religious ritual, and the emotions aroused by music were attributed, as were the effects of narcotics, to the direct influence of a deity. In archaic Greek poetry, the word for song, *aoide*, is related to the word *ep-aoide*, meaning 'enchantment'. Poets often describe poetry as a *pharmakon* or narcotic, apt both to bring relief and also to cause pain in love. Songs, or *aoidai*, are the 'sagacious daughters of the Muses', and possess the power to 'break the spell' (*thelgein*) of pain, just as a physician, who cures by means of incantations, or *epaoidai*. The languages of poetry, love and narcotics are treated as real, and not solely metaphoric, equivalents.[26]

[26] Charles Segal, *Orpheus. The Myth of the Poet*. The Johns Hopkins University Press. Baltimore and London 1989, 15–18; W.K.C. Guthrie, *Orpheus and Greek Religion. A Study of the Orphic Movement*. Princeton University Press. Princton, New Jersey 1993, 40.

Amorous and musical ecstasy was the domain of Venus, the planet of death and rebirth, the planet symbolising the dramatic unity of human corporality and spirituality. The presence of music in this relationship seems wholly natural. Deeply immersed in sensual experience, it is at the same time a conduit leading into the realms of pure spirituality. The spiritualization of eroticism, and of corporality in general, appears to be the main theme of representations of Venus' children. Therefore, the reinterpretation of ancient oriental conceptions in Renaissance astrological art appears to express the plenitude of the symbolic dimensions of this astral goddess. Let us not be misled by the naive frivolity of these images, by their intentional or unintentional comicality. She still remains the mistress of life and death, of corporality and spirituality, of beauty and sensuality.

Figures

Fig. 1. The Seven Planets and their Children. From B.N. Ms. Suppl. Turc 242, fol. 32v–33r. 1582.

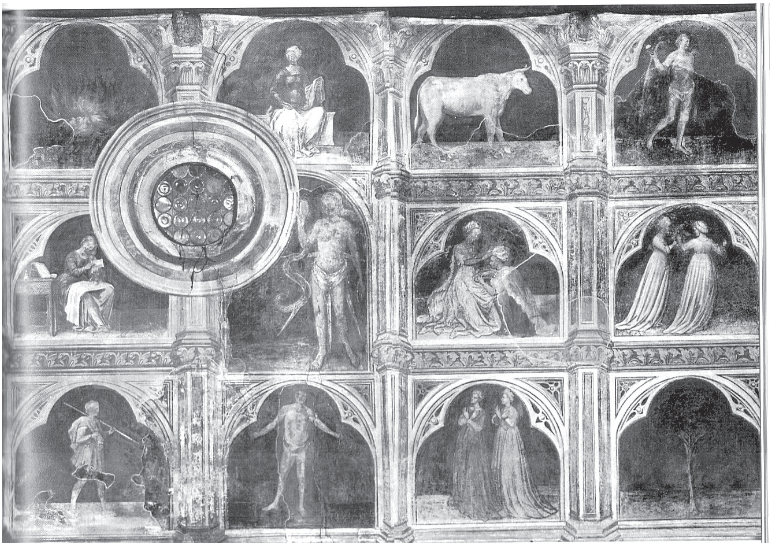

Fig. 2. The Children of Venus, mural painting in the so-called Salone at Padua, about 1420.

Fig. 3. The Children of the Sun, Housebook, 1480, fol. 14r, Wolfegg, Kunstsammlungen.

Fig. 4. The Children of Mercury, Housebook, 1480, fol. 16r, Wolfegg, Kunstsammlungen.

Fig. 6. The Children of Venus, Housebook, 1480, fol. 15r, Wolfegg, Kunstsammlungen.

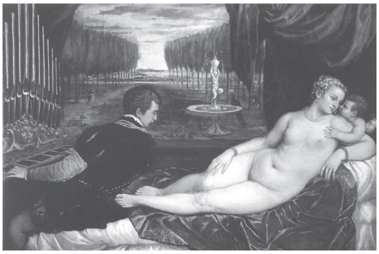

Fig. 5. Titian, Venus and Cupid with an Organist 1548. Museo Prado, Madrid.

Fig. 7. Venus, Abu Ma'shar (Albumasar), *Liber astrologiae*, c. 1320/1325–1350.

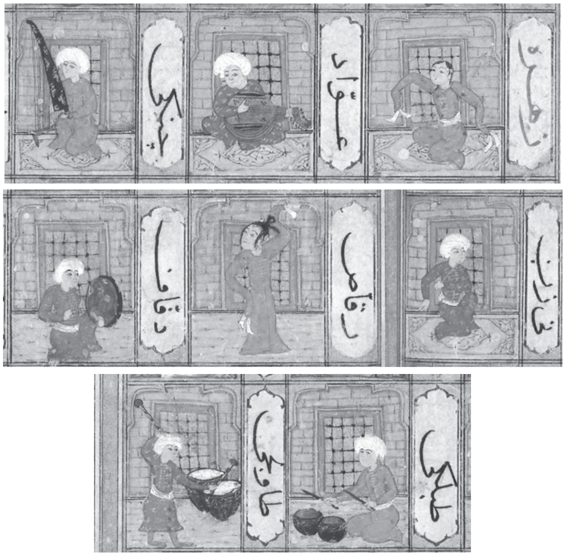

Fig. 8. Venus and her Children. From B.N. Ms. Suppl. Turc 242, fol. 32v–33r. 1582.

Fig. 9. Venus. Roman mosaic from the third century AD. After Warren Kenton, *Astrology. The Celestial Mirror* (Thames and Hudson, London: 1991), fig. 12.

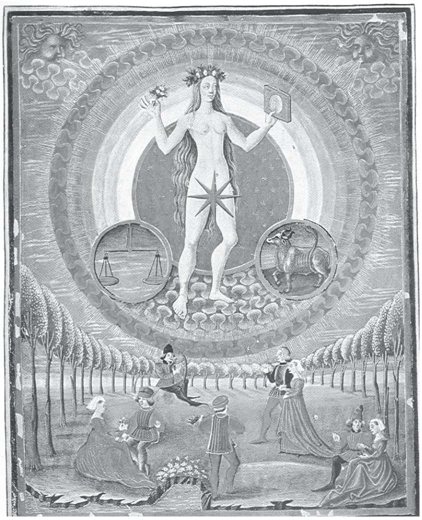

Fig. 10. The Children of Venus, Cristoforo de Predis (?), miniature from *De Sphaera*, c. 1466–1475. Codex Ms. lat. 209, fol. 9v. Biblioteca Estense, Modena.

Fig. 11. The Children of Venus, Block-Book, c. 1470, fol. 28v, Berlin Staatliche Museen.

Fig. 12. The Children of Venus, Block-Book, c. 1460, fol. 164r, Basel, Offentliche Bibliothek.

Chronotypic Variation among Early and Middle Neolithic Societes in Poland

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Abstract: *According to Douglass W. Bailey (1993) Neolithic and Early Bronze societies from south-eastern Europe were driven by two different chronotypes, the cyclical and linear ones. However, when the cognitive categories of linear versus cyclical chronotypes are replaced with the concept of social time, significantly increases the number of possible time concepts. For example, the concept of the time of slowed down duration describes the nature of the megalithic mortuary practices of the Funnel Beakers in Kujavia in a much better way than does the idea of a linear chronotype (Iwaniszewski 1997).*

No doubt, shifts from foraging bands to farming and herding communities increased socioeconomic complexity affecting peoples' conceptualizations of time. As the term "social time" refers to the inter-subjective experience of time developed through the routine social interaction, specialized ranked and stratified Neolithic societies are likely to have diverse systems of social time operating simultaneously on different social or task levels. Despite this variety, archaeological narratives tend to rely upon simplistic models of the two competing chronotypes.

The "Neolithic way of life" introduced significant and permanent changes in peoples' conceptualizations of their experience of time. Although some of time concepts may have originated during the Mesolithic period anticipating later meanings, the ways in which Neolithic societies conceptualized their experience of time were embedded in their own socio-technological configurations. In this paper I will analyze the material evidence associated with the uses of social time among Linear Pottery, Funnel Beaker and Globular Amphora communities in north- and south-central Poland.

Introduction

The central question of this paper is the conceptualization of time of the peoples who lived in the past. In archaeology time is generally conceived as a dimension within which past events and processes took place and archaeologists usually use time to order their data in terms of dates and sequences (Shanks and Tilley 1988: 118–136). Time in archaeology is both spatial and linear, "each object or feature has a temporal attribute, objective and quantifiable" (Shanks and Tilley 1988: 119) and constitutes a useful framework in which the archaeological record is located and ordered (Shanks and Tilley 1987: 32; 1988: 119). In most archaeology time is treated as an exterior parameter of a past social entity ("a container for action") rather than an operator (medium giving shape to action); it is a dimension that surrounds social practice rather than a conceptualization involved in the construction and ordering of social life.

Proceedings of the Conference "Time and Astronomy in Past Cultures", Toruń, March 30 – April 1, 2005, A. Sołtysiak (ed.), Warszawa – Toruń 2006, pp. 101–115.

In social theory however, time cannot have an independent status. Like space, time is intimately linked to culture. Time is never perceived as such by individuals but is always embedded in social structures and practices giving it its shape and representation. Since social practices and processes are situated in time as well as in space (Barrett 1987–8), they always contain the temporal and spatial qualities. Shared concepts of time impose temporal order on human practices, frame their beginnings and endings, and define their rhythms, durations and rates of change. In other words, "time is not something that exists independently of human life" (Lauer 1981: vii) but "is a constitutive dimension of social reality" (Bourdieu 1977: 105–106; Fabian 1983: 24; Nowotny 1990).

Temporal patterning provides a framework for the organization of all social and psychological-cognitive processes. Since any society perceives and conceptualizes time in different and specific ways, its perceptions and concepts of time are not universally valid but constructed and shaped by particular practices. Time in many ways is a means for the production of cultures and implies the production of meanings embedded in social practices and structures (Nowotny 1990: 9–10). Within this perspective time always appears in the social context as an integral part of social practices and cannot be extracted from its social implications and even the systems of time reckoning and clock time become the products of a particular social patterning of time (Nowotny 1975).

Time has a plurality of meanings. Though the ability to represent time symbolically and to perform specific operations on its representations is common to all human societies, each society may develop specific time concepts using different metaphors. Shared concepts and representations of time often receive a specific symbolic form that is used and manipulated in order to control the events. Cyclical and linear patterns of time appear in all societies, but they are emphasized differently according to dominant features of their common sociocultural, politic and economic conditions (Leach 1966).

Time is also embedded in nature, in the movements of celestial bodies, the seasonal changes of the landscape, the natural cycles of agriculture, the cyclical behavior of animals, and in the inter-generational change of communities and all these manifestations of the flow of time may be used as models or representations of time (Hallpike 1986: 328–344).

Ancient chronotypes can be studied archaeologically through the examination of three types of evidence (Goody 1968):

a) systems of time measurement;
b) sets of attitudes towards time past, present and future;
c) task orientation, the allocation and scheduling of time.

Temporal orientation of Mesolithic foragers and first farmers in north European Plain

The Linear Pottery (Linearbandkeramik, LBK) groups that populated the North European Plain around 7,500 years ago (5700–5500 BCE) were the first Neolithic communities in western and central Europe. Although LBK sites were located in a vast territory between the Paris Basin and the western Ukraine, they displayed a great homogeneity of artifacts and architecture, suggesting commonly held cultural traditions (Thomas 1996: 99–100; Price et al. 2001: 593; Whittle 1996: 149, 171), particularly in its earlier phases (Modderman 1988). LBK settlements consisting of a number of timber longhouses were dispersed through the landscape and situated only on relatively small areas within easily cultivated highly fertile soils, often located on loess hillslopes with easy facile to nearby watercourses (Whittle 1996: 149). The LBK groups have been typically described as sedentary farmers who migrated to the west, north and east from the Hungarian Plain. The conventional view sustained that domesticated plants and animals were brought to central and western Europe by LBK communities who gradually colonized loessland enclaves within woodlands populated by still Mesolithic groups. The lifestyles of Mesolithic foragers and Neolithic farmers were drastically contrasted. The first LBK communities were believed to represent a sedentary agriculture while late Mesolithic groups were portrayed as egalitarian bands of mobile hunter-gatherers.

Differences between two life-styles, those of Mesolithic foragers and Neolithic farmers, resulted in different concepts of time. Dwelling on Clastres (1981) and Levi Strauss descriptions of egalitarian bands of hunter-gatherers conceived as "cold societies" who develop strategies to deny any flux of time, Felipe Criado Boado (1991a, 1991b: 83–84) proposed that European Mesolithic societies used similar strategies of distancing and hidding of the corpses and remains of the recent dead. A reference to the ancestors living in the shared mythical past emphasizes the cultural continuity of the living, but any notion of the recently dead individuals augments the sense of discontinuity and reveals abrupt changes between present and past. The material traces of the recently dead individuals may be, in this sense, counterproductive in producing shared identities in communities imagining themselves as living in their ancestors' time, inducing them to the development of the practices of distancing and occultation of the new dead (Clastres 1981:72–77; Criado Boado 1991b: 83–84). Though a type of the discontinuity between man and nature is emphasized with the emergence of megaliths, the continuity between the living and the dead is maintained through enduring monuments exhibiting some respect to shared ancestors (Criado Boado 1991a: 102–105; 1991b: 83–84, 86–87).

In the recent years, however, this image has undergone a significant change. Already Criado Boado (1991b: 84–85) observed that both Mesolithic and Neolithic types of societies were not so much distanced one from another. The contrast between both life-styles has possible been much exaggerated. Recent reviews of the European Neolithic (Thomas 1996; Whittle 1996) provide new interpretative frameworks suggesting that Neolithic communities "only very gradually became farmers”. Early and middle Neolithic communities combined mobile pastoralism and dispersed horticulture with semi-nomadic style of life rather than a matured system of intensive agriculture, animal husbandry and developed sedentarism. In light of these developments, all old stereotypes, described above are disappearing and we are presented with a new image of the Mesolithic-Neolithic transition. It also offers a possibility to shed a new light upon the concepts of time of the societies peopling the North European Plain between the sixth and fourth millennia BCE.

It is certainly very unfortunate that the role of time for ancient Neolithic societies has long been overlooked in the current archaeoastronomical research. Archaeoastronomers generally perceive time as based on the movement of the celestial bodies. Since calendars have generally been based on heavenly phenomena, cultural expressions of the passage of time are treated as socially unproblematic leading to the emergence of the structural-cognitive approach. This one-sided emphasis leads to the assessment of taken-for-granted assumptions about time, reducing possible concepts to two competing models of the cyclical and lineal time (we observe this tendency also in archaeology: Miller 1986; Criado Boado 1991a, 1991b; Bailey 1993; Czebreszuk 2001: 28–29, 33, 202–203). It certainly is possible to catch some glimpses of the conceptions of time of distant peoples using this set of models, but when the cognitive categories of linear versus cyclical chronotypes are replaced with the concept of social time, significantly increases the number of our research possibilities (see Iwaniszewski 1997).

Varieties of social time among LBK and post-LBK communities

As Criado Boado (1991a: 93–94) observes, the idea of the continuous passage of time is an important feature safeguarding longevity of a given social group or community. During the LBK and early post-LBK period, human communities were living in nucleated settlements consisting of a number of timber longhouses. Certainly size, materials used, specific form and the like all went far beyond the requirements of shelter and many authors have already recognized the identification of the house with the human body, family, kin group or a type of polity (see Parker Pearson and Richards 1994). Houses represent different types of social entities as well as stand for people’s perceived world, the cosmos (cf. Douglas 1972). As a “structuring structure”, a house is regarded as both the medium and the result of social practices (Bourdieu 1977: 87–91; 1991: 419–437). According to Hodder (1984) the LBK longhouses eventually become symbols of Neolithic communities and their permanent character provides symbols of continuity of the primary horticultural community. Indeed, the average lifespan of longhouses (between 30 and 45 years, Modderman 1988: 76) is higher than the mean age of its inhabitants. The very notion of perceiving of clusters of long-used, monumental and stable longhouse settlements creates the possibility of continued use of a specific space, providing symbols expressing a certain sense of continuity of a particular community that lived in the area for generations (van de Velde 1990: 35–36). The continuous reoccupation and rebuilding of particular structures may reflect some sense of social stability, longevity and cultural continuity (van der Velde 1979: 35, 130; 1990: 35, 37; Thomas 1996: 110–111) of early Neolithic groups. Even in later LPC and LBPC settlements an area for housing a new building was usually chosen close to the place occupied by the remnants of the old ones (Modderman 1988: 101). As early LBK settlements became foci for a system of mobile pastoralism and dispersed horticulture, as recent work by Thomas (1996: 110–111) implies, than their settlements may have contributed to the development of specific identities tied to particular locations, indicating a certain sense of continuity of a particular community that lived in the area for generations, as well as, some sense of heredity of the statuses of their inhabitants (van der Velde 1990: 35–36).

Like other houses, the LBK longhouses could have been used both to enable and to represent daily activities of their inhabitants. The concept of a continuous time is therefore linked to basic social unit, a family, and daily household activities. Repetitive character of daily activities induces a notion of a type of a cyclical time. Time created through repeated practices conducted within LBK settlements is, however, subordinated to the image of the flow of time represented by permanent material construction. These elements fit well the Gurvitch (1964) category of *endured time, or time of slowed long duration.* This type of social time is a metaphor for the past being projected in the present and in the future. The past, corresponding to the epoch of first builders of the longhouse is relatively remote, yet it is dominant and projected into the present. This type of social time is particularly related to kinship and social organization based on lineages. I assume this concept of time operated at two slightly different levels, an individual house, or a socio-domestic unit (represented by a longhouse) and a whole settlement (consisting of a number of longhouses).

Within the nearby woodlands, the LBK peoples certainly left signs of some of their previous activities. The evidence of forest burning and occasional clearings, the remains of some cultivated plots of land, even the treaded paths, were all visible signs of earlier human activities, the signs of the past. While some of them referred to repetitive activities, displaying events following each other in never-ending cycles, others were left occasionally. Though the signs of repetitive activities not necessarily were attached to the same physical locations, they nevertheless represented a type of the cyclical time. Generally, the inhabitants of the LBK settlements practiced subsistence strategies based on environmental and climatic cycles (both horticulture and mobile pastoralism depend on the cycles of growth of plants and animals). Their repetitive activities more or less recorded patterns of natural phenomena and their temporal referents were made in terms of temporal and (also) spatial synchronicity, that is, "when certain features are simultaneously present" (see Williams and Mununggurr 1989: 77). As examples from different geographical and cultural areas show, important subsistence activities could have been conceived as sequences of activities associated with simultaneous environmental events (cf. Nilsson 1920: 45–85; Hallpike 1986: 328–337). This model associates temporal continuity and periodicity with activities performed within woodlands rather than within longhouse settlements, and it is precisely the same concept of the cyclical time that was probably conceptualized by nearby Mesolithic foragers. What I want to suggest is that the space beyond the house was linked to cyclical patterns of time associated with sequences of natural events and with a sense of loosening of familiar or lineage links while routine, repetitive practices performed within settlements were much more connected to the wider social field and subordinated to the time of slowed duration.

There have been suggestions (Bailey 1993: 207–208; Whittle 1996: 59–61) that the placement of the deceased within the settlement area (either in pits beneath house floors or near to walls or in pits within houses or in areas adjacent to settlements) reflected the intention of including the dead in the space of the living and the cyclical model of time. Similar strategies were used on Mesolithic and Epipalaeolithic sites (the deceased being buried near or below hearths, Raczky 1993: 7, also Bailey 1993: 208). It is probable that open-air hearths provided a sense of permanence and stability in foraging societies and the placement of the deceased could have reinforced social ties of those mobile groups.

Visibility and orientations of LBK longhouses

Another point that merits attention here is the orientation of the longhouses. Orientation patterns are usually studied by archaeoastronomers who assume that some of architectural features are pointing at astronomically important directions. It should be noted here that, though some regional variations may be observed, most LBK houses are aligned to NW-SE axis,[1] many of them falling out of the solar arc.[2] The persistence over time and space of similar orientation patterns was explained in terms of prevailing winds and snow showers (Soudský 1969: 81–82; Startin 1978: 149; Marshall 1981: 112–117): the houses were built to face dominant storms and winds. However, reconstructions of the longhouse setting within natural environment do not support this theory. First, the LBK communities lived in within a still wooded environment, surrounded by small cultivated plots and gardens, so the woodland would have had a taming effect on strong winds and storms. Second, the longhouses reaching a maximum height of 4 meters would have been well overshadowed by trees reaching 30 and more meters in height (see Modderman 1988: 83–84, 90). Third, a high proportion of predominant winter winds would have been from north and northwest, but the winter winds are from southwest and west (Marshall 1981: 113) and do not correlate with orientation patterns (Thomas 1996: 108). Fourth, like longhouses, LBK graves were similarly oriented and there is no need to protect them against wind. Therefore, the direction of dominant wind and the

[1] In the west, orientations are northwest-southeast or even west-east, while in central Europe orientations are north-south (see Fig. 39 in Soudský 1969: 81).

[2] Solar arc is defined as the range between the directions to solstice sunrises on the eastern horizon and to solstice sunsets on the western horizon. For more details regarding long houses orientations see Iwaniszewski 1996.

maximization of seasonal warmth should be excluded from the factors determining building orientations. An alternative point might have been the need of the maximization of light from the southeastern entrance during the first half of a day (Thomas 1996: 108).

The abandonment of the agricultural models based on both the ‘slash-and-burn’ and field rotation techniques (Modderman 1988: 114–115) introduces problems of the visibility of LBK settlements. The lack of permanently cleared patches within woodlands together with the low visibility of longhouses overshadowed by high trees speak against the possibility of extensive vistas made from settlements to distant horizons. LBK settlements were not situated on high elevations but rather on slopes (Modderman 1988: 84), so with all probability, the vistas from settlements were blocked by tress of nearby woodland and I assume that LBK communities generally lacked adequate reference points located on horizon.[3] Also longhouses located within patches of clearings would have been completely invisible from considerable distances. The significance of the relationship between longhouses and landscape features seems therefore to be of less importance. Broad space of a forest was then contrasted with much more limited space occupied by a village and villagers activities.

Enclosures

In another place I (Iwaniszewski 1996) discussed orientation patterns of post-LBK enclosures and burials. Enclosures should not be one-sidedly interpreted as Kalendarbauten (Becker 1990: 170), because only in Lower Austria is observed a trend to align them to specific calendar dates. In all other regions (Bavaria, Moravia and Slovakia) solstitial and equinoctial orientations are dominant (Iwaniszewski 1996: 18–19) They can refer to cosmovisional dimensions rather than to temporal cycles and can reflect the interest in the cyclical model of time.

It is interesting that while the Kujavian long houses are not aligned to the positions of the Sun along the horizon, the Linear Pottery and Lengyel Culture longhouses from Březno (Bohemia) are aligned (Iwaniszewski 1996).

Social time in FBC communities

The succeeding archaeological horizon in northern Europe is related to the Funnel Beaker Culture (FBC) marking the end of the Early Neolithic. The emergence of the Funnel Beaker Culture seems to be associated with the agricultural expansion to sandy soils previously inhabited by hunter-gatherers. Though first FBC communities overlap chronologically with the post LBK settlements (the Lengyel-Polgar cycle in the eastern part of the north European Plain), they nevertheless occupy a different niche in the landscape. Cereal agriculture, the

[3] I am discussing this problem in detail in other publication.

exploitation of sandy lands, pastoralism and the construction of unchambered long barrows are among the most outstanding elements of this new life-style. In southern Poland some of FBC settlements may also be associated with the areas earlier occupied by either LBK, or post-LBK societies. FBC communities abandoned the longhouse pattern, their houses are also smaller than in post-LBK communities, suggesting changing social structures. The early FBC social organization probably based on lineages, and a household represented a minimal familiar unit. Later FBC settlements were usually composed of several families living within a larger village (Prinke and Szmyt 1996: 53).

The Middle Neolithic started with the appearance of megaliths. The FBC long barrows were built of wood, stone and earth and imitated both in shape and outline the form of longhouses. They were built to endure for long periods of time. Located near to hilltops within a cultivated land they could have been observed from distant landmarks. Unlike the LBK longhouses these monuments could have stood within a reasonable clear environment produced by the regular movements of the livestock. Given the location of some long barrows on earlier settlement sites (of LBK, post-LBK and FBC origin), the notion that monumental barrows represented houses was strengthened as the emphasis on continuity over a long time. Large and enduring monuments constrained people's movements across the country so they could have represented a category of the time of slowed down long duration (Iwaniszewski 1997). Unlike LBK communities however, Funnel Beakers related this concept of time with the dead members buried under specially erected monuments. The monuments were located within agricultural fields or pastoral lands so it becomes evident that this model of enduring time was located in the sphere of basic subsistence practices (hunting, gathering, animal breeding, farming) rather than within the area of 'routinized' activities held in a domestic unit (for a contrary viewpoint see Whittle 1996: 248). The dead were deliberately excluded from the sphere of the living. The individuals buried within settlements in unmarked flat graves would have represented a cyclical concept of time, but the dead kept visible within cultivated lands would have been easily identified with nearby communities. It is therefore likely that burial monuments were used to maintain the sense of continuity and social cohesion within the pattern of small and temporary villages scattered in the landscape.

Some of the FBC long barrows (in Kujavia as well as in Little Poland) were oriented to be connected with the risings and settings of the Sun throughout the year. Basing on my earlier work in Kujavia (Iwaniszewski 1995) and the Sandomierz Upland (Iwaniszewski a, b) I conclude that long barrows were located deliberately to have extensive vistas. They were predominantly aligned towards the sunset. Some of them, especially those erected in later phases of the FBC, were aligned towards the sunset on dates corresponding to major seasonal changes and agricultural cycles. Though they are regional variations in the location of the FBC long barrows, they always present good visibility conditions. It may be associated with the progressive clearing of forests during the FBC (Kruk 1980: 188–190, 196–197, 328–331; Kruk 1993; Kruk and Milisauskas 1999: 110–115, 148; Szmyt 1996: 100–104; Wierzbicki 1999: 41; Czebreszuk 2001: 59–61).

As early Neolithic communities emphasized continuity and renewal through erecting, repairing and rebuilding of longhouse, so Funnel Beakers continued the same emphasis through erecting of enduring funerary features. But the barrows also introduce new ways of creating the sense of continuity in the face of death. The placement of the death within cultivated fields may denote the emergence of the new agricultural metaphor to deal with death and continuity. Long barrows are oriented to specific dates associated with important agricultural cycles. They may have represented a category of the time of slowed down long duration. On the other hand however, the cyclical pattern of basic collective activities was recorded, visualized and renewed through regularly occurring alignments with the Sun. Also, through their alignments the monuments established the relationship with distant outside referents, towards a broad space of a forest as well as of cleared farming plots and meadows. Like megaliths, long barrows may be treated (e.g. Tilley 1984: 122) as enduring structures, built to deny the flow of time and to induce a sense of permanence, stability and continuity. Therefore, though long barrows are linked to chosen landscape features through cyclic patterns of time, they appear to be subordinated to the conceptualization of the enduring time.

Long barrows that are aligned to specific celestial targets can be effective in introducing a new sense of time. The monuments, on the one hand serve as funeral structures and refer to the events (real or mythic one) in the past, on the other hand their alignments make a reference to the cyclic time represented by the repeated solar events. Now, if we deal with the people who buried their relatives under the barrows, or with their descendants, we can really speak of the concept of the past being projected into the present, the time of slowed down long duration. Similarly, I assume that longhouse builders were closely related to the people who earlier built their dwellings. Here however, we deal with the situation when the long barrow builders and they descendants disappear from the region, but their monuments still stand within the landscape. Living communities that cannot show direct genealogical links to the long barrow builders, will normally use ideological arguments to provide such links (see Augé 1976). Such ideologies will mask the obvious time discontinuity, through the development of a concept of more distant ancestors. To be clear, I am trying to make a difference between the category of the recently deceased to whom genealogical ties may be demonstrated and the category of distant ancestors to whom fictional, mythical relationship is displayed. These forefathers may eventually be related to the ideas of fertility, periodic renewal and the like, because they are positioned within the discourse that makes a reference to the timeless time rather than to a concrete historical event. Anyway, when a rupture between the past and the present is occulted and what is discontinous is presented as continuous, we deal with Gurvitch's (1964) concept of *deceptive time*. It is a time of long duration masking the rupture between the past and the present. Summing up, long barrows placed within the landscape represented the concept of the time of slowed down long duration in earlier phases of the FBC (the FBC phases I–III), and the concept of deceptive time for the most of later phases of the FBC (the FBC phases IV–V).

Temporal Orientation of GAC communities

At the end of this sequence in central-northern Europe is the Globular Amphora Culture (GAC). The culture was distributed between the Dnieper in the east and the Elbe in the west. GAC communities practiced animal husbandry and cereal growing. They lived either in small short-lived villages (each household representing a nuclear family) or within bigger aggregations of families (only during the GAC phases IIb–IIIa, Szmyt 1996: 201–216) forming a region (consisting of some twenty local aggregations). Permanent settlements are few. GAC remains suggest patterns of dispersed settlements populated for relatively short periods.[4] Basic social unit was represented by a household. My discussion will be limited to the Kujavian group of the GAC.

GAC communities were ranked societies particularly emphasizing gender and age differences (Szmyt 1996: 206).

Since the scheduling of agricultural activities always follows an annual cycle for the major crops (wheat, barley, and beans; Szmyt 1996:166), so I assume that the dominant chronotype of the Kujavian GAC villagers would have been that of the cyclical concept of time. But typical GAC villages were inhabited for a short period of time perhaps indicating a greater concern with mobile cattle herding (Szmyt 1996: 172–175, 191) rather than with intensive farming. GAC settlements were founded within the landscape already transformed by man. Many villages were situated on locations previously occupied by human societies (LBK, post-LBK, FBC and earlier GAC villages) indicating a type of attachment to earlier phases, what in some sense may reflect the dominance of the discontinuous past, perhaps a variant of the deceptive time described above. There is still no much evidence from GAC settlements to speculate more on time concepts. It may indicate a tendency to be attached to remote ancestors (about symbolic valorization of the GAC landscape in Kujavia see Szmyt 1996: 123–124). Because first phases of GAC overlap chronologically with Funnel Beakers but their settlements occupy different locations in the landscape, it is possible that both types of communities represented by FBC and GAC maintained different identities throughout long time (see Czerniak 1990: 61; Czerniak and Kośko 1993: 115–116 on post-LBK and FBC relations; Szmit 1996: 244 on FBC and GAC relationship).

In Kujavia GAC megalithic tombs occupied locations within territories still unaffected by human activity near to the permanently exploited areas (Szmyt 1996: 158–159). Frequent changes in residence of small familiar groups were contrasted with megalithic cemeteries used for a long time. The GAC people were still moving around but could have been brought together by gatherings (funeral rituals?) at more stable points marked by cemeteries. It seems that megalithic tombs may have induced a sense of permanence and durability among peoples who were constantly moving across the country (Szmyt 1996: 158–159). Burials within settlements were exceptional.

[4] Szmyt (1996: 142) observes the average lifespan of GAC settlements was substantially shorter than that of LBK and post-LBK communities and even shorter than FBC households.

The corpses of deceased were buried in single and collective graves, in stone chambers and dug-in-earth cists, usually in a flexed position and along east-west axis, with gender and sex differentiation. The occurrence of animal (predominantly cattle) burials suggests the increasing ritual importance of animals.

Generally the Kujavian passage graves contained multiple inhumations left in unanatomical arrangement (Góra 1972). Burials of several individuals are also in cists. These graves were reopened when new deceased were inserted (Szmyt 1999: 28). According to Mizoguchi (1993: 230–231) this denotes a specific knowledge regarding the position of the skeleton, of grave goods, and the "possession of such knowledge solidifies ties among the members of a group and legitimates and naturalizes their specific relations to the other members of other groups in the community". Consequences of earlier inhumations constrain the way in which mortuary rituals introduce new dead to the grave.

Occassionally GAC graves were inserted into FBC long barrows (Chmielewski 1952: 28–30). In her monograph on the Globular Amphora Culture in Kujavia, Szmyt (1996: 145) provides examples of single graves from 7 long barrow sites. They represented both individual and collective (double) burials and the attempt to continue to use the same space as a sepulchral area.

Though GAC funerary practices may, in first instance, denote a kind of the enduring time, concepts of both the deceptive and erratic time are here much more probable. The re-utilization of FBC long barrows for GAC mortuary practices is here a good example. The discontinuity between the two communities, both in time and space, is here masked through the use of the same structure. The displacement of bones and altering of an anatomical arrangement in collective graves during the inhumation of a new corpse privileges the mortuary ritual performed actually neglecting the funerary rules of the past. The individual status may easily be identified through grave goods, but the disarrangement of older remains makes it impossible. In other words, the past constrains, but prevails the present. Unfortunately, there is still little evidence to be able to infer which of two possibilities can better describe the dominant chronotype: the erratic time (the time of uncertainty) or the alternating time (realizations of past and future in the present, Gurvitch 1964: 31–33).

Conclusions

Up to this moment, I was able to identify three types of social time proposed by Gurvitch (1964). In addition, another type may be postulated, but more case studies are needed. Social time manifestations are multiple and offer much better research strategies than the use of concepts of the cyclical and linear time.

Bibliography

Augé, Marc
1976: *Pouvoir de vie, pouvoir de mort: Introduction à une anthropologie de la répression*. Flammarion, Paris.

Bailey, Douglass W.
1993: Chronotypic Tension in Bulgarian Prehistory: 6500–3500 BC. *World Archaeology* 25, 2: 204–222.

Becker, H.
1990: Mittelneolitische Kreisgrabenlagen in Niederbayern und ihre Interpretation auf Grund von Luftbildern und Bodenmagnetik. In *Vorträge des 8. Niederbayerischen Archäologentages*, edited by K. Schmotz, pp. 136–176. Krebs, Deggendorf.

Bourdieu, Pierre
1977: *Outline of A Theory of Practice*. Cambridge University Press, Cambridge.
1991: *El sentido práctico*. Taurus, Madrid.

Chmielewski, Waldemar
1952: *Zagadnienie grobowców kujawskich w świetle ostatnich badań*. Muzeum Archeologiczne, Łódź.

Clastres, Pierre
1981: *Investigaciones en antropología política*. Gedisa, Barcelona.

Criado Boado, Felipe
1991a: Tiempos megalíticos y Espacios Modernos. *Historia y Crítica* 1: 85–108.
1991b: 'We, the post-megalithic people…' In *The Meanings of Things. Material Culture & Symbolic Expression*, edited by Ian Hodder, pp. 79–89. [One World Archaeology 6]. Harper Collins, London & N. York.

Czebreszuk, Janusz
2001: *Schyłek neolitu i początki epoki brązu w strefie południowo-zachodniobałtyckiej (III i początki II tys. przed Chr.* Wydawnictwo Naukowe Uniwersytetu Adama Mickiewicza, Poznań.

Czerniak, Lech
1980: *Rozwój społeczeństw kultury późnej ceramiki sznurowej na Kujawach*. [Seria Archeologia nr 16]. Uniwersytet im. Adama Mickiewicza, Poznań.
1990: The Neolithization of Kujavian Communities. *Archaeologia Polona* 28: 49–69.
1993: *Wczesny i środkowy okres neolitu na Kujawach 5400–3650 p.n.e.* Instytut Archeologii i Etnologii Polskiej Akademii Nauk, Poznań.

Czerniak, Lech and Aleksander Kośko
1993: *Z badań nad genezą rozwoju i systematyką kultury pucharów lejkowatych na Kujawach*. [Źródła do studiów nad prahistorią Kujaw 11]. Uniwersytet im. Adama Mickiewicza, Poznań.

Douglas, Mary
1972: Symbolic Orders in the Use of Domestic Space. In *Man, settlement and urbanism*, edited by Peter Ucko, pp. 13–22. Duckworth, London.

Fabian, Johannes
1983: *Time and the Other. How Anthropology Makes Its Object*. Columbia University Press, New York.

Goody, Jack
1968: Social Organization. In *International Encyclopedia of the Social Sciences*, edited by David L. Silles, pp. 30–42. Macmillan & Free Press, New York.

Góra, Mieczysław
1972: Problem przyjścia na teren polski megalitycznej tradycji budowania grobów korytarzowych. *Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi* 19: 277–287.

Gurvitch, G.
1964: *The Spectrum of Social Time*. Reidel, Dordrecht.

Hallpike, C.R.
1986: *Fundamentos del pensamiento primitivo*. Fondo de Cultura Económica, México, D.F.

Hodder, Ian
1984: Burials, Houses, Women and Men in the European Neolithic. In *Ideology, Power and Prehistory*, edited by Dan Miller and Christopher Tilley, pp. 51–68. Cambridge University Press, Cambridge.
1994: Architecture and Meaning: The Example of Neolithic Houses and Tombs. In *Architecture & Order. Approaches to Social Space*, edited by Michael Parker Pearson and Colin Richards, pp. 73–86. Routledge, London and New York.

Ingold, Tim
1993: The Temporality of the Landscape. *World Archaeology* 25, 2: 152–174.

Iwaniszewski, Stanisław
1995: The Funnel Beaker Culture (TRB) Long Barrows from the Kujawy District in Central Poland: First Results of Archaeoastronomical Investigations. In *Archaeoastronomy from Scandinavia to Sardinia. Current Problems and Future of Archaeoastronomy 2*, edited by Emilia Pásztor, pp. 33–37. Budapest.
1996: Neolithic and Eneolithic Structures in Central Europe: Calendric-Astronomical Implications. In *Proceedings of the Second SEAC Conference, Bochum, August 29th–31st, 1994*, edited by Wolfhard Schlosser, pp. 15–28. Astronomisches Institut, Ruhr Universität, Bochum.
1997: Neolithic Uses of Time and Astronomy: Funnel Beakers and Long Barrows in Kuiavia, Poland. In *Actas del IV Congreso de la SEAC "Astronomía en la Cultura"*, edited by Carlos Jaschek and Francisco Atrio Barandela, pp. 173–184. Universidad de Salamanca, Salamanca.
a: Megalityczny obrządek pogrzebowy i neolityczny krajobraz w mikroregionie stryczowickim na Wyżynie Sandomiersko-Opatowskiej. Referat przedstawiony na konferencji "Idea megalityczna w obrządku pogrzebowym kultury pucharów lejkowatych" Igołomia 5-7.12.02.
b: The Dead in Neolithic Landscapes: an Agricultural Metaphor in the Funerary Tradition of the TRB Culture in the Sandomierz Upland. Paper Presented at *5th World's Archaeological Congress*. Washington, D.C., 23–27.06.2003.

Kruk, Janusz
1980: *Gospodarka w Polsce południowo-wschodniej w V–III tysiącleciu p.n.e.* Ossolineum, Wrocław.
1993: Rozwój społeczno-gospodarczy i zmiany środowiska przyrodniczego wyżyn lessowych w neolicie (4800–1800 bc). *Sprawozdania Archeologiczne* 45: 7–17.

Kruk, Janusz and Sarunas Milisauskas
1999: *Rozkwit i upadek społeczeństw rolniczych neolitu*. Instytut Archeologii i Etnologii Polskiej Akademii Nauk, Kraków.

Lauer, Robert H.
1981: *Temporal Man. The Meaning and Uses of Social Time*. Praeger, New York.

Leach, Edmund R.
1966: Two Essays Concerning the Symbolic Representation of Time. In *Rethinking Anthropology*, by Edmund R. Leach, pp. 124–136. The Athlone Press, University of London, London.

Marshall, Alistair
1981: Environmental Adaptation and Structural Design in Axially-pitched Longhouses from Neolithic Europe. *World Archaeology* 13, 1: 101–121.

Miller, Arthur G.
1986: *Maya Rulers of Time*. Pennsylvania State University, The University Museum, Philadelphia.

Mizoguchi, Koji
1993: Time in the Reproduction of Mortuary Practices. *World Archaeology* 25, 2: 223–235.

Modderman, P.J.R.
1988: The Linear Pottery Culture: Diversity in Uniformity. *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 38: 63–139.

Nilsson, Martin P.
1920: *Primitive Time-Reckoning*. [Skrifter utgivna av humanistiska vetenskapssamfundet i Lund]. C.W.K. Gleerup, Lund.

Nowotny, Helga
1975: Time Structuring and Time Measurement: On the Interaction Between Timekeepers and Social Time. In *The Study of Time II*, edited by J.T. Fraser & N. Lawrence, pp. 325–339. Springer Verlag, New York.
1990: From the Future to the Extended Present – Time in Social Systems. In *In Search of Usable Knowledge. Utilization Contexts and the Application of Knowledge*, by Helga Nowotny, pp. 9–27. Westview Press, Colorado.

Parker Perason, Michael and Colin Richards
1994: Ordering the World: Perceptions of Architecture, Space and Time. In *Architecture & Order. Approaches to Social Space*, edited by Michael Parker Pearson and Colin Richards, pp. 1–37. Routledge, London and New York.

Price, T. Douglas, R. Alexander Bentley, Jens Lüning, Detlef Gronenborn, Joachim Wahl
2001: Prehistoric Human Migration in the *Linearbandkeramik* of Central Europe. *Antiquity* 75, 4: 593–603.

Prinke, Danuta and Marzena Szmyt
1996: Ze studiów nad problematyką regionalizacji kulturowej w późnym neolicie na Kujawach. In *Z badań nad genezą regionalizmu kulturowego społeczeństw Kujaw*, pp. 39–73. Uniwersytet im. Adama Mickiewicza, Poznań–Kruszwica–Inowrocław.

Raczky, P.
1983: Origins of the Custom of Burying the Dead Inside Houses in South-East Europe. *A Szolnak Megyei Mūzeumok Évkönve* 19: 5–9.

Shanks, Michael and Christopher Tilley
1987: Abstract and Substantial Time. *Archaeological Review from Cambridge* 6, 1: 33–41.
1988: *Social Theory and Archaeology*. University of New Mexico Press, Albuquerque.

Soudský, Bohumil
1969: Étude de la maison néolithique. *Slovenská archeologia* 17, 1: 7–96.

Startin, W.
1978: Linear Pottery Culture Houses: Reconstruction and Manpower. *Proceedings of the Prehistoric Society* 44: 143–159.

Szmyt, Marzena
1996: *Społeczności kultury amfor kulistych na Kujawach*. Uniwersytet im. Adama Mickiewicza, Poznań.

1999: *Between West and East. People of the Globular Amphora Culture in Eastern Europe: 2950–2350 BC*. [Baltic-Pontic Studies, vol. 8]. Institute of Eastern Studies, Institute of Prehistory, Adam Mickiewicz University, Poznań.

Thomas, Julian
1996: *Time, Culture and Identity: an Interpretative Archaeology*. Routledge, London and New York.

Tilley, Christopher
1984: Ideology and the Legitimation of Power in the Middle Neolithic of Southern Sweden. In *Ideology, Power and Prehistory*, edited by Daniel Miller and Christopher Tilley, pp. 111–146. New Directions in Archaeology. Cambridge University Press, Cambridge.

Whittle, Alasdair
1996: *Europe in the Neolithic. The Creation of New Worlds*. [Cambridge World Archaeology]. University of Cambridge, Cambridge.

Wierzbicki, Jacek
1999: *Łupawski mikroregion osadniczy ludności kultury pucharów lejkowatych*. Seria Archeologiczna 44. Uniwersytet im. Adama Mickiewicza, Poznań.

Williams, Nanvy M. and Daymbalipu Mununggurr
1989: Understanding Yolngnu Signs of the Past. In *Who Needs the Past? Indigenous Values & Archaeology*, edited by R. Layton, pp. 70–93. One World Archaeology 5. Routledge, London.

van de Velde, P.
1979: On Bandkeramik Social Structure. *Analecta Praehistorica Leidensia* 12: 1–242.
1990: Bandkeramik Social Inequality – A Case Study. *Germania* 68, 1: 19–38.

Table 1. Neolithic Chronology in Kujavia (Dates according to Czerniak 1980, 1993, Szmyt 1996).

Archaeological culture	*Chronology*
Linearbankeramik – Late Band Pottery Culture Lengyel–Polgar Culture	5400–4000/3650 BC
Funnel Beaker Culture	4400–2300 BC
Globular Amphora Culture	4050/3750–2200 BC

Ethnographic Correlates of One Type of Soli-lunar Alignment: The Doubling of Winter Solstice Sunset with the Southern (Minor or Major) Standstill Moonsets

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Abstract: *Recent paradigm shifts in the palaeo-anthropology of human cultural origins and the archaeology of the North-West European Neolithic have transformed our understanding of pre-history. The new consensus is that sub-Saharan Middle Palaeolithic hunter-gatherers created culture, and monument builders of the Late Neolithic and Early Bronze Age attempted to preserve through modification the cosmology of these ancestral hunters. This paper examines the horizon properties of the main soli-lunar alignments found at many stone monuments in the British Isles, and finds an emphasis on winter over summer, settings over risings, and dark moon over full moon. These findings support the interpretation that monument builders were motivated to preserve by modification an ancient lunar scheduled cosmology within an emerging emphasis on the sun.*

Keywords: soli-lunar; Stonehenge; dark moon; sex-strike theory; ritual; estrangement

Recent shifts in archaeology and anthropology

Two recent paradigm shifts have reversed our understanding of prehistory. No longer do we view the North-West European Neolithic as a culture-creating farming revolution that led our ancestors out of primitive hunter-gathering (Renfrew 2001, Runciman 2001). Monument builders were not settled mixed arable farmers. It is now known that the builders were cattle herders who in seasonal migrations followed the Mesolithic hunting trails of their ancestors, and who continued to hunt and who sometimes planted. All commentators are agreed that their monuments display conservatism in their design and motifs, and that this is best explained by reference to the builder's concern to address an ancient and ancestral hunter's cosmology. The standard model within archaeology now is that the monument building cultures of this period were as much addressing the cosmological beliefs of the hunting cultures of the Mesolithic and Palaeolithic as they were pointing towards any new 'domesticating' future (Barrett 1994, Bradley 1998, Thomas 1999, Tilley 1996, Whittle 1996). This shift in the archaeology of the monument builders in NW Europe

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of 4.5–1.5 thousand years BC requires us to look in particular to the cosmology and religious ideas of the hunters and gatherers that preceded them.

While in Neolithic archaeology the paradigm shift sends us looking further back in time for clues to the motivations of the monument builders, the paradigm shift in palaeo-anthropology has brought forward the story of human cultural origins. Instead of millions of years of slow parallel evolution of anatomically modern humans across three continents (Out of Africa 1), it is now agreed that our ancestors evolved recently in sub-Saharan Africa about 175,000 years ago (Stringer 1996, White 2003), did not successfully disperse from there till about 70 thousand years ago (Oppenheimer 2003), displaced archaic humans who had left Africa earlier, and had already established symbolic culture before leaving Africa (D'Errico 2001, Henshilwood 2001, Hovers 2003, McBrearty 2000, Watts 1999). This 'Out of Africa 2' model supports the finding of anthropology that universals underlie subsequent cultural variation. These universals operate at the level of an invariant syntax of rules, which simultaneously allow multiple political meanings across cultures (Levi-Strauss 1969). For example, while red ochre is invariably associated with ritual potency, its use may be associated with women and men during 'rituals of inversion', or may be more narrowly associated with initiated men alone (Knight 1991, Watts 2005). Other examples include Frazer's finding of an incompatibility between menstrual blood and the sun (Frazer 1971), and Levi-Strauss's of an incompatibility between cooking and lunar eclipses (Levi-Strauss 1969). Such cultural universals have never been refuted, but twentieth century professional field social anthropology could provide no explanation for them. The recent return in anthropology to evolutionary theory promises to provide an explanation.

This exercise has assessed the evolutionary costs and benefits of various types of Middle-Late Pleistocene human coalitions (Dunbar 1999). When climatic changes undermined the viability of female self-provisioning, Darwinian selection pressures would have favoured the stabilisation of strategies to undermine dominant individuals' competitive behaviours (Boehm 2001). It has been found that matrilineal coalitions in particular would have accrued substantial evolutionary benefits by phase-locking their economic and ritual routines to the rhythms of the moon (Knight 1991, Knight 1995, Power 1999, Power 1997). More specifically, this 'sex strike' model predicts that the time of maximum ritual potency and sacred observance would have been at dark moon (Knight 1991, Watts 2005). This period of maximum darkness, when the moon had left the night sky, would be the time for women-as-wives to withdraw from temporary marriage and seclude themselves. This would signal to men-as-husbands to prepare and deliver collective hunting services. These women could have called upon their brothers, if necessary, to assist them in this seclusion strategy. Significant provisioning advantages would be gained by such Late-Pleistocene mothers of highly dependent offspring over those females following more competitive strategies.

As a cosmology this model predicts that 'time' in Palaeolithic hunting cultures was governed by a bi-polar logic of dark/full moon alternation. While dark moon was the signal for the imposition of strict and rigid sacred taboos that affected all of life, full moon was the signal for the relaxation of taboos, and return to a profane life. Ritually, dark moon symbolised for women their 'death' as wives and their metamorphosis into sisters, and for men their 'death' as husbands and transformation into brothers. While symbolically women would be conceptualised as 'prey', communing with game animals, economically men would be conceptualised in their roles as hunters. At the end of a successful monthly collective hunt and surrender of meat around the time of full moon, women would no longer need to seclude themselves, and full moon would be bracketed with their symbolic 'rebirth' as 'wives' while men could once again approach as 'husbands'. In sum, sex-strike theory predicts that the period of waxing moon was constructed as a sacred period of strict seclusion and taboos against 'marital' sex, while waning moon was a profane period of temporary 'marriage' and cooked meat. These predictions fit well with suggestions that earliest astronomical motifs were part of a deep bi-polar cultural syntax (Levi-Strauss 1969), were lunar not solar (Frolov 1977–79, Marshak 1972), and emphasised dark moon not full moon (Marshak 1972).

Testing these models by the archaeoastronomy of ancient monuments

By about ten thousand years ago, at the end of the Palaeolithic, mega-faunal extinctions in Europe would have undermined the optimum material preconditions for a lunar-scheduled forager coalition. Following a lunar-governed time schedule for hunting and ritual would have become maladaptive. Nevertheless, the great time depth to such routines and respect previously afforded to women's collective seclusion would have prompted concerns that group solidarity and ritual itself might be undermined. Theory would then predict a protracted and contradictory accommodation to local conditions combined with attempts to respect the form of ancient rules. More specifically, we would predict that if we find monument double alignments on the sun and the moon, this could be interpreted as a complex syntax in which a more ancient lunar cosmology is becoming displaced and appropriated to an emerging solar cosmology. Sex-strike theory therefore predicts a period of disengagement to control, modify and transcend a Palaeolithic cosmology throughout the Mesolithic and into the Neolithic. Evidence from the 'ethnographic present' suggests that the agents controlling this disengagement would have been high status men attempting to usurp and monopolise ritual power from matrilineal coalitions (Knight 1991).

Both paradigm shifts point to a single conclusion – that culture was a recent achievement of Palaeolithic hunter gatherers, it still echoes in the ethnographic present, and it focussed the concerns of the monument builders of the Neolithic and Early Bronze Age. This allows us to investigate North-West European monuments not just by inductively building theory from recognising the patterns in the material record of prehistory, but also theory-testing from the hypothesised properties of this ancient big-game hunting cosmology. To know the principles of this ancient symbolism provides us with another tool to decode these monuments. For paired alignments of the moon and the sun we would expect to find them arranged to preserve and confiscate lunar properties into solar symbolism, with especial emphasis on dark moon symbolism inserted into an estranging solar cosmology.

Recent archaeoastronomy

Over the last three decades archaeoastronomy has confirmed a tendency amongst the stone monuments of the Late Neolithic and Early Bronze Age in the British Isles to have an orientation towards the south-west which pair alignments on the setting winter solstice sun *and* the moon at its southern standstill moonset limits. In at least five regional groups of monuments of the Late Neolithic and Early Bronze Age, in all accounting for 323 monuments, their main alignments focus on winter solstice sunset and the southern major or minor moonsets. These are: 64 Scottish recumbent stone circles (Ruggles 1999), 28 Clava cairns (Burl 1981), 189 West Scotland stone rows and 48 SW Ireland stone rows (Ruggles 1999), Avebury stone circle and Stonehenge's Phase 1, Phase 2 and Phase 3 (North 1996). This strengthens other researchers who have called attention to the especial emphasis on solar orientations in the winter half of the year for many Neolithic and Early Bronze Age stone monuments (Prendergast 1995, Prendergast 1998), and '[t]he evidence for prehistoric interest in obvious astronomical events such as midwinter sunrise and sunset is almost universally accepted.' (Ashmore 1999: 28; see also Barnatt 1978, 1976, 1979, 1988, 1999, Sims 2006). While this paper will concentrate on interpreting the astronomical symbolism of sarsen Stonehenge (Stonehenge 3ii–v; see Cleal 1995), we will see that its astronomy was the 'same' as 322 other monuments, including Stonehenge's own two or three earlier incarnations.

The main alignment at Stonehenge

North (1996) has argued that when we imagine a reconstructed sarsen Stonehenge from the Heel Stone in elevation view, rather than plan view, the paradox is created of observing an almost solid-seeming wall of stone (**Fig. 1**). This 'obscuration' effect does not work in the reverse direction, towards the north-east and summer solstice sunrise. From about 11 metres before the Heel Stone, approaching the monument uphill along the Avenue, and right up to the 'entrance' between stones 1 and 30, just two gaps could have been seen along the main axis. The lower gap was aligned on winter solstice sunset. Anyone processing slowly along this axis from the right hand side of the Heel Stone would have experienced the effect of the sinking winter sun being held still, the upward movement of the walker's eye exactly cancelling out the sinking movement of the setting sun. When standing on the left hand side of the Heel Stone, the upper gap is aligned on the southern minor standstill moonsets (**Fig. 2**). Both these alignments can be made by an adult male observer of average height

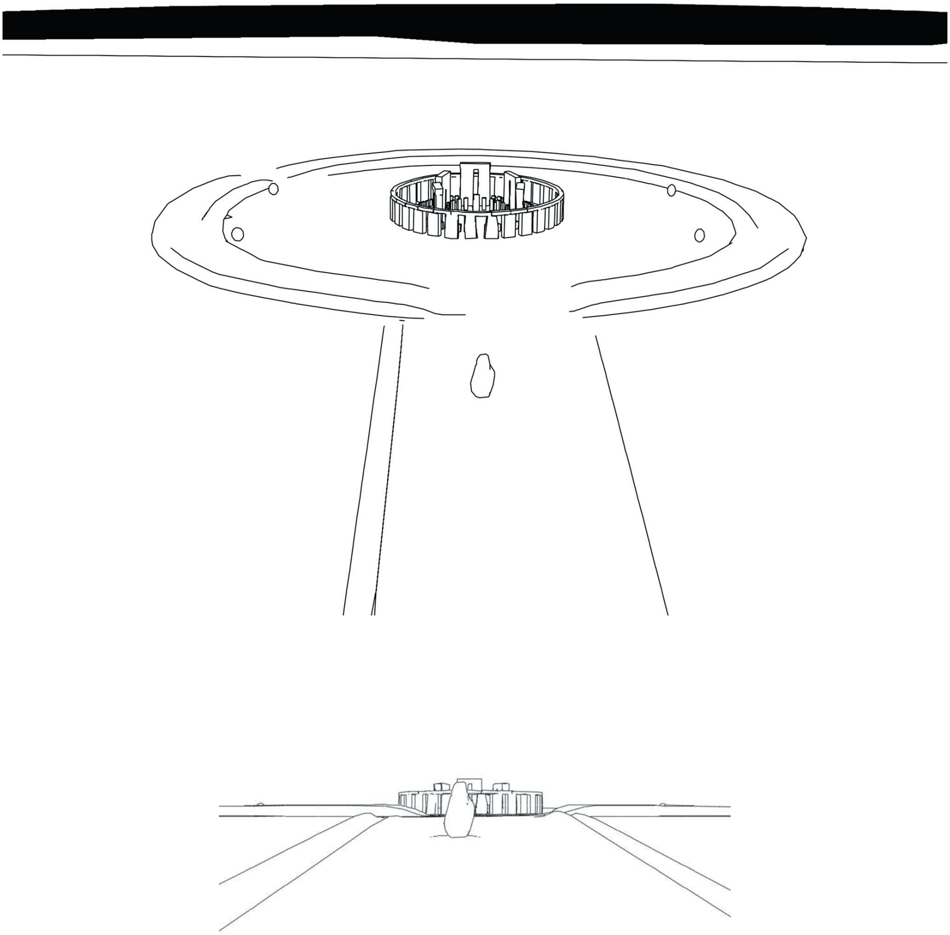

Fig. 1. Computer simulation of Stonehenge 3ii–v in oblique and elevation view.

for the Late Neolithic and Early Bronze Age, and the Heel Stone ditch allows a variety of standing positions to allow for observers of variable height.

These properties of sarsen Stonehenge are internal to the monument, and a product of the spectacular design principles of duplicated circles and arcs of lintelled stone pillars in concentric nested and tiered ranks. This design and placement of the trilithons creates the paradoxical property of what in plan view is a monument full of gaps, but which in elevation view appears to be a solid wall of stone. The placement of the trilithon horseshoe within the sarsen circle reduces the possible sightlines through the monument from the Heel Stone. The height of the grand trilithon created a protruding upper window proud of the encircling lintels of the outer circle. This allowed the double func-

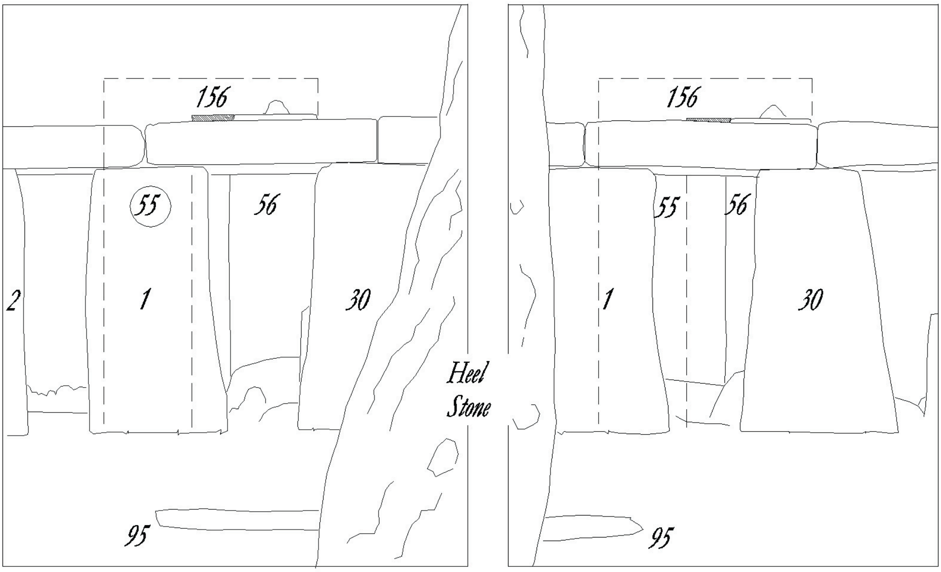

Fig. 2. Elevation views along the main axis of Stonehenge 3ii–v, standing on the left and right hand sides of the (upright) Heel Stone.

Note

1. Stones 55 and 156 of the grand trilithon have been reconstructed to fit the present setting of stone 56. North suggests that in 1901 Gowland may have re-set stone 56 'a hand-breadth's too deep.' (North 1996: 443) From my own inspection of this stone, it has also been twisted anti-clockwise out of alignment with the gap between stones 1 & 30.
2. The Altar Stone is not shown but, according to North, would probably have stood upright in front of the grand trilithon uprights, obscuring the lower portion of the bottom window.
3. A plan view of the monument cannot take account of many individual properties of some of the stones. This elevation view demonstrates how the dishing property of stone 1 keeps the view between the grand trilithon uprights, and therefore winter solstice sunset, open from the left hand side of the Heel Stone. If stone 1 were of a 'standard' shape, this would not have been the case.
4. The shaded portion beneath the grand trilithon lintel, stone 156, represents the upper window aligned on the southern minor standstill moonsets. Notice how this window is enlarged by left hand viewing from the Heel Stone.
5. Adapted from North 1996, Fig. 170.

tion of the grand trilithon for a lower alignment on the setting winter solstice sun and an upper alignment on the southern minor standstill moonsets. As this is the defining architecture of the monument, then it is not appropriate to prefer an inaccurate summer solstice sunrise alignment above these two accurate alignments. There are other reasons to accept that the main alignment is to the south-west rather than the north-east: the north-east entrance through the encircling ditch and the Avenue were the main route into the monument for all phases of its construction, and both look to the south-west; the 'dishing' of stone 1 keeps the winter solstice alignment open when viewing from the left hand side of the Heel Stone; the nearest trilithons are aligned to focus on the Heel Stone; the Altar Stone provides a durable and raised horizon into which the winter sun will appear to set into the apparent centre of the monument when viewing from the Heel Stone. There are additional reasons to discount the claim for a summer solstice sunrise alignment: no back sight was ever located at the centre of the monument; an upright Slaughter stone would have obscured sight of the Heel Stone from the centre; no clear horizon can be seen to the north-east; stone-hole 97 housed the Heel Stone in an earlier arrangement and did not provide one end of a ‘solstice corridor’, and the summer sun does not rise over the Heel Stone, but three solar diameters to its left. For these main reasons sarsen Stonehenge, in keeping with the main alignments found at other stone monuments in the British Isles, is aligned on winter solstice sunset not summer solstice sunrise.

Previous interpretations of the Stonehenge main alignment

The winter solstice sunset takes place over the course of about a week once a year. The upper alignment on the southern minor standstill moonsets, however, takes place once every nineteen years over the course of a year. Within archaeoastronomy, four interpretations have been suggested for alignments on lunar standstills: extreme horizon risings/settings of the major standstill (Morrison 1980); point estimate of the geocentric extreme declination of the moon’s trend movement in the nodal cycle (Thom 1971); reversed horizon movements of the moon’s southern minor standstill (North 1996); and luminosity of standstill full moon (North 1996; Ruggles 1999). Challenges can be made to all four of these interpretations.

Morrison (1980) suggested that monument builders preferred alignments on the major standstill, since these were extreme parts of the horizon never reached by the sun and only reached by the moon once every nineteen years. The minor standstill, in contrast, took place on a part of the horizon within the sun’s extremes, and the moon could set in this region at any part of its nineteen year cycle. However, Ruggles (1999) has shown that monuments with southern standstill lunar alignments are as likely to choose the minor standstill as the major standstill, and North (1996) has shown that Stonehenge 3ii–vi had its main alignment on the southern minor standstill moonsets. Archaeoastronomical field work over the last 25 years does not therefore support Morrison’s hypothesis for an exclusive focus on the major standstill.

Thom (1971) suggested that soli-lunar alignments of the Early Bronze Age were evidence for early eclipse prediction abilities, and that such double alignments were a component of astronomical measuring devices to calculate the 18.61 year nodal cycle which governs eclipses. However, since a horizon alignment does not directly or accurately measure the moment of the geocentric extreme necessary to make such a calculation, Thom suggested that further extrapolation devices accompanied the monuments to interpolate the true value. Again, in extensive field work re-examination of many of the monuments studied by Thom, Ruggles (1999) has found no evidence for such extrapolation devices, or for levels of accuracy up to 1′ of arc claimed by Thom, but for a large number of monuments aligned on southern lunar standstill moonsets to a range of accuracy between 6′ and 1°.

North (1996) suggested that the 13 lunistices of the southern minor standstill moonsets could be observed alternating in the upper grand trilithon window. Using models of these geocentric extreme declination lunistices (see also Morrison 1980) he assumed that these sinusoidal movements of the geocentric extreme declinations of the standstill moon were replicated at the horizon. If true this would present, in contrast to the sun's horizon movements, a reversed horizon swing before the moon continued its southward migration after its minor standstill period. North thought the builders might have considered this property 'magical'. Two main objections can be made. First, this suggestion cannot explain why other monuments, including Stonehenge 1 & 2, selected the southern major standstill, which has an extended horizon reversal. Second, these sinusoidal movements occur during the moon's mid-transit, and cannot be observed on the horizon.

Finally, the fourth hypothesis suggested within archaeoastronomy for a lunar alignment is that the builders were selecting for an alignment on the full moon (North 1996, Burl 1991, Ruggles 1999). Four main objections can be made. First, most of the stone monuments which have been found to have soli-lunar alignments focus on winter solstice. Yet during winter the full moon is on the northern horizon, and most stone monuments' lunar alignments are on the southern standstill not the northern. Second, if the builders required the luminosity of the full moon we would expect the lunar alignment to be on the rising moon, not on the setting moon as most are. Third, North (1996) calculates that seen from the Heel Stone the height of the grand trilithon upper window subtended an angle of about 8′ arc. Since the diameter of the moon is about 30′ of arc, then the upper window was never designed to frame the full moon. Fourth, a standstill lasts for about a year with 13 lunistices, and all of these return to the same horizon alignment. To rebut the charge of ethnocentrism, if we are to justify selecting just the full moon out of all the 13 moons that fit this alignment, then it must be made clear what criteria can justify such an assumption. Since it has already been established that the levels of accuracy of such alignments do not meet the high fidelity claimed by Thom, and since distinguishing full moon from all the other lunistices of a standstill would require similar levels of accuracy, it remains to be demonstrated what criteria are being mobilised to pick full moon.

We have not found any compelling argument to accept that the builders of these ancient monuments were interested in summer sunrise, extreme horizon alignments, eclipse prediction, reversed horizon swing, or full moon. Nevertheless nearly three decades of painstaking field work has shown that the monuments were indeed aligned on lunar standstills. The conclusion can only be drawn that the builders must have been selecting for some other *horizon* properties of lunar standstills. For the archaeoastronomy of these monuments to move forward, these properties should be sought.

Remaining properties of a horizon alignment on a lunar standstill

All four of the previous interpretations consider lunar alignments as separate from solar alignments. However, considering them as double alignments allows us to investigate the emergent properties of their association. For 'one' direction to function for two alignments suggests the builders were motivated to achieve a conflation between the two. The monument's binary design itself suggests this, with the sarsen circle of thirty stone pillars repeated by an inner bluestone circle of 59 or 60 stones, and the trilithon horseshoe repeated by the nineteen bluestones also arranged in a horseshoe. If the lunar alignments were originally meant to just complement, rather than conflate, a solar alignment, then there would have been no reason to seek a single double alignment with the challenging architecture of serried ranks of tiered and lintelled sarsen pillars.

If we reduce the alignment properties of sarsen Stonehenge to the main axis windows of the grand trilithon, this allows us to compare the double alignment of winter solstice sunset and the southern minor standstill moonsets with the seven other theoretically possible double alignments of lunar standstills with the sun's solstices (**Fig. 3**). It will be seen that the builders of sarsen Stonehenge selected that combination, W2, which allowed a superior moon setting above

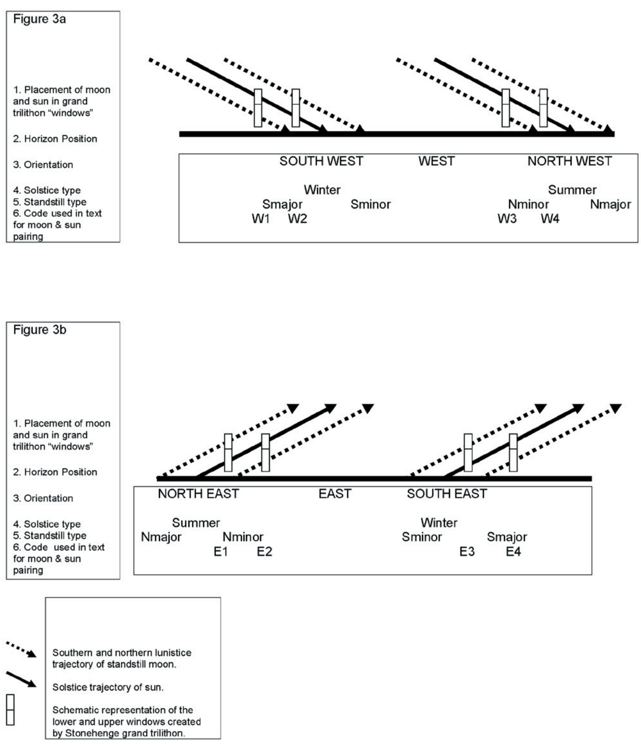

Fig. 3. Schematic representation of the eight possible horizon pairings of the sun's solstices and the moon's standstills.

winter sunset. However the same architecture could have equally well have chosen any one of the seven other possible combinations (W1, W3–4, E1–E4). By comparing their choice of W2 with these other possibilities we will isolate the priorities they sought for this main alignment at Stonehenge.

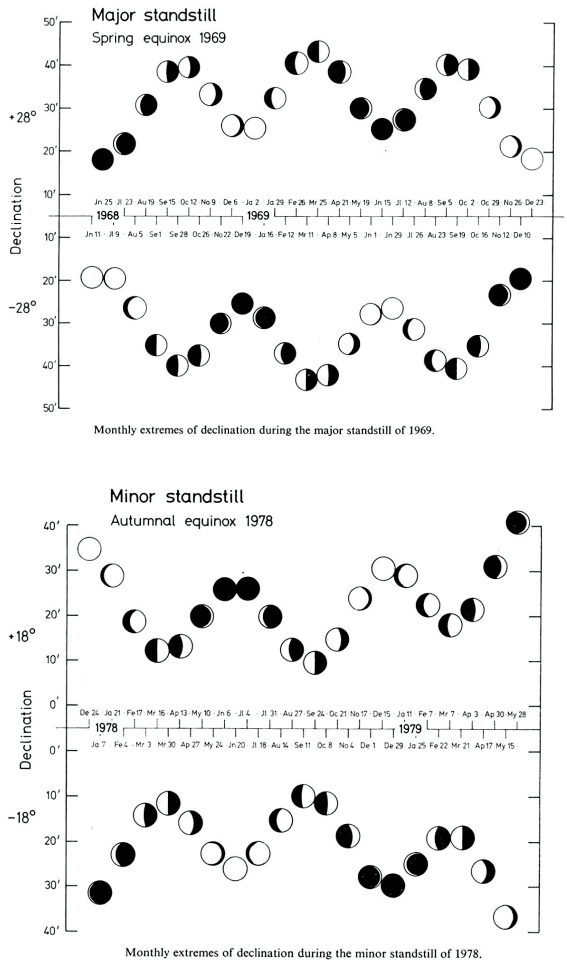

Fig. 4. Monthly (geocentric) extreme declinations of 1969 major standstil and 1978 minor standstill, by date and lunar phase. Note: 1. Month here means sidereal month; 2. The geocentric extreme declination occurs during the Moon's mid-transit, not at the moment of horizon moonrise or moonset; 3. Adapted from Morrison 1980.

The combination W2 allows the moon to be placed above the sun. But three other combinations also allow this property – W4, E1 and E3. By rejecting these three the builders rejected pairing the moon with summer solstice sunset, summer solstice sunrise and winter solstice sunrise. Therefore the builders did not want, for their main alignment at Stonehenge, any association with summer or risings or both. The remaining four other combinations would have had the sun above the moon. But one of these, W1, would have paired winter solstice sunset with the setting moon at the extreme of its range. Yet this unique property of the moon is clearly secondary to the builders, since they chose the southern minor standstill which places it above the sun. Therefore the builders were not seeking a winter calendrical pairing between the moon and the sun, but a ritual pairing with the moonsets dominant over the winter sunset.

Other than the respective placement of the sun and the moon at each of the solstices and standstill lunistices, only at a lunar standstill twice every nineteen years does the binary logic of dark/full moon alternation phase lock with the sun's solstices. It can be seen from **Fig. 4** that the northern lunistices, whether at major or minor standstills, always present a full moon at winter solstice and a dark moon with summer solstice. It is the reverse for southern lunistices, which present a full moon at summer solstice and a dark moon at winter solstice. Therefore a double alignment to the south-west which combines winter solstice sunset with either the southern major or the southern minor moonset guarantees the start of the longest and darkest night.

Setting aside the sinusoidal perturbation in **Fig. 4**, which we have already shown to be a property of the geocentric extreme declination which is not observable at the horizon, one final property emerges from a double alignment of a solstice sun with a lunar standstill. It can be seen that all thirteen lunistices would set within the same narrow band of the horizon (a range of just over 1°), with the additional complex property that over the course of a year they scroll through a full range of lunar phases in reverse sequence.

Two comments need to be made on these findings before any attempt at interpretation can be made. First, the computer-simulated series of lunistices produced by Morrison (1980) in **Fig. 4** implies that all of them can be observed in a standstill year. This is not the case. Against the glare of the sun, waning crescent moons cannot be observed at their settings and waxing crescent moons cannot be observed at their risings. Therefore the southern standstill builds up to winter solstice dark moon and is preceded by just 8 lunistices, not thirteen, from spring equinox to waxing crescent moon 27 days before winter solstice. Winter solstice coincides with the ninth lunistice of dark moon which also cannot be observed. After this, and still at the southern standstill, the subsequent waning crescent moons cannot be observed setting in the upper window. The ritual connected to this alignment therefore builds from spring equinox and ends at winter solstice. Second, it will be noticed that viewing winter sunset from the right hand side of the Heel Stone is not problematical. For about a week all who were allowed could easily observe the sun apparently setting in the centre of the monument. In the language of Darwinian signalling theory, this is a 'redundant' signal. However, viewing the southern lunistices at either major or minor standstills is a time-lapsed observing exercise which occurs only once every 27 days. Mapping this grouping of moonsets twice every nineteen years is a more specialist exercise and, in the language of signalling theory, is a 'cryptic' signal.

Remaining interpretations from horizon properties of a lunar standstill

In summary, the properties of a double alignment on winter solstice sunset and southern standstill moonsets limit the symbolic range of any associated rituals. A simple solarist interpretation cannot explain an alignment on a disappearing sun coupled with an invisible moon. A calendrical interpretation cannot explain the choice of doubling the sun with a superior moon. An interpretation which assumed alignments on a full moon cannot explain the selection for dark moon. However, an interpretation is required which includes the following suite of characteristics: the symbolic conflation of the sun and the moon; dark moon; the longest darkest night; the preservation of lunar phased rituals on a solar level; the emphasis on settings rather than risings; and the complex property of phase-locking a reversed sequence of lunar phases with the bi-polar logic of solstice alternation.

Minimally, this suite of properties would allow the inference that both sun and moon were conceptualised by the builders to have entered the underworld through the axial centre of the monument, and that powerful rituals were timed for the moment of their joint seclusion when they disappear at the start of the longest darkest night. Maximally, they could also be interpreted as an attempt by Late Neolithic and Early Bronze Age cultures to preserve under altered conditions the ritual syntax of their Palaeolithic hunting ancestors. Sex-strike theory predicts that these hunters timed their ritual and economic routines according to lunar cycles. The central defining principle of this logic relied on the sacred seclusion of women's coalitions at the time of dark moon. Once hunting and gathering could no longer guarantee survival at the end of the Palaeolithic, women's monthly seclusion rituals would have interfered with a more flexible requirement to hunt, gather and innovate whenever circumstances allowed at any time of the month. Other means would have had to be found to keep groups together. The symbolic and ritual implications of disengagement with lunar-scheduled coalitions of secluding women would have been profound. Displacement of women's ritual leadership could have been facilitated by ritual specialists eventually displacing monthly rituals onto a solar timescale. Preserving the sacredness of dark moon rituals according to the logic of solstice alternation, with the added complexities of lunistice sidereal alignments scrolling lunar phases in reverse order, would have been one way for a group of ritual specialists to accommodate to this crisis.

Conclusion

Recent research in archaeology interprets North-West European Late Neolithic and Early Bronze Age monuments as engaging with an earlier and resilient ritual code of ancestral hunter-gatherers. Recent palaeo-anthropology suggests that Palaeolithic hunter-gatherers carried with them a unitary cosmology. The sex-strike model of the earliest hunter-gatherer cultures predicts a Palaeolithic symbolic template timed to the rhythms of the moon, with particular symbolic potency attached to dark moon. Hypotheses generated by the sex-strike model suggest that soli-lunar alignments at Later Neolithic and Early Bronze Age monument are best interpreted as attempts at a complex preservation and estrangement of ancient lunar rituals within an emerging solar cosmology. Sarsen Stonehenge, as one spectacular example of a whole class of monuments with similar main alignments, doubles winter sunset with southern minor standstill moonsets which synchronises winter rituals with dark moon. This finding of archaeoastronomy is consistent with these recent understandings from archaeology and anthropology, and weakens interpretations that prioritise summer, risings and full moon.

Bibliography

Ashmore, P.
1999: Archaeology and Astronomy: A View from Scotland. *Archaeoastronomy* XIV:3–32.

Barnatt, J.
1978: *Stone Circles of the Peak*. London: Turnstone.

Barrett, J.
1994: *Fragments from Antiquity: an Archaeology of Social Life in Britain, 2900–1200 BC*. Oxford: Blackwell.

Boehm, C.
2001: *Hierarchy in the Forest. The Evolution of Egalitarian Behaviour*. Cambridge and London: Harvard University Press.

Bradley, R.
1998: *The Significance of Monuments*. London: Routledge.

Burl, A.
1976: *The Stone Circles of the British Isles*. New Haven: Yale University Press.
1979: *Rings of Stone: The Prehistoric Stone Circles of Britain and Ireland*. London: Weidenfeld and Nicolson.
1981: 'By the Light of the Cinerary Moon': Chambered Tombs and the Astronomy of Death, in *Astronomy and Society in Britain During the Period 4000–1500 BC*. Edited by C.R. and A. Whittle. Oxford.
1988: *Four Posters: Bronze Age Stone Circles of Western Europe*. British Archaeological Reports 195.
1999: *Great Stone Circles*. London: Yale.

Cleal, R.M.J., Walker, K.E., and Montague, R.
1995: *Stonehenge in Its Landscape*. London: English Heritage.

D'Errico, F., Henshilwood C., and Nilssen P.
2001: An Engraved Bone Fragment from ca. 70 ka-year-old Middle Stone Age Levels at Blombos Cave, South Africa. *Antiquity* 73:309–18.

Dunbar, R., Knight, C. and Power, C. (Editors)
1999: *The Evolution Of Culture: An Interdisciplinary View*. Edinburgh: Edinburgh University Press.

Frazer, J.G.
1971: *The Golden Bough*. London: Macmillan.

Frolov, B.A.
1977-79: Numbers in Palaeolithic Graphic Art and the Initial Stages of Development of Mathematics. *Soviet Anthropology and Archaeology* 16&17:142–166; 73–93; 41–74; 61–113.

Henshilwood C., Sealey J., Yates R., Cruz-Uribe C., Goldberg P., Grine F., Klein R., Poppenpoel C., Van Niekerk K., and Watts I.
2001: Blombos Cave, Southern Cape, South Africa: Preliminary Report on the 1992-1999 Excavations of the Middle Stone Age Levels. *Journal of Archaeological Science* 28:421–48.

Hovers E., Ilani S., Bar-Yosef O., and Vandermeersch B.
2003: An Early Case of Colour Symbolism. *Current Anthropology* 44:491–522.

Knight C.
1991: *Blood Relations: Mestruation and the Origins of Culture*. London and New Haven: Yale University Press.

Knight, C., Power, C. & Watts, I.
1995: The Human Symbolic Revolution: a Darwinian Account. *Cambridge Archaeological Journal* 5:75–114.

Levi-Strauss, C.
1969: *The Raw and the Cooked*. Harmondsworth: Penguin.

Marshak, A.
1972: *The Roots of Civilisation*. London: Weidenfelf and Nicolson.

McBrearty, S. and A. B.
2000: The Revolution That Wasn't: a New Interpretation of the Origins of Modern Human Behaviour. *Journal of Human Evolution* 39:453–563.

Morrison, L.V.
1980: On the Analysis of Megalithic Lunar Sightlines in Scotland. *Archaeoastronomy* 2:65-77.

North, J.
1996: *Stonehenge: Neolithic Man and the Cosmos*, First edition. London: Harper Collins.

Oppenheimer, S.
2003: *Out of Eden: The Peopling of the World*. London: Constable.

Power, C.
1999: 'Beauty Magic': the Origins of Art, in *The Evolution Of Culture: An Interdisciplinary View*. Edited by C.K. and C.P.R. Dunbar. Edinburgh: Edinburgh University Press.

Power, C. and L.C.A.
1997: Female Proto-Symbolic Strategies, in *Women in Human Evolution*. Edited by L.D. Hager, pp. 153–71. London and New York: Routledge.

Prendergast, K.
1995: *Embodiment and Objectivity: The Ritualisation of Winter in a European Context*. Oxford.
1998: *The Celestial Orientation of Monuments and Social Practice in Neolithic Britain*. Ph.D., University of Oxford.

Renfrew, C.
2001: Commodification and Institution in Group-Oriented and Individualizing Societies, in *The Origin of Human Social Institutions*. Edited by W.G. Runciman. Oxford: The British Academy.

Ruggles, C.L.N.
1999: *Astronomy in Prehistoric Britain and Ireland*. London: Yale University Press.

Runciman, W.G. (Editor)
2001: *The Origin of Human Social Institutions*. *Proceedings of the British Academy*. Oxford: University Press.

Sims, L.
2006: The solarisation of the moon: manipulated knowledge at Stonehenge. *Cambridge Archaeology Journal* 16.

Stringer, C. and M.
1996: *African Exodus: The Origins of Modern Humanity*. London: Cape.

Thom, A.
1971: *Megalithic Lunar Observatories*. Oxford: Clarendon Press.

Thomas, J.
1999: *Understanding the Neolithic*. London and New York: Routledge.

Tilley, C.
1996: *An Ethnography of the Neolithic: Early Prehistoric Societies in Southern Scandinavia*. Cambridge: University Press.

Watts, I.
1999: The Origin of Symbolic Culture, in *The Evolution of Culture*. Edited by R. Dunbar, Knight, C. & Power, C., pp. 113–146. Edinburgh: Edinburgh University Press.
2005: 'Time, Too, Grows on the Moon': Some Evidence for Knight's Theory of a Human Universal, in *The Qualities of Time: Anthropological Approaches*. Edited by W.J. and D. Mills. Oxford: Berg.

White, T., Asfaw B., DeGusta D., Gilbert H., Richards G., Suwa G. and Howell F.C.
2003: Pleistocene *Homo sapiens* from Middle Awash, Ethiopia. *Nature* 423:742–52.

Whittle, A.
1996: *Europe in the Neolithic: the Creation of New Worlds*. Cambridge: University Press.

The Calendar of Coligny and Related Calendars

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Abstract: *The calendar of Coligny was found in the small town of Coligny, north of Lyon, in 1897 as a bronze plate broken into many pieces. It describes 5 years of a calendar in Gaulish language and in Latin script. The calendar is about 2000 years old and was probably used in Gaul in the first century BC before the conquest of Gaul by the Romans. Today the calendar can be seen in Lyon in the Musée de la civilization gallo-romaine.*

Altogether, this calendar is one of the few written sources of the Celts and an important witness of their scientific achievements. The calendar of Coligny and the astronomical knowledge which it contains could open the way to a better understanding of Celtic culture in the future.

Since the calendar of Coligny was the earliest document in the Gaulish language which was found again, it was discussed in the last century mainly by scholars of Celtic languages. Only in the last 20 years the calendar was also investigated from the point of view of astronomy, mathematics and the history of these sciences.

1. A first analysis

The calendar plate of Coligny was found in Coligny (Dépt. Ain) in France in November 1897. It is exhibited in Lyon in the *Musée de la civilization gallo-romaine*. The size of the plate is 148 cm times 90 cm, but broken into many pieces. 153 of these fragments were found, i.e. ca. 45% of the whole area of the plate.

The following short description and discussion of the calendar of Coligny is mainly based on Olmsted ([9] and [10]). More details on calendars in general and on the Celts are given in [3]. The calendar of Coligny is discussed together with two other archaeological objects of astronomical and mathematical relevance in a paper in German [4].

These fragments contain inscriptions in the Gaulish language in Latin script. According to Duval and Pinault [2] the calendar plate was produced in one of the early centuries after Christ. This dating by epigraphic and stylistic methods is in contrast to a more historical dating in the first century BC before Caesar's conquest of Gaul.

Altogether this calendar describes 5 years or 62 months of 1832 days. There are 12 regular months which occur in all 5 years. Furthermore, there are 2 intercalary months which occur once each within these 5 years.

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The names of the 12 regular months are: Samonios (SAM), Dvmannios (DVM), Rivros (RIV), Anagantion (ANA), Ogronnios (OGR), Qvtios (QVT), Giamonios (GIA), Semivisonns (SEM), Eqvos (EQV), Elembivios (ELE), Edrinios (EDR), and Cantlos (CAN).

There are 6 complete months of 30 days: SAM, RIV, OGR, QVT, SEM, and EDR. 5 months of 29 days are incomplete: DVM, ANA, GIA, ELE, and CAN. The month EQV has 30 days in the years 1, 3, and 5, but only 28 days in year 2 and 29 days in year 4 of the cycle of 5 years. Each month is divided into two parts. The first 15 days are counted as usual; in the second half of the month the counting of the days starts again from 1. The two intercalary months INT1 (Qvimonios) and INT2 (Rantaranos?) have 30 days each.

The cycle of the 5 years of the calendar plate is as follows:

INT1, SAM, DVM, ..., CAN (year 1) (385 days);
SAM, DVM, ..., CAN (year 2) (353 days);
SAM, DVM, ..., QVT, INT2, GIA, ..., CAN (year 3) (385 days);
SAM, DVM, ..., CAN (year 4) (354 days);
SAM, DVM, ..., CAN (year 5) (355 days).

The following short and simplified analysis of the function of the calendar of Coligny is further based on Olmsted. The cycle of 5 years of the calendar plate is repeated 5 times where, however, the first intercalary month INT1 in the beginning of the first cycle is left out once. This leads to a period of 309 months with 9130 days which is a good approximation of 309 lunar months of 9124.9517 days as well as of 25 solar years of 9131.0550 days. The small differences of about 0.05 days to a whole day yield an error of 1 day in about 500 years in respect to the Moon and to the Sun. Of course, these 25 years are 5 days too long from the lunar point of view and 1 day too short from the solar point of view. This problem is dealt with by the use of 3 special counting schemes.

It is interesting to remark that the above period of 309 lunar months was used in an Egyptian lunar calendar whereas the Egyptian calendar of 365 days gave rise to the Julian calendar (compare [13]).

2. The origin of the calendar

According to Olmsted the original cycle of the calendar was 30 years instead of 25 years, maybe in the beginning of the first millennium BC. This idea is derived from Pliny (*Naturalis historia* XVI, 250) (compare [9], p. 61):

> Est autem id rarum admodum inventu et repertum magna religione petitur et ante omnia sexta luna, quae principia mensum annorumque his facit, et saeculi post tricesimum annum, quia iam virium abunde habeat nec sit sui dimidia.

In these 6 cycles of 5 years each the month EQV had only 28 days in the fourth year. Such a calendar is more exact with respect to the Moon, but less exact with respect to the Sun. In 30 years an error of 1.266 days occurs which leads to a shift of the solstices. After the introduction of the Christian calendar in Ireland this shift was stopped. This would be an explanation for the fact that the 4 main seasonal feasts in Ireland are shifted by 51 days in relation to the astronomical event. Halloween is celebrated on November 1 as the beginning of winter already 51 days before December 21.

3. Research history

Already early after its discovery the calendar of Coligny was analized by Thurneysen, a leading scholar of Celtic studies of his time. The language of the calendar was regarded as Gaulish, one of the Celtic languages [14]:

> Noch bleibt die wichtige Frage zu erörtern, ob die Zeitrechnung des Kalenders einheimischen Ursprungs ist oder ob sie, wie so viele Culturelemente, durch Massalia's Vermittlung aus Griechenland geflossen. (...)
> Wir können also den Kalender unbedenklich als ein Denkmal der einheimisch keltischen Kultur ansehen, wie ja schon Caesar von Lehren der Druiden über die Bewegung der Gestirne berichtet.

The text of the calendar of Coligny was the first known text in the Gaulish language at all in 1897. Of course, the calendar was discussed in specialized journals of Celtic studies. Mainly philological aspects were discussed.

From the points of view of astronomy, mathematics, and the history of these disciplines the calendar has been seriously discussed only since 1986. In this year the astronomer Carlos Jaschek in Strasbourg founded a colloquium *Astronomie et sciences humaines* and a journal with the same title in which several papers on the calendar of Coligny appeared (The earliest among them were by Parisot [11], LeContel and P. Verdier [6], P. Verdier [15–16]).

In the same year 1986 the calendar of Coligny was documented in [2] where the interested reader finds photographs, drawings, editions, translations, and comments for all its months. In order to investigate the calendar in detail it is no longer necessary to visit the museum in Lyon.

Although the calendar of Coligny has been exhibited to the public in Lyon for a long time, it is more or less still unknown. One reason is that the Celts are mostly regarded as inferior to the Greeks and Romans from a cultural point of view. It is nearly unknown that there are Celtic written texts since the sixth century BC. Texts in the Gaulish script are written in 3 different alphabetic scripts, in Etruscan, in Greek, and in Latin.

Nevertheless, it is repeated again and again that the Celts produced no written sources. The image of the Celts is still dominated by the view of the Greeks and the Romans who were their enemies and regarded them as barbarians.

However, even Julius Caesar did not only report negative aspects concerning Celtic culture and knowledge. In *De bello gallico* 6,14 we can read on the remarkable knowledge of the Gauls as follows:

> Multa praeterea de sideribus atque eorum motu, de mundi ac terrarum magnitudine, de rerum natura, de deorum immortalium vi ac potestate disputant et iuventuti tradunt.

Moreover in *De bello gallico* 6,18 it is reported that the Celts counted time in nights:

> Ob eam causam spatia omnis temporis non numero dierum, sed noctium finiunt; dies natales et mensum et annorum initia sic observant, ut noctem dies subsequatur.

In the last years since 1991 altogether 6 books on the calendar of Coligny were published. The two books of Olmsted ([9] and [10]) were already discussed above and are the basis of my description above.

In the other 4 books ([1], [5], [7] und [8]) the calendar is discussed from very different points of view. A detailed discussion would lead too far and has to be postponed for now.

For the future discussion it might be useful to start just from the beginning. One could ask whether the calendar of Coligny is a calendar at all. Was it a scheme which should be repeated again and again? Or was it just 5 specific years of Gaulish history?

At least it seems to be necessary to start a broader discussion from many different points of view and including participants of different disciplines.

4. Relation to other calendars

Maybe the most important question concerning the calendar of Coligny is where the knowledge which is contained in the calendar came from. Of course, a development of this knowledge within the Celtic culture (see Thurneysen above) is possible. In this case, however, a quite new picture had to be drawn concerning the scientific achievements of the Celts in comparison to those of their neighbours and enemies.

It would be easier (which does not mean this is more probable) to explain the calendar as inherited from other cultures by knowledge transfer. Such lunisolar calendars were mainly known in the Ancient Near East. One of these witnesses is the still surviving Jewish calendar.

The calendar of Coligny has two particular properties. On the one hand, the first 15 days of a month are counted from I to XV, and for the second half the counting starts from I again. This is unique for such calendars, as far as I know. On the other hand, the two intercalary months have special names. In the Ancient Near East a regular month was repeated. This is still the case for leap months in the modern Jewish calendar.

A short look on these ancient calendars in Mesopotamia (compare e.g. [12]) shows that either the sixth month Ululu or the twelfth month Addaru is repeated. Until the eighth century BC the king decided when to insert an additional month. Throughout the centuries the scheme of these leap months was established to a system of 7 extra months within 19 years, sometimes called the Metonic cycle, although it was fixed in Mesopotamia before the times of Meton in ancient Greece. Such a correspondance of a second Ululu in year 17 and a second Addaru in year 19 would fit to the calendar plate system of Coligny. However, the two small, but important differences mentioned above do not support a direct dependance on Near Eastern calendars.

Maybe it was more an idea which travelled on the Mediterranean Sea from East to West, the idea of lunisolar calendars as such, already earlier during the first millennium BC. Such a hypothesis has to be supported by further research in the future, of course.

At least, concerning the case of alphabetic script exactly this happened. The idea of an alphabet travelled from East to West on the Mediterranean Sea, and starting from the Phoenician and other Semitic alphabets new scripts were created such as Etruscan, Greek, and Latin, just those which the Celts used for their purposes.

Bibliography

[1] A. Bernecker, 1998: *Der gallorömische Tempelkalender von Coligny*, Bonn.

[2] P.-M. Duval, G. Pinault, 1986: *Recueil des inscriptions gauloises*, vol. 3, Les calendriers, Paris.

[3] H. Gropp, 1996: *Some Remarks on Celtic Mathematics*, in: M.J. Lagarto, A. Vieiria, E. Veloso (eds.), "História e Educação Matemática", Procedings Braga 96, Vol. II, Braga (Portugal), pp. 162–169.

[4] H. Gropp, 2006: *Von Nebra nach Coligny: 1500 Jahre Mathematik und Astronomie vor Christi Geburt in Mitteleuropa*, in: M. Hykšová, U. Reich (eds.), "Wanderschaft in der Mathematik", Algorismus 53, pp. 110–119.

[5] H.-R. Hitz, 1991: *Der gallo-lateinische Mond- und Sonnen-Kalender von Coligny*, Dietikon (Switzerland).

[6] J.-M. LeContel, P. Verdier, 1988: *La mesure du temps chez les Celtes*, "Astronomie et sciences humaines" 2, p. 117.

[7] J.-M. LeContel, P. Verdier, 1997: *Un calendrier celtique: le calendrier gaulois de Coligny*, Paris.

[8] J. Monard, 1999: *Histoire du calendrier gaulois – le calendrier de Coligny*, Vannes (France).

[9] G.S. Olmsted, 1992: *The Gaulish Calendar*, Bonn.

[10] G.S. Olmsted, 2001: *A Definitive Reconstructed Text of the Coligny Calendar*, Washington.

[11] J.P. Parisot, 1988: *Le calendrier gaulois de Coligny*, "Astronomie et sciences humaines" 1, pp. 3–22.

[12] R.A. Parker, W.H. Dubberstein, 1956: *Babylonian Chronology 626 B.C. – A.D. 75*, Providence (USA).

[13] E. Siarkiewicz, 1993: *The Moon and the Genesis of the Mesoamerican 260-day Count System*, in: V. Koleva (ed.), "Astronomical Traditions in Past Cultures", SEAC 1 Proceedings, Sofia, pp. 167–174.

[14] R. Thurneysen, 1899: *Der Kalender von Coligny*, "Zeitschrift für celtische Philologie" 2, pp. 523–544.

[15] P.E.A. Verdier, 1989: *Ma traduction du calendrier de Coligny*, "Astronomie et sciences humaines" 3, pp. 23–38.

[16] P.E.A. Verdier, 1989: *Le carnaval et le calendrier de Coligny*, "Astronomie et sciences humaines" 4, p. 35.

The Medieval Liturgical Calendar, Sacred Space, and the Orientations of Churches

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Abstract: *Medieval Europeans inherited three principal traditions of space and time. From the Greeks they inherited a geometrical spatial tradition, with the pole of the world defining the primary north/south axis, the place of equinoctial sunrise defining the orthogonal east/west axis, and the solstices defining additional points on the horizon. From the Romans, they inherited spatial concepts based on the practical tradition of surveying and temporal concepts framed in the Julian Calendar, which framed the year in approximately solar terms and defined the canonical dates of the solstices and equinoxes. Early medieval sources, chiefly of Irish and British provenance, add an indigenous concern with the mid-quarter days, dividing the year at dates midway between the solstices and equinoxes.*

A survey of 130 English Medieval Village Churches reveals how these temporal concepts were expressed in spatial orientations. In particular, this survey shows that neither indigenous temporal concepts nor Greek geometrical concepts significantly influenced the orientation of churches. Their orientations can best be defined in terms of Roman calendric and Medieval computistical traditions.

One of the reasons we investigate the astronomical alignments of structures – whether Maya temples or prehistoric stone monuments – is to recover the specific astronomical and cosmological concepts employed by an ancient people. Often these alignments are the only evidence an investigator has for a particular culture's concepts of space and time. Circumstances are somewhat different for Medieval Europe, where written texts tell us that rather than a using single uniform astronomical tradition, medieval people knew and used several different astronomical traditions.[1] In this case, alignment studies offer a way to determine which of these alternative astronomical traditions was employed in a particular cultural and historical context. Put another way, the study of church orientations offers us a way to determine the historical and cultural sources of the concepts of space and time employed by the builders of these churches.

Medieval Europeans inherited three principal traditions linking space and time: one from the Greeks, one from the Romans, and one from their indigenous ancestors. From the Greeks they inherited a geometrical tradition of

[1] S.C. McCluskey, *Astronomies and Cultures in Early Medieval Europe*, Cambridge: Cambridge University Press, 1998.

Proceedings of the Conference "Time and Astronomy in Past Cultures", Toruń, March 30 – April 1, 2005, A. Sołtysiak (ed.), Warszawa – Toruń 2006, pp. 139–148.

a spherical Earth at the center of a spherical cosmos, commonly associated with the teachings of Plato, Aristotle, and especially Ptolemy. The framework of the spherical cosmos was defined by the circles of the equator, the tropics, the arctic and antarctic circles, and the path of the Sun through the Zodiac. If we consider directions along the horizon, this model used the pole of the world to define the primary north/south axis and the place of equinoctial sunrise to define the orthogonal east/west axis.

Medieval writers did not learn of this model of the universe from the writings of its Greek creators. Instead, they read of it in the Latin writings of a wide range of late antique and early medieval authors including Pliny the Elder, Martianus Capella, Macrobius, Isidore of Seville and Bede of Jarrow.

From the Romans, medieval people inherited the practical traditions of surveying and the Julian civil calendar. The social complexities of government and land tenure, which supported the kind of systematic surveys of fields and cities employed by the Romans, were absent in medieval Europe and I know of no medieval examples of Roman style surveying instruments. But Roman surveying texts did survive into the Middle Ages, and they provided several practical techniques for determining the cardinal directions. In one of those texts the Roman surveyor, Hyginus Gromaticus, spoke of laying out fields by observing the rising of the Sun, which he compared with orienting temples to face toward the East.[2]

Side by side with this way of organizing space, Medieval Europeans inherited the temporal concepts of the Roman Julian Calendar, which framed the year in approximately solar terms and defined the canonical dates of the solstices and equinoxes. This calendar swiftly supplanted the indigenous calendars of northern Europe. In the early Middle Ages the Julian Calendar took on elements important to Christian readers, incorporating the feast days of Christian saints, indications of the days of new moons through the nineteen year lunar cycle, and the limits of the movable luni-solar feasts related to Easter.

Drawing on the Roman traditions, Medieval writers conceptualized how the daily path of the Sun changed in the course of the year. A ninth-century Carolingian manuscript shows three paths of the Sun (**Fig. 1**). As with medieval maps, east is placed at the top of the diagram and the artist shows that at the winter solstice, on the 21st of December, the Sun rises in the southeast, passes low across the sky, and soon sets in the southwest. At the equinoxes, here the vernal equinox on the 21st of March is named, the Sun rises in the east, passes at a middling height across the sky, and sets in the west. At the summer solstice, on the 21st of June, the Sun rises in the northeast, passes high across the sky, and sets late in the evening in the northwest. This diagram depicts both the changing length of daylight and the changing place of sunrise in the course of the year.[3]

[2] Hyginus Gromaticus, *Constitutio Limitum*, 3, in C. Thulin, ed. *Corpus Agrimensorum Romanorum, I*, (Stuttgart: B. G. Teubner, 1971), p. 134.15–21.

[3] Cologne, Erzbischöfliche Diözesan- und Dombibliothek, Dom Cod. 83II, fol. 81v. The earliest known example of such a diagram is found in an early eighth-century manuscript, once possessed by the Northumbrian missionary to the continent, Willibrord. Bibliotheque Nationale de France, Latin 10837, fol. 42r. On this diagram tradition see Barbara Obrist, "The Astronomical Sundial in Saint Willibrord's Calendar and its Early Medieval Context," *Archives d'histoire doctrinale et littéraire du Moyen Âge*, 67(2000): 71–118.

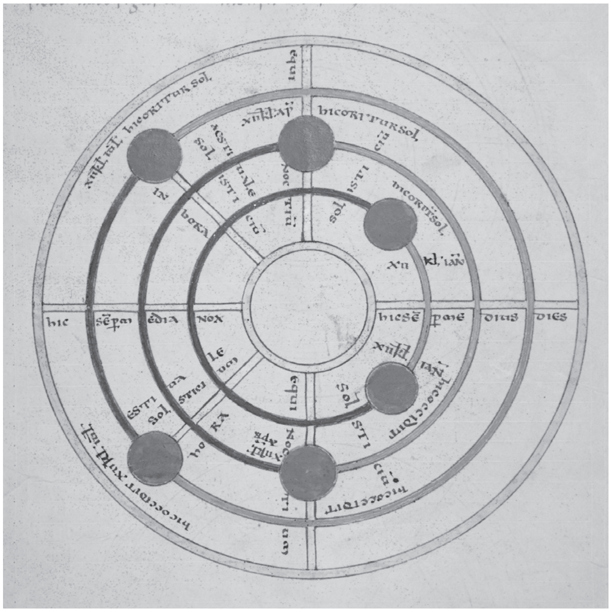

Fig. 1. Path of the Sun at the solstices and equinoxes. (Carolingian, ca. 805). Cologne, Erzbischöfliche Diözesan- und Dombibliothek, Dom Cod. 83[II], fol. 81v. Full color images of the manuscript may be consulted at http://www.ceec.uni-koeln.de/.

Fig. 2. Rising and setting of the Sun at the solstices and equinoxes (Thorney Abbey, ca. 1110). Oxford, St. John's College, Ms 17, fol. 5v. Used by permission of the President and Scholars of St. John's College, Oxford.

An eleventh century English version of this diagram (**Fig. 2**) adds two further elements to this schema, which more clearly draw together space, time, and the liturgical calendar.[4] First, the scribe explicitly relates the directions of sunrise and sunset to geographical space, for he has superimposed the places of sunrise and sunset on a conventional T-O map of the earth with Asia in the east, Europe in the northwest, and Africa in the southwest. Secondly, although the equinoxes are still named, sunrise and sunset at the winter solstice are labeled *nativitate Domini*, the Nativity of the Lord on the 25th of December, while the summer solstice is labeled *natalis Ioannis*, the birthday of John on the 24th of June.

You may have noticed that these two diagrams give different dates for the solstices: the Carolingian diagram gives computists' dates of the 21st of June or December; the English one gives the Julian calendar's dates of the 24th of June for the summer solstice and the 25th of December for the winter solstice. This same discrepancy is found in English liturgical calendars, which commonly include the computistical vernal equinox on the 21st of March; the Annunciation of the Lord, a conventional equinoctial feast, on the 25th of March; and the entry of the Sun into Aries, which marks the geometrical vernal equinox, on the 18th of March.[5] These alternative dates of the solstices and equinoxes were recognized by medieval writers, and will play a role in our later discussion.

The third, and most poorly documented, medieval astronomical tradition adds an indigenous concern with the so called mid-quarter days to the classical emphasis on the solstices and equinoxes. In the Celtic world, festivals at the mid-quarters were held to mark the true turning points of the year. Known by their Irish names of Samhain, Imbolc (or Oimelg), Beltaine, and Lughnasa, they fall in the Julian calendar at the beginning of November, February, May, and August. Between the seventh and the ninth centuries, three of them came to be identified with the Christian feasts of All Saints on 1 November, of St. Brigit on 2 February, and of St. Oswald on 5 August. All three of these Christian feasts have British or Irish roots.[6]

Legal codes also suggest the importance of the mid-quarter days. Since the seventh century tithes and rents fell due in England and Wales on the feast of St. Martin, which falls near the autumn mid-quarter day.[7]

In part inspired by such popular traditions, early archaeoastronomers such as Norman Lockyer, Boyle Somerville and, most recently, Alexander Thom, sought to demonstrate that solar observations on the mid-quarter days played important

[4] Oxford, St. John's College, Ms 17, fol. 5v.

[5] Francis Wormald, *Early English Kalendars before A.D. 1100*, Henry Bradshaw Society [Publications], 72, (London, 1934). The equinox on 25 March is given in Wormald's calendars 2, 4, 13, & 14; on 24 March in calendar 1, and on 21 March in calendars 5–14, 16, 18–20. The entry of the Sun into Aries on 18 March is given in calendars 1–2, 4–7, 9–11, 13, 14, 16, 19, & 20.

[6] S.C. McCluskey, "The Mid-Quarter Days and the Historical Survival of British Folk Astronomy," *Archaeoastronomy* 13, supplement to *Journal for the History of Astronomy*, 20(1989): S1–S19.

[7] *Ancient Laws and Institutes of England*, (London, 1840), Ine 4, II Edgar 3, Cnut, Eccles., 10 (Ine and II Edgar are also in D.C. Douglas, ed., *English Historical Documents*, I, [New York: Oxford Univ. Press, 1955] pp. 365, 395); Melville Richards, trans., *The Laws of Hywel Dda*, (Liverpool, The University Press, 1954), p. 84.

roles in the division of the year. Thom saw in the distribution of orientations of megalithic monuments, clear indications of sunrise and sunset at the solstices, equinoxes, and mid-quarter days, and at further divisions of the year.[8]

Recent analyses of Thom's data by Clive Ruggles, however, have brought this evidence for mid-quarter alignments into question. Few of Thom's calendar dates remain after this reevaluation of the data. Moreover, the historian and folklorist, Ronald Hutton, has demonstrated that most of the British folklore associated with the mid-quarter days is relatively recent and the idea of a calendar divided at the mid-quarters may be "a scholastic construction of the eighteenth and nineteenth centuries."[9]

Despite these critiques, trustworthy evidence for the mid-quarter days as calendric divisions remains in some early medieval Irish texts and a few Christian feast days associated with the British Isles. A historical connection of the medieval mid-quarter divisions of the calendar with a prehistoric astronomical tradition of solar observations remains to be demonstrated.

In order to examine the contribution of these three astronomical traditions to the astronomical practices of Early Medieval England, I undertook a systematic survey of the orientations of 130 English Medieval Village Churches.

The initial hypothesis guiding this survey was the popular tradition that churches are oriented to face the direction of sunrise on the feastday of the church's patron saint. The earliest evidence for this belief is a manuscript of 1678 by the English antiquary, John Aubrey.[10] On the other hand, a wide range of ancient and medieval texts indicate that churches should be built facing equinoctial east.[11]

Since patron saints were believed to be a significant factor governing church orientations, a well-defined sample was chosen including four groups of churches, each subset dedicated to different patron saints. These churches were dedicated to Mary (with a major feast on 25 March, the vernal equinox), John the Baptist (with a major feast on 24 June, the summer solstice), All Saints (with a feast on 1 November, a mid-quarter day), and Andrew (whose feast on 30 November has no astronomical significance at all and thereby provided a control).

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[8] Joseph Norman Lockyer, *Stonehenge and other British Stone Monuments Astronomically Considered*, (London, Macmillan, 1906), pp. 21–22, 32–33, 232, 241, 252, 317–318 and *passim;* Boyle Somerville, "Prehistoric Monuments in the Outer Hebrides and their Astronomical Significance", *Journal of the Royal Anthropological Institue,* 42(1912): 23–52; Alexander Thom, *Megalithic Sites in Britan,* (Oxford, Clarendon Pr., 1967), pp. 106–117.

[9] Ronald Hutton, *The Stations of the Sun: A History of the Ritual Year in Britain*, (Oxford, Oxford University Press, 1996), p. 411.

[10] Aubrey's account was published in Francis Grose and Thomas Astle, *The Antiquarian Repertory: A Miscellaneous Assemblage of Topography, History, Biography, Customs, and Manners...*, vol. 1, p. 72, (London, 1807–09).

[11] On these sources see Cyrille Vogel, "Sol aequinoctialis: Problemes et technique de l'orientation dans le culte chretien," *Revue des sciences religieuses*, 36(1962): 175–211; Stephen McCluskey, "Astronomy, Time, and Churches in the Early Middle Ages," pp. 197–210 in Marie-Therese Zenner, ed., *Villard's Legacy: Studies in medieval technology, science and art in memory of Jean Gimpel*, (Aldershot: Ashgate, 2004) and Walter Johnson, *Byways in British Archaeology*, (Cambridge: Cambridge University Press, 1912), pp. 205–242.

Fig. 3. Survey area. Dioceses indicated as of A.D. 1035. Historic counties and portions of counties comprising the survey area are indicated within the Diocese of Dorchester on Thames. Base map compiled from maps 231 and 241 in David Hill, *An Atlas of Anglo-Saxon England*, (Toronto: Univ. of Toronto Pr., 1981).

The churches were selected from the counties of Leicestershire, Rutland, and Northamptonshire (plus a few from neighboring parts of Lincolnshire and Huntingdonshire), all of which lie within the large medieval diocese of Dorchester on Thames (**Fig. 3**).[12] To try to limit the sample to early medieval churches, I required that the village in which the church was located was described in the Domesday Book as existing in 1066. To try to insure that the reported patron saint reflected circumstances at the time of the construction of the church, I required that the patron saint of the church was attested in documents existing before the Protestant Reformation, taking 1530 as an arbitrary cut-off date. These criteria were sufficient to obtain a sample of at least 24 churches for all four dedications.[13]

Let me briefly summarize the survey procedures employed without going into a lot of technical detail. The orientations of the axis of the church were measured using a tripod mounted magnetic compass, with the magnetic azimuths converted to true azimuths by applying the magnetic declination computed for the date and place of each survey.[14] In the few cases where it was possible to

[12] The churches were chosen from the Trans National Atlas of Saints' Cults; G.R. Jones, *TASC datasets for England and Wales*, http://www.le.ac.uk/elh/grj1/leverhulme.html, 11 Sept. 2002.

[13] The number of churches surveyed that met the dating criteria were All Saints, 39; Mary, 38; Andrew, 29, and John the Baptist, 24.

[14] Magnetic declinations were computed for the location of the church and the date of the survey according to the International Geomagnetic Reference Field (IGRF 2000) using the PC version of GEOMAG software (pgeomag32.exe, 02/05/2001) distributed by the National Geophysical Data Center, http://www.ngdc.noaa.gov/seg/potfld/magmodel.shtml.

observe the magnetic azimuth to one or more distant landmarks, the observed, rather than the computed, magnetic declination was applied to the measured orientation of the church.

To analyze these data, the orientations were plotted as a cumulative frequency distribution, or "curvigram" of the orientations.[15] For each church a normal curve of unit area was computed (**Fig. 4**), centered on the median of all the measurements of that church's orientation and with a standard deviation determined by combining the standard deviation of those measurements with the uncertainty in the magnetic declination (0.55°). By summing these normal curves for a set of churches, we can examine the pattern of church orientations in full detail, yet without portraying false detail which was not justified by the limited precision of our measurements.

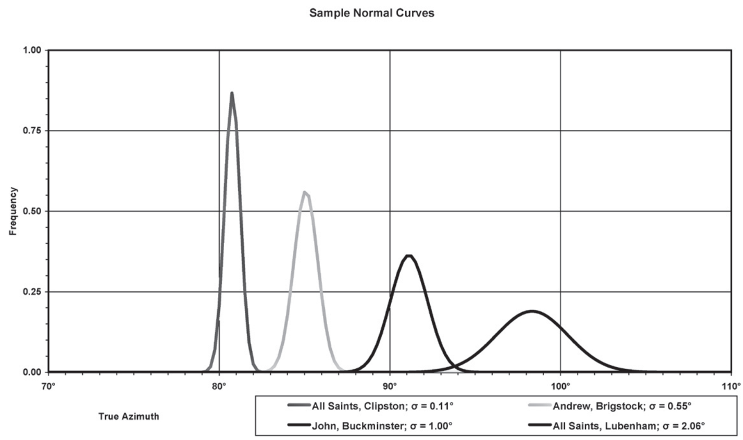

Fig. 4. Curvigrams for Typical Churches. The width of the curve represents the normal distribution for the precision of measurement of each church's orientation.

Beginning with the broadest overview of the azimuths, the most obvious element is a universal pattern of eastward orientation, centered a bit north of east (**Fig. 5**). All 130 churches surveyed are concentrated in a 52° arc within the range of sunrise and 95% of the churches fall within a 38° range between 68° and 106°, with a median azimuth of 85° and a mean of 86°. 36% of the churches surveyed fall within the broad equinoctial band, which indicates that an equinoctial orientation principle was widely, but by no means universally, followed.

Scarcely any of the churches fall in the range of sunrise on the mid-quarter days, and none of the churches are oriented toward sunrise on the feast of All Saints. It is clear from this broad overview that we can rule out the hypothesis that an indigenous calendar emphasizing the mid-quarter days played any significant role in the orientation of this group of churches.

[15] Alexander Thom, *Megalithic Sites in Britain*, (Oxford: Clarendon Press, 1967), pp. 45–6, 102–3; Clive Ruggles, *Astronomy in Prehistoric Britain and Ireland*, (New Haven: Yale University Press, 1999), pp. 50–52, 56, 59.

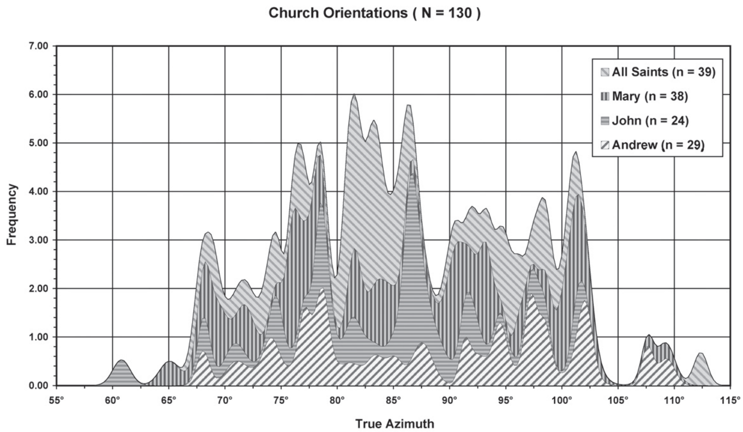

Fig. 5. Cumulative Church Orientations. Distribution by patronal dedication for 130 English Village Churches.

When we examine the question of orientation toward sunrise on the feast of the churches' patron saints we get a largely negative result. No churches were oriented to sunrise on the Feast of St. John near the summer solstice (when the Sun rises at about 48°), the feast of All Saints on 1 November (when the Sun rises at about 116°), or the feast of St. Andrew on 30 November (when the Sun rises at about 128°). Many churches were oriented toward sunrise on the feast of the Annunciation to Mary, but churches dedicated to All Saints make a much larger contribution to this peak in the distribution than do churches dedicated to Mary. Again we do not have a preferential orientation toward sunrise on the feast of the churches' patron saint. This preliminary examination rules out the hypothesis that churches were frequently oriented towards sunrise on their patrons' feast day. It seems we can dismiss that hypothesis as an example of the romantic reconstruction of a presumed ritual which cannot be supported by any ancient or medieval texts and is shown to be false in the case of the churches in this archaeoastronomical survey.

Despite the fact that these churches did not display a strong pattern of orientation toward sunrise on the feast of their patron saint, the general distribution of these orientations reveals that they are governed by astronomical concepts. As mentioned above, 36% of the churches are oriented toward sunrise within the broad band between 81.5° and 94°, which marks sunrise on the range of dates given in medieval calendars for the equinoxes. Since equinoctial orientations seem to be indicated by this distribution, and ancient and medieval texts frequently maintained that churches should be oriented to face the equinoctial rising of the Sun, closer examination of these orientations is necessary if we are to determine exactly how medieval church builders understood the astronomical concept of the equinoxes.

Some time ago Ruggles pointed out that the linkage of space and time in equinoctial orientations is inherently ambiguous. The conceptual issues involved in the study of medieval churches are different from those raised in the study of prehistoric stone monuments, reflecting the differences between the direction of equinoctial East defined spatially by the Greek geometrical model of the cosmos and those directions defined temporally by sunrise on the dates of the equinoxes attested in Medieval liturgical calendars. The differing dates in the calendars indicate that a church oriented toward sunrise on one of those equinoctial dates can point in any of a number of different directions within a range of azimuths extending some 12.5° from 81.5° to 94° (**Fig. 6**). Since most computists rejected the view that the dates given for the entry of the Sun into Aries or Libra marked the equinoxes,[16] this would produce a gap in the center of this expected range extending from about 86° to 89.5° which includes the place of sunrise on the geometrical equinoxes.

This difference means that by examining the orientations of a set of churches, we can determine whether the builders defined the equinoxes using Greek geometrical principles or Roman calendric ones.

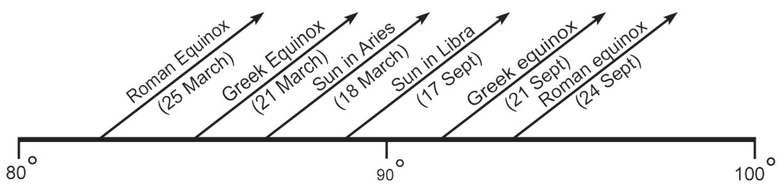

Fig. 6. Different calendric concepts of equinoctial sunrise. The different places of sunrise on the various dates given for the equinoxes in medieval calendars. Note that a gap would occur slightly North of due East if sunrise on the dates of the Sun's entry into Aries and Libra were ignored.

Returning to our overview of the data, we find a broad peak marking the range of dates for the vernal equinox, a less pronounced peak marking the autumnal equinox, and a gap falling between them centered on about 88°. This is the pattern we would expect for orientation to sunrise on the dates of the solstices given in medieval texts and calendars, with special attention being given to the vernal equinox.

If we look more closely at the data indicating the vernal equinox, the highest part of this peak at 82° corresponds to sunrise on the Roman vernal Equinox and the feast of the Annunciation to Mary on 25 March. When we look at these data by Saints' dedications we find, as mentioned previously, that churches dedicated to All Saints make an overwhelmingly large contribution to this peak, while churches dedicated to Mary only play a marginal role. This peak appears to represent an equinoctial orientation, rather than one due to a Marian feast, reflecting the general absence of patronal orientations. Furthermore, the right hand edge of the peak between about 85° and 87° is due to churches dedicated

[16] Bede, *De temporum ratione*, 16.41–44, (*The Reckoning of Time*, trans. Faith Wallis, [Liverpool: Liverpool University Press, 1999], p. 56); Bedae Venerabilis, *Opera Didascalica* 2, ed. C.W. Jones, Corpus Christianorum Series Latina, 123 B, (Turnhout: Brepols, 1977) p. 334.

to St. John the Baptist. If we consider that this peak reflects the dedication to St. John, it appears to represent churches oriented so that the nave points toward sunset on the feast of the Conception of John the Baptist on the Roman autumnal equinox of 24 September.

The peak near due east at about 90° to 94° is not as well defined as the peak marking the vernal equinox. Nevertheless, it generally corresponds to sunrise on the Roman autumnal equinox on 24 September, which is also the feast of the Conception of John the Baptist. None of the subsets of churches makes an especially large contribution to this peak, although churches dedicated to St. John are somewhat underrepresented. As with the peak for the vernal equinox, the data support an equinoctial, rather than a patronal orientation.

Thus, this survey provides several insights into the uses of astronomical orientations to recover past astronomical practices. Most generally, by showing that the supposed preferential orientation of churches toward sunrise on the feast of the church's patron saint was not borne out by detailed surveys, it provides a cautionary warning about the dangers of accepting reconstructions of early astronomical practices based on popular folklore gathered from more recent sources.

More specifically, it provides a way to identify which of the three early medieval astronomical traditions that we have considered, actually governed the orientation of these churches.

First, the absence of orientations toward the mid-quarter days rules out the hypothesis that an indigenous calendar emphasizing the mid-quarter days played any significant role in the orientation of this group of churches.

Second, the gap in the data near sunrise at the geometrical equinoxes rules out the hypothesis that the orientations of these churches reflect an application of spatial concepts drawn from the ancient Greek model of the cosmos.

Third, the peaks in the data indicating sunrise on the days given in medieval calendars for the vernal and autumnal equinoxes indicates that temporal concepts in the liturgical version of the Julian calendar were expressed in the spatial orientations of churches.

In sum, this survey of 130 English Medieval Village Churches reveals that neither indigenous temporal concepts nor Greek geometrical concepts significantly influenced the orientation of churches. Their spatial orientations were determined by temporal concepts developed through the adaptation of the Roman civil calendar to meet the liturgical concerns of Early Medieval society.

The Finnish Wooden Calendars and Some Aspects of Folk Knowledge in the Middle Ages

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Abstract: *The present study treats some cognitive aspects of the Finnish calendars, and in particular the calendar sticks used in the Middle Ages.*

Finnish medieval calendars are a particularly valuable source of information. Their system of festivals is closely related to the specific economic activities and cycles, and for this reason they have preserved a very precise knowledge about the natural cycles. The geographic location of the country accounts for the local climatic features, the wide range in length of day and night, which, in turn, have allowed people to determine precisely the beginning and the end of some year cycles, as well as to forecast with great certainty the seasonal changes.

During the Middle Ages, the wooden calendars were widespread among the various population strata. Today, several collections of the National Museum of Finland keep about 130 wooden calendars, the oldest of which was made in the 16th century. The calendars vary in size and shape, type of the symbols and pictograms, as well as in the structure of the record used. Both sophisticated and rich in information runic calendars of the Western Church and calendars of the Eastern Church with simpler shape and signs have been preserved.

Keywords: Ethnoastronomy; time-reckoning; calendar sticks; runic calendars; Church calendar systems.

Introduction

People around the world have used calendars and calendar calculations from ancient times up to the present day. These calculations have never been an end in themselves – they are aroused by the necessity to organize life within the human communities and to facilitate contacts between their members.

Being an element of culture, the calendar is traditionally conservative, but is also subject to improvements. The most abrupt changes, called calendar reforms, usually shake the society and are treated as an act of violence to which people oppose.

Calendar sticks were used during the Middle Ages in numerous regions of Europe, northern Asia and among the American Indians. They continue the preceding archaic tradition of time-keeping. The numerous specimens from Western and Northern Europe are often perfect in form and contents, while the

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wooden calendars in the Balkans, Eastern Europe and Siberia are simpler and have a more archaic look. The comparison between the two groups reveals local traditions and clearly manifest cultural influences. Very interesting in this respect are the contact zones of the different influences, one of which is Finland.

A number of scholars have dealt with the problems of time-reckoning and time-keeping in Finland and abroad. Some of the most prominent of those, who have studied and described the Finnish time-reckoning system and calendars, are the ethnographers Uuno Taavi Sirelius (Sirelius 1921) and Arvi Korhonen (Korhonen 1915) in the first decades, and Kustaa Vilkuna (Vilkuna 2002) in the second half of the 1900s. Auvo Hirsjärvi (Hirsjärvi 1948; 1957) focused on runic staffs in his studies from the middle of the 20th century. The very thorough comparative study of the Russian scholar Vjacheslav I. Sreznevskij (Sreznevskij 1876) from the second half of the 19th century also contains data about several Finnish wooden calendars.

The medieval Finnish folk calendar has been formed as a result of both foreign influences and some local practices and experience determined by the geographic location and climatic conditions. Present-day Finland is located at a northern latitude of 60° to 70°. The high latitude accounts for the long and severe winters and the shorter summers, as well as for the wide range in length of day and night. The climatic conditions determine the schedule of the economic activities – the northern climate shifts the limits of the warm and the cold periods in the year, and thus shifts the favourable moments for the various economic activities in the different regions of the country. The Finnish folk calendar reflects the seasonal changes, and thus helps people to plan their work and to do weather forecasts.

The traditional folk calendar with its "tips" for the farmers was woven into the festive system of the church calendar after the introduction of Christianity. The layer of this older, pagan tradition, however, at least at first sight, is not always clearly defined and provides scanty information. The data we have about traditional time-reckoning and calendars clearly show that they have been strongly influenced by Christianity. The Finnish calendar sticks are based on the Julian calendar, which was introduced to the Finns along with Christianity. They mark numerous religious feast and days of Christian saints as well as significant moments from the economic and the seasonal cycles. The Gregorian calendar was introduced in Sweden and Finland in 1753 when 17 February was followed by 1 March.

Christianity was known in Finland as early as the 11th century. In the 12th century King Erik of Sweden and Bishop Henry began organizing the Roman Catholic Church there. Under the influence of Sweden, which ruled Finland from 1323 until 1809, the Finns gradually accepted Christianity. The church of Finland changed from Roman Catholic to Lutheran during the Protestant Reformation in the first half of the 16th century. The Catholicism, however, left numerous traces in the religious feast system. After the Reformation, the Church in Scandinavia abolished the cult of saints, but the people still remembered certain days devoted to saints, which also marked important economic activities and days when people made weather forecasts and judged of the future crop.

Fig. 1. Map of Finland and its ethnographic regions.

During the 12th century, Russian monks Christianized Karjala (Karelia), the southeastern part of Finland. The Finns in Karelia around Lake Ladoga (now in Russia) had already got acquainted with the Orthodox faith in the 11th century due to the more intensive trade and cultural contacts with the East. Finland was ceded to Russia in 1809 and remained under Russian rule until 1917, when Finland became an independent state. Nowadays the Orthodox Church is the second state church of Finland along with the Evangelical Lutheran one, and the Orthodox Finns represent about 1% of the population.

Calendar sticks

A number of hand-made technical means assisted Finns from both the Western and the Eastern Church in their time-keeping before the appearance of the printed calendars. The calendars found so far in Finland were drawn on boxes, bunches of wooden or bone plates, or sticks, the latter being the most numerous and diverse. These devices were in fact eternal calendars used by several generations. Being omnipurpose tools with encyclopedic contents, their usage required specific knowledge and computing skills. They are based on the Julian calendar and contain feasts of the Catholic or the Orthodox liturgical calendars.

Distribution

Currently, about 130 calendar sticks are kept in three collections of the National Museum of Finland – the so-called Finnish, Estonian and Finno-Ugric collections. Some 40 runic calendars collected from Finns living in the Swedish county of Värmland are kept in Swedish museums. Most of the sticks kept

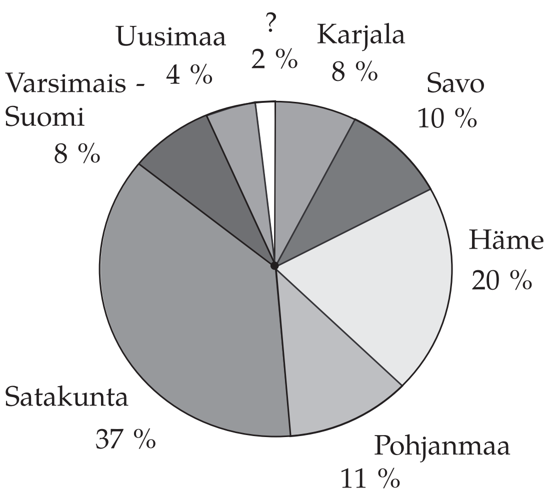


Fig. 2. Distribution of the 105 Finnish calendar sticks.

in Finland were collected in the second half of the 19th century. The oldest known Finnish wooden calendar is from 1566 and is kept in Paris. The last known calendar stick was made in 1868 (Vilkuna 2002: 368). After the Gregorian calendar was introduced in Finland in 1753, their usage started to drop down. The statistical analyses in the present study refer only to the 105 calendar sticks from the Finnish collection of the National Museum of Finland. Almost all of them are calendars of the Western Church and only four are Orthodox.

Most sticks have been collected in the regions of Satakunta – over one third (37%), and Häme (20%). A total of 11% of the calendar sticks have been collected in Pohjanmaa, 10% in Savo, 8% in Varsinais-Suomi and Karjala (Karelia) each and 4% in Uusimaa. Two calendars are of unknown origin. The collection does not include calendars from the regions of Lappi (Lapland) and Kainuu.

Signs

The days in the year are marked on the calendars with the three types of signs: letters (runes or Latin ones), streaks, and notches. The various types of day-signs are illustrated in **Fig. 3**. Rows 1–4 show different sets of 7 runic letters. The three sets in row 4 are the most widely used combinations. The next most popular sets are in row 3, followed by those in rows 2 and 1. There are also numerous single combinations. The set of runes on the grey background (in row 3) is from the oldest known Finnish runic calendar from the year 1566, which we describe further in the text. Latin letters are used as day-signs on three calendars only and the combinations are shown in row 5. Days are marked with streaks on five calendars of the Western Church (row 6) and on one Orthodox (row 7, left). The other three Orthodox calendars mark the days with short notches incised in the edges of the stick (row 7, right).

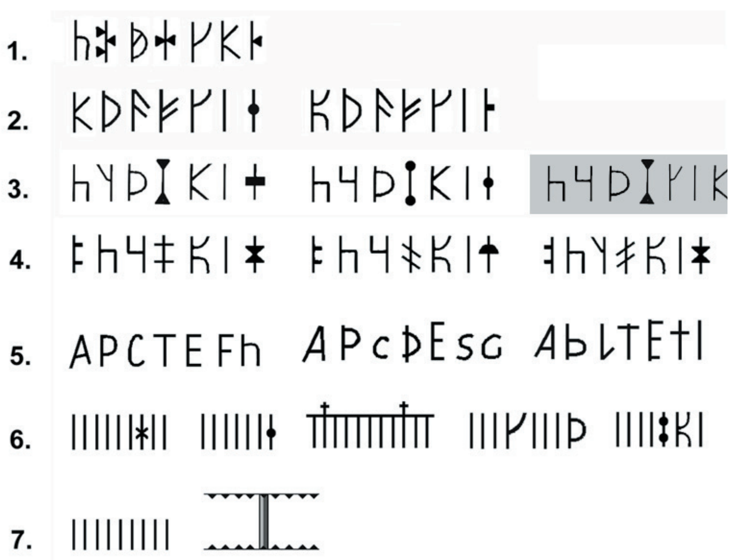


Fig. 3. Day-signs on the Finnish calendar sticks.

The runes used in the Finnish calendars are from a more recent Scandinavian runic alphabet (the so-called Younger Futhark) containing 16 runes, whose heyday was from the 9th to the 12th century. In order to mark the 19 golden numbers of the Metonic cycle, three additional runes have been made up (Sirelius 1921:542).

On older Swedish calendars there are pictograms of farm tools, objects used in the everyday life, weapons, etc. Somewhat more schematic variants of such signs are used to mark feast on Finnish calendars as well. The present study does not include a detailed analysis of the feast signs, the runes for the 19 golden numbers, and other signs and inscriptions on the calendars. Such an analysis is under way and results will be published later.

Runic calendars

The runic calendars are only of the Western Church. They appeared in Finland in the 13th century at the earliest, when the Catholic Church strengthened its position and the liturgical calendar of the Turku diocese began to take shape. It is very probable that before that a simpler device, marking the days not with runes but with notches, was used by the Nordic peoples (Vilkuna 2002:368). Finns adopted the runic calendar from Scandinavia, mainly Sweden, but have also developed some typical local features. Such are several immovable feasts celebrated in Finland on a different date than in Sweden. Finns have also modified a little the runes used on their sticks (Sirelius 1921:544). Although the Lutheran Church abolished the cult of saints after the Reformation, the folk calendar and the hand-made devices preserved numerous days of saints as important dates referring to economic activities and weather forecasts.

Runic calendars have been found in all the regions except Lappi (Lapland) and Kainuu. Their number in the Finnish collection totals 96 (including the three ones with Latin letters).

The runic calendars have the shape of an ordinary stick, sword, saber, walking stick, scepter or staff. Many of them have a handle or a knob at one of the ends. The length of the sticks varies from about 50 cm to almost 2 meters.

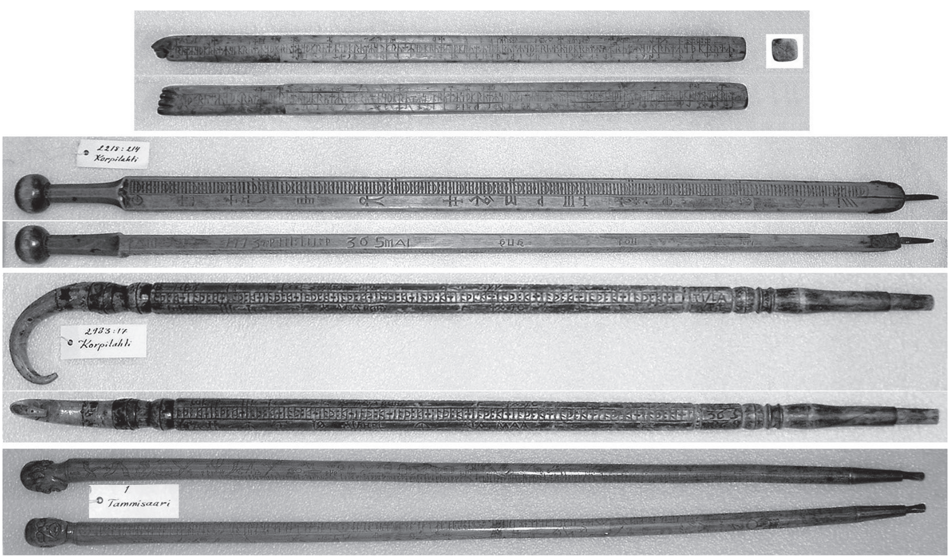


Fig. 4. Typical runic calendars.

Fig. 4 presents some very typical runic calendars. Their cross-sections can be 4-, 6-, 8-sided or absolutely round. Some shapes and cross-sections dominate in certain regions, for example the flat 8-sided sword-shaped sticks are typical of Satakunta.

The runic calendars contain 2 or 3 series of signs. The day-signs are grouped in sets of 7 different runes and these sets repeat 52 times, as there are 52 weeks in a year.

A separate row of signs above the day-signs marks the fixed feast. The signs include cross, half cross, circle and pictograms. The latter usually depict an object by which a martyr has been killed or a tool which is typical of a certain economic activity.

Some runic calendars have a third row of 19 signs marking the so-called golden numbers, but they are not as wide-spread in Finland as in Sweden. The 19 golden numbers correspond to the 19 years in the Metonic cycle. They show the dates when the new moon was expected to occur in a given year of the cycle. On several sticks, between the handle and the calendar record, there are small tables containing runes, which serve to determine the weekday at the beginning of a new year in the 28-year cycle. All these subsidiary runic signs help to determine the dates of Easter and of the related movable feasts.

The months in the runic calendar are not separated from each other. Very rarely initial letters of the Finnish month names are inscribed to mark the beginning of the months. Quite often a year of the Common Era, some initials, or the number '365' are inscribed too.

The calendar record on each side – with very few exceptions – is read from the handle to the other end of the stick. The record begins on 1 January on most of the calendars or on 25 December. Very rarely the record begins on other dates.

As we shall see later, a very conspicuous feature of the runic calendars in comparison to the Orthodox ones is that they are much more highly developed, allow making more complicated calendar calculations and their make and decoration are more exquisite. The masters of runic sticks have attained jeweller's precision turning the calendars into a real work of art.

Streak calendars

There are five calendars of the Western Church where the weekdays are marked with 7 streaks (**Fig. 5**). On one or two of the streaks in a set there are additional signs or the streaks are replaced by runes (**see Fig. 3**, row 6). Here the months are not separated from each other. The streak calendars look very much like a ruler.

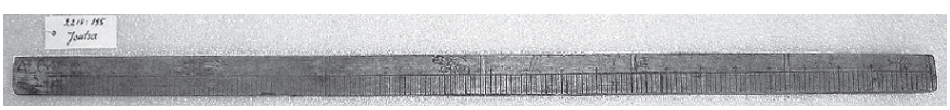


Fig. 5. A streak calendar.

Notch calendars

The four Orthodox calendars in the Finnish collection are from Karjala (Karelia). They are relatively short sticks with triangular or rectangular cross-sections, whose length varies from 60 cm to 70 cm. The days in the year are marked by notches on the edges and the feast signs are drawn on the adjacent sides. The feast signs include cross, parts of the cross, swastika, circle and their variants. The months are separated from each other by furrows or a free space. The beginning of the record coincides with the beginning of the year, 1 March. The record is always read from the handle to the other end of the stick. On some of the sticks there are Cyrillic inscriptions in Russian of month names or of important astronomical moments. The make and overall look of the Orthodox calendars are much simpler than those of the runic calendars.

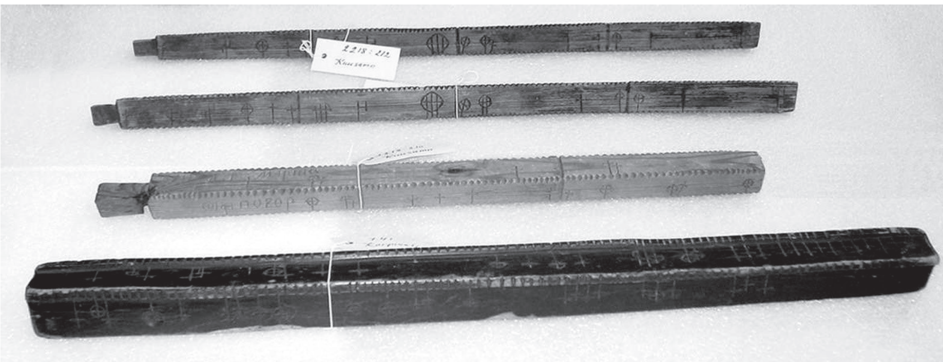


Fig. 6. The four Orthodox calendars in the Finnish collection.

The oldest known Finnish calendar

A good example of a Finnish runic calendar that illustrates the specific local features is the one kept in the Sainte-Geneviève library in Paris (**Fig. 7**). It is supposed to be the oldest known Finnish calendar and has been studied by Monique Roussel (Roussel 1952). The stick is 111 cm long and its cross-section is a rectangle with sides of 4 and 1 cm. The calendar is sword-shaped. There are two rows of signs – one for the weekdays and one for the feast signs. The letters 'ASS' and the year '1566' are inscribed in the handle. The other end of the stick is worm-eaten.

The record on the two sides begins on 19 November and 1 June, respectively (**Fig. 8**). The record is read from the handle to the other end of the stick.

Among the feast signs, the most interesting and noteworthy are the letter 'A' for St. Andrew's day, as well as the three signs on 13, 14 and 15 April marking the so-called three summer days – the first days of the warm half-year according to the Finnish folk calendar. The biggest and most richly ornamented signs indicate the most significant Christian feasts: Christmas, Candlemas, Nativity of St. John the Baptist, Holy Cross Day. Here, too, the sign on 2 July, Virgin Mary's visit to Elisabeth or Hay-Maija, resembles a big letter 'M'.

The beginning of the cold half-year is also marked with a triple sign on 13, 14 and 15 October according to the folk calendar.

Roussel considers the calendar to be Finnish because its feast system follows the liturgical calendar of the Turku diocese in Finland, where several immovable feasts are celebrated on different dates than in Sweden: Henrik 20.1. versus 19.1. in Sweden; Marketa 13.7. versus 20.7. in Sweden; St. Anne 15.12. versus 9.12. in Sweden (Roussel 1952:33).

Fig. 7. The runic calendar from the Sainte-Geneviève library, Paris. An inscription on the handle reads 'ÀSS 1566' (Source: Roussel 1952).

We would also add that the series of 7 runes for the weekdays is among the second most widespread in Finland (see **Fig. 3**, row 3). The feast system of the Paris calendar matches very well the framework of the most common church festivals in the Finnish runic calendars, as is seen on the following diagrams (**Tab. 2**).

Traditional time reckoning and feasts

Before the introduction of Christianity and the Julian calendar, Finns used a luni-solar time-reckoning system (Vilkuna 2002:356, Sirelius 1921:529–531). The old pre-Christian calendar has been closely related to recurring natural phenomena and economic activities as is seen from the folk month names, the following of which have been preserved and are used today instead of the Latin ones (the second part in the names is *kuu* 'moon; month'): *tammikuu* 'oak-month, January', *helmikuu* 'pearl-month, February', *maaliskuu* 'sap-month, March', *huhtikuu* 'fallow-month, April', toukokuu 'spring-crop-month, May', *kesäkuu* 'summer-month, June', *heinäkuu* 'hay-month, July', *elokuu* 'corn-month, August', *syyskuu* 'autumn-month, September', *lokakuu* 'mud-month, October', *marraskuu* 'dying-month, November', *joulukuu* 'Christmas-month, December'. On some of the wooden calendars the first several letters of each month name are incised before or above the signs at the beginning of the corresponding month.

The new year began either in the autumn, or in midwinter, or in early spring (Sirelius 1921:532). Most often the year ended together with the harvest in the autumn and the new year began with the start of the new hunting season. Since people in different regions completed the harvest at different times, the end of

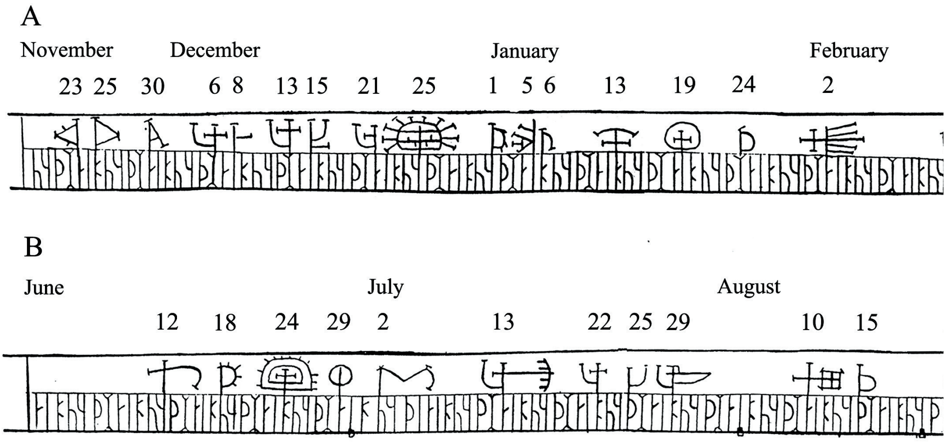


Fig. 8. Identification of the feast signs on side A and B (Source: Roussel 1952).

the year was not strictly fixed. The end of the autumn harvest was celebrated with a feast called *kekri* or *keyri*, which, too, initially was not fixed to a particular moment but could take place from early to late autumn, most often at the end of October and the beginning of November (Vilkuna 2002:296, 354). Between the old and the new year, at the time of *kekri*, there were 12 days called *jakoaika* 'division-time' which were to correct the discrepancy between the lunar and the solar year (Vuorela 1975:718).

There is a wide-spread opinion (see Vilkuna 2002:356-363; Talve 1980: 192) that in pre-Christian times Finns used a time-reckoning system based on a seven-day week, which was in use by all the Nordic peoples. In this system the week was independent of the moon phases. The year was divided into two longer periods – winter and summer. The first began on 14 October (*talvipäivä* 'winter-day') and the second on 14 April (*suvipäivä* 'summer-day'). In-between there were two other important dates – 13 January (*talvennapa* 'midwinter') and 13 July (*keskikesä* 'midsummer'), which divided the winter and the summer periods in halves. These four dates therefore divided the year into four parts, each 13 weeks long. Thus in a year there were 4 x 13 weeks = 52 weeks = 364 days.

The week is a very important time unit in the liturgical calendar as well. Numerous movable feasts are defined in terms of weeks, e.g. the feasts from the Easter cycle such as Ascension and Pentecost. Besides, all the Nordic runic calendars mark the days in the year by a repeating series of 7 runes – one for each day of the week.

According to others (see Sirelius 1921:532–533; Helminen 1933:246), however, ancient Finns did not use a time unit longer than the day and shorter than the month. The notion of a 7-day week and week counting have been introduced along with Christianity and the Julian calendar.

The archaic division of the year into a winter and a summer period (or into four periods) was preserved in the liturgical calendar in the dates 14 October (St. Calixtus), 13 January (St. Knud), 14 April (St. Tiburtius) and 13 July (St. Margaret), which the common people still called first winter day, midwin-

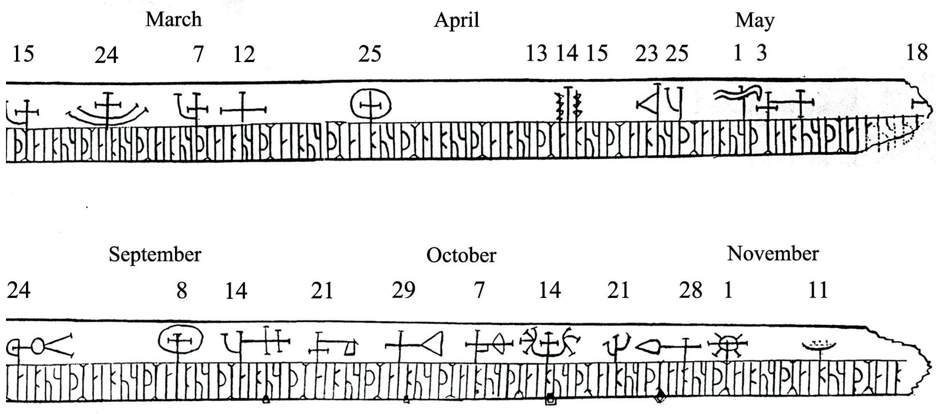


Fig. 8. (continued)

ter, first summer and midsummer, respectively. The four dates mark tangible changes in the nature such as the beginning of the cold spell, the warming up of the weather or the moments of extreme temperatures. The hottest and the coldest spells in a year usually follow by some three weeks the solstices (Vilkuna 2002:360). The folk calendar commemorates the beginning of the summer and the winter with the so-called *suviyöt* 'summer nights' (12–14 April) and *talviylöt* 'winter nights' (13–15 October). These two groups of dates are often marked on calendar sticks and according to Vilkuna are the only feasts from the old calendar referring to the four-part division of the year, which have not been borrowed from the Christian calendar (Vilkuna 2002:104, 284).

Besides the above-mentioned four important moments in the folk year determined by the climatic conditions, the folk and also the wooden calendars mark the significant astronomical events – the solstices and the equinoxes (according to the old and/or the new style), which are devoted to significant saints and are associated with numerous rites and forecasts. The days around the solstices are called *pesäpäivät* 'nest days' because the Sun is believed to reach its nest and stay there for a few days before turning backwards (Vilkuna 2002:152, 335).

The Finnish wooden calendars mark the leap day on 24 February – a feature inherited from the old Roman calendar, where the additional day in a leap year was placed on the sixth day before the Kalendae of March.

In the following tables we have tried to outline the framework of the Finnish feast system, which is a combination of folk and Church traditions. The main sources of information about it are the customs, economic activities, common knowledge about natural phenomena, as well as the calendar stick.

Tab. 1 summarizes the most popular feasts according to data published in ethnographic studies on the Finnish folk calendar and calendar sticks (Vilkuna 2002; Lipsanen 1987; Roussel 1952; Hirsjärvi 1948, 1957; Sirelius 1921; Sreznevskij 1876). The feasts, which do not explicitly pertain to the liturgical calendar, are emphasized in italics (including ones related to natural phenomena, economic activities, etc).

The diagrams in **Tab. 2** show which feasts are marked on the Paris calendar (gray columns) (Roussel 1952), on a number of Finnish calendar sticks (black columns) (Sirelius 1921; Hirsjärvi 1948, 1957; Sreznevskij 1876), and in the folk calendar (white columns) (Vilkuna 2002; Lipsanen 1987).

As we can see, the three columns coincide on most of the feasts. The dates mentioned only in the folk calendar (single white columns in the diagrams) are smaller feasts of local importance, as well as some Orthodox feasts.

Tab. 1. Finnish calendar feasts.

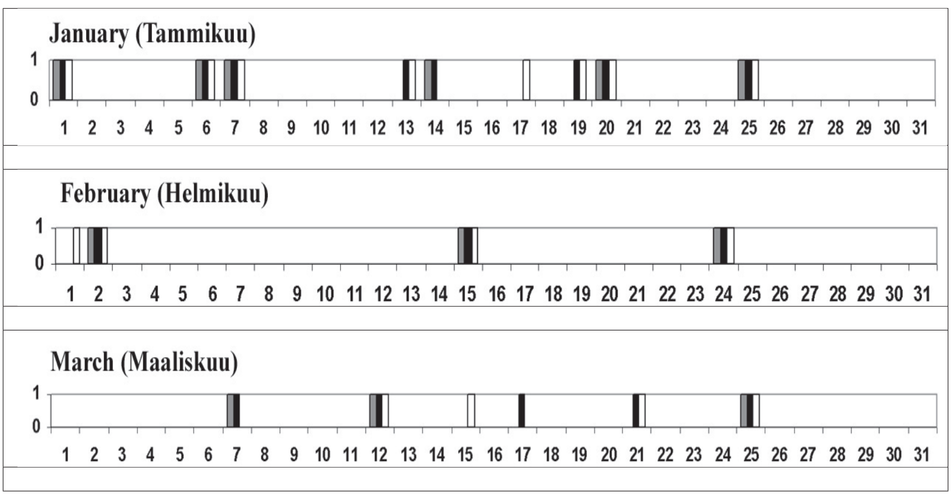
Date	Feast
January (Tammikuu)	
1	New Year's Day; Circumcision of Jesus (Uusivuosi)
6	Epiphany, Three Kings' Day (Loppiainen)
7	St. Knud (Nuutti, Danish king) (on 13 January after 1708); ***Back-weeks (Selkäviikot)***
13	St. Khud (Nuutti); St. Hilarius; ***Midwinter***
14	St. Felix; ***Midwinter***
17	St. Anthony (Anton, Tyni); ***Midwinter***
19	St. Henry (Heikki) (on this date since 17th century); ***Midwinter***
20	St. Henry (Heikki); St. Sebastian
25	St. Paul (Paavali)
February (Helmikuu)	
1	St. Birgitta (Riitta)
2	Presentation of Jesus in the Temple; Candlemas (Kynttilänpäivä)
15	St. Siegfried (Sipi)
24	St. Matthew, Apostle and Evangelist (Matti); ***Winter Matthew (Talvi-Matti, Vasikka-Matti);*** **Leap day (Karkauspäivä)**
March (Maaliskuu)	
7	St. Thomas Aquinas (Tuomas)
12	St. Gregory (Rekko); ***Spring Equinox***
15	St. Christopher (Risto)
17	St. Gertrud
21	St. Benedict (Pentti); ***Spring Equinox; Snake Day in southern Pohjanmaa***
25	The Annunciation (Marian ilmestyspäivä)

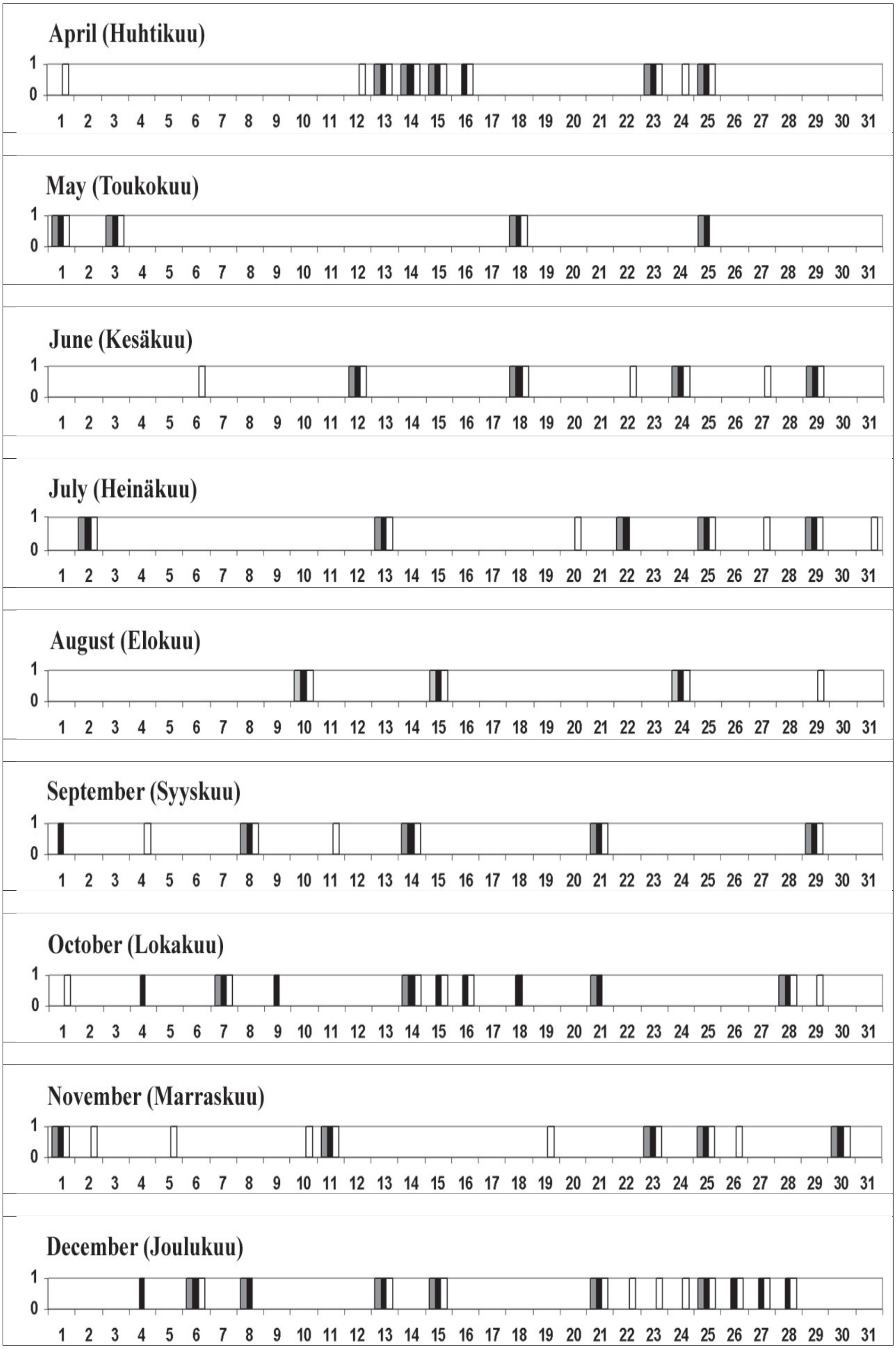
April (Huhtikuu)	
1	April Fool's Day (Aprillipäivä)
12–14	***Three summer nights (Suviyöt)***
14	***St. Tiburtius; The first summer's day***
14–16	***Three summer days (Suvipäivät)***
23–25	***Old summer nights***
23	St. George (Yrjö); ***Shout nights (Huutoyöt)***
25	St. Mark, Apostle and Evangelist (Markus)
May (Toukokuu)	
1	St. Walburga (Vappu)
3	Holy Cross Day (Ristin päivä)
18	St. Eric (Eerik, Erkki, Swedish king)
25	St. Urban I
June (Kesäkuu)	
6	St. Gustav (Kustaa)
12	St. Eskil (Esko)
18	Transfer of the Relics of St. Henry to Turku
22	***Summer solstice (also 10, 12, 15 June; Nest days (Pesäpäivät)***
24	St. John the Baptist (Johannes Kastaja); ***Midsummer***
27	Venerable Sampson the Hospitable (Sämpsä, Ukko) (Finnish Orthodox calendar)
29	SS. Peter and Paul, Apostles (Pekka, Pietari ja Paavali)
July (Heinäkuu)	
2	Virgin Mary's visit to Elisabeth or ***Hay-Maija (Heinä-Maija)***
13	St. Margaret (Marketta) (now on 20 July); ***The first hay-making day; Midsummer and bear-day***
20	Prophet Elijah (Elia, Ilja) (Finnish Orthodox calendar)
22	St. Mary Magdalene (Maria Magdalena)
25	St. James (Jaakko, Ukko)
27	Sleepyhead Day (Unikeon päivä)
29	St. Olaf (Olavi, Olli) (Norwegian king)
31	Day of Helena (Legendary Sweedish queen)

August (Elokuu)	
10	St. Laurence (Lauri)
15	Dormition (Jälki-Maria)
24	St. Bartholomew (Pärttyli)
29	Beheading of St. John the Baptist (Finnish Orthodox calendar)
September (Syyskuu)	
1	**St. Egidius abbot (Elia)**
4	Day of Moses (Mooses)
8	Nativity of the Virgin Mary; ***Autumn-Mary (Syys-Maria); Pestuupyhä***
11	St. Alexander Nevski (Santeri) ***Eve of the autumnal equinox; Festivals of Light;***
14	***Holy Cross Day***
21	St. Matthew, Apostle and Evangelist; ***Autumn-Matti (Syys-Matti)***
29	St. Archangel Michael (Arki-Mikkeli)
October (Lokakuu)	
1	Pokrova (Finnish Orthodox calendar)
4	St. Francis
7	St. Bridget (Pirkko)
9	St. Dionysius
14	St. Calixtus***; The first winter's day***
14–16	***Three winter days (Kolme talvipäivää)***
18	St. Luke, Apostle and Evangelist (Luukas)
21	St. Ursula
28	St. Simeon (Simo)
29	St. Anastasia (Finnish Orthodox calendar) Squirrel's day (Oravan päivä)
November (Marraskuu)	
1	All Saints' Day (Pyhäinmiesten päivä); ***End of the economic year–kekri celebration***
2	All Souls' Day (Sielujen päivä)
5	Day of Malachi, today Reima (Malakias, nyt Reima)
10	St. Martin Luther (Martti)
11	St. Martin (Martti)
19	St. Elizabeth (Liisa)

23	St. Clement (Klemetti)
25	St. Catherine (Kaisa)
26	St. Linus (Liinus)
30	St. Andrew (Antti)
December (Joulukuu)	
4	St. Barbara
6	St. Nicholas (Nikolai)
8	Conception of the Virgin Mary by St. Anne (Maarian sikiämä)
13	St. Lucia (Lusia)
13-14	Lucia's night, Anne's eve; ***Winter solstice***
15	St. Anne (Finnish Anna, Suomalainen Anna); ***Winter solstice***
21	St. Thomas (Tuomas)
21-24	***Nest Days (Pesäpäivät), Winter solstice***
25	Christmas Day (Joulu)
26	St. Stephen, Apostle (Tapani)
27	St. John, Apostle and Evangelist
28	Holy Innocent's Day; [27-28 December: Old small Christmas saints (Joulun vanhat pikkupyhät)]

Tab. 2. Feasts marked on the Paris calendar (gray columns), Finnish calendar sticks (black columns), and in the Finnish folk calendar (white columns).




April (Huhtikuu)
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
May (Toukokuu)
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June (Kesäkuu)
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July (Heinäkuu)
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August (Elokuu)
1
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
September (Syyskuu)
1
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
October (Lokakuu)
1
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
November (Marraskuu)
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
December (Joulukuu)
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Conclusions

The above-mentioned features of the Finnish medieval calendar point to some already forgotten calendar traditions and practices, to the circumstances and reasons for their convergence, to the knowledge of objective natural phenomena (such as the important astronomical events and climatic conditions) and their place in the people's everyday life.

The feast system of the Finns manifests the syncretism of the Christian practices with the local traditions. The wooden calendar was one of the instruments for strengthening the Christian religion. Its popularity among different population strata was due to the fact that the calendar record was a logically built mnemonic system of alternating signs, which allowed to easily determine the dates of past and future events.

Time-reckoning devices reach extraordinary perfection both in shape and contents in the form of runic calendars. When the latter contain also signs for the 19- and 28-year cycle of the Christian chronology or small auxiliary tables, the feast dates from the Easter cycle can be calculated as well. All this shows that the wooden calendars were made and used by people who were well acquainted with the church calendar and could skillfully make sophisticated calendar calculations. The wooden time-reckoning devices also developed further the esthetic sense and craftsmanship of the people.

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Bibliography

Helminen H.
1933: *Kansanomainen ajanlasku ja vuotisjuhlat*. Helsinki.

Hirsjärvi A.
1948: *Metsäsuomalaisten riimukalentereista*. "Kalevalaseuran vuosikirja", 27–28, 1947–48, pp. 39–48.
1957: *Riimusauva, suomalaisen almanakan edeltäjä. Suomen almanakan juhlakirja*, Helsinki, pp. 15–24.

Korhonen A.
1915: *Suomalaisten vanhasta ajanlaskusta*. Helsinki.

Lipsanen A.
1987: *Finnish Folk Year*. Helsinki.

Roussel M.
1952: *La calendrier runique de la Bibliothèque Sainte-Geneviève*. "Suomen Museo", LIX, pp. 29–38

Sirelius U.T.
1921: *Suomen kansanomaista kulttuuria*, II, Otava, pp. 527–546.

Sreznevskij V.I.
1876: *Severnyj reznoj kalendar*. "Trudy vtorogo arkheologicheskogo s'ezda v Sankt Peterburge", vyp. 1–2, pp. 1–108.

Talve I.
1980: *Suomen kansankulttuuri*. Helsinki.

Vilkuna K.
2002: *Vuotuinen ajantieto*. Helsinki.

Vourela T.
1975: *Suomalainen kansankulttuuri*. Porvoo.

The Observation of Celestial Bodies and Time Counting in the Lithuanian Folk Culture

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Abstract: *This paper deals with Lithuanian ethnographic data of the 19th and 20th centuries and with historical sources disclosing some of the Lithuanian folkways of counting time. This popular chronology is based on the observation of the Sun, the Moon and the stars. The Folk knowledge about the cycles of celestial bodies used to define the time of the day, the days in the year and the seasons is discussed and summarized. The ethnographic material shows that the azimuths of the sunrise and sunset were observed. The length of the shadow of a gnomon which can be a chosen tree or a person, etc., have been used as well as the simple observation of the eight of the Sun above the horizon.*

We certainly know that the changes of Moon phases and its positions among the stars and constellations were observed for the Moon calendar. But although the connections between various agricultural works and the phases of the Moon are very strong and significant, we unfortunately still miss extent direct knowledge about Moon observations.

Certain stars and planets were observed as well in the folk calendar, more especially the Pleiades, Orion, Ursa Major and Venus.

I. The Sun

Determination of the time of the day

The cycle of the movements of the Sun over horizon was the most natural phenomenon used to divide the day. Of course, the solar motion was perceived as a rotation around the earth. According to the cardinal positions, one full day was divided into 4 smaller parts: ***rytas*** *'morning'*, ***vidurdienis*** *'noon, midday'*, but also the term *pietūs* was commonly used, meaning altogether midday, dinner time, and South; ***vakaras*** *'evening'* and ***vidurnaktis*** *'midnight'*. These divisions corresponded to sunrise, upper solar culmination, sunset and mid night. Accordingly the same solar positions were applied to the space structure (cardinal points) which were named: ***rytai*** *'east'*, ***pietūs*** *'south'*, ***vakarai*** *'west'*, and ***šiaurė*** *'north'* or sometimes ***vidurnakčiai*** *'midnight, north'*.

Thus, the daily movement of the Sun through the sky was used to organize space and time and all human activities: work, meals and rest. We can observe here that the distinct categories of time and space were perceived as a unique

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whole, a time-space dimension, forming a frame for all activities. More precise subdivisions also relating to meal times were added to these four main cardinal solar positions:

1. ***priešpusrytis (priešpusryčiai), priešrytis*** literally meaning *'before half east'* or *'before breakfast'* or *'before East'* or *' before morning'*, some times ***apíeaušris*** *'twilight'*. The time of night when the Sun is about north – east (in summer time) just before dawn, and the time of the first breakfast in summer time.
2. ***pusrytis,*** *'half east'* or *'half morning'* or *'breakfast'*, more or less the time of sunrise at the East, time of first breakfast.
3. ***priešpietis*** or ***pùspietis***, *'before south'* or *'half south'* – forenoon, time of the second breakfast, the Sun is then approximately in the south – east, it defines the middle of the morning working time.
4. ***pietūs*** or ***pietai*** *'south, noon, dinner'.*
5. ***pavakarỹs*** or ***apývakaris*** and ***apývakarė, (pusvakariai, priešvakaris*** also ***popietis, popietuvė*** and ***pusdienis)*** *'about west', 'half west', 'before evening'* also *'after south/noon/dinner'* and *'half the day'*. The Sun is half way between culmination and sunset. When the days are long, the time of an afternoon meal.
6. ***vakarienė*** *'westering, evening, supper'.*
7. ***pùsnaktis*** *'half night';* midnight.

Priešpusryčiai (LKŽ X 711) and ***pavakariai*** used to be added to the usual main time sequences when the days were longer than the night in summer. These minor time partitions are related to intermediate Sun positions, which also describe intermediate cardinal points.

The ethnographic data concerning the division of the day are documented by a German written source of the 17th century. M. Pretorijus reports a division of the day in 15 parts. In fact he presents a general division in 4 parts, each of them subdivided respectively in 4, 3, 4, and 4 minor units (BRMŠ III 175, 282):

1. ***Rytas*** *'morning'*:
1.1 ***bregstims*** *'break'*, 1.2 ***priblindums*** *'twilight'*, 1.3 ***auszra*** *'dawn'*, 1.4 ***pusritis*** *'breakfast'*;
2. ***Pietus*** *'noon'*:
2.1 ***uspietus*** *'half noon, forenoon'*, 2.2 ***tikkras pietus*** *'proper noon'*, 2.3 ***po pietu*** *'after noon'*;
3. ***Wakars*** *'evening'*:
3.1 ***paludenis*** *'half the day'*, 3.2 ***apilope*** *'time of foddering'*, 3.3 ***prietemis*** *'half-light'*, 3.4 ***wakaris*** *'evening'*;
4. ***Naktis*** *'night'*:
4.1 ***iszwakaras*** *'threshold of night'*, 4.2 ***immigis*** *'deep sleep'*, 4.3 ***guddumas*** *'in the dead of night'*, 4.4 ***gaidgyste*** *'cockcrow'*.

In the 19th century, S. Daukantas gives the detail of the original names for each of the 24 hours of the day (Daukantas 1976, 587):

> 1. ***sambrėškis*** or ***brėkšta*** *'the break of dusk'*, 2. ***santėmis arba sutemo*** *'dusk'*, 3. ***vakaras*** *'evening'*, 4. ***nuovakarės*** *'offdusk'*, 5. ***išvakarės*** *'outdusk'*, 6. ***naktovidas*** *'midnight'*, 7. ***įmygis*** 'deep sleep', 8. ***pirmieji gaidžiai*** *'first cocks'*, 9. ***antrieji gaidžiai*** *'second cocks'*, 10. ***prieš aušrą*** *'before dawn'*, 11. ***aušta*** or ***švinta*** *'dawn'* or *'getting light'*, 12. ***mažoji pusrytėlė*** *'the minor half east/morning/breakfast'*, 13. ***išaušo*** *'dawn is over'*, 14. ***saulėtekis*** *'sunrise'*, 15. ***didysis pusrytis*** *'the major half east/morning/breakfast'*, 16. ***priešpietis*** *'forenoon'*, 17. ***pietai arba pusdienis*** *'south or noon'*, 18. ***pakaitis*** *'heat'* (the nap), 19. ***po pakaičio*** *'after heat'*, 20. ***po pusdienio*** *'afternoon'*, 21. ***pavakarė*** *'before evening'*, 22. ***mažoji pavakarėlė*** *'the minor evening'*, 23. ***vakarop*** *'near evening'*, 24. ***saulėlydis*** *'sunset'*.

Both documents partly cover and confirm each other, which is always a sign of authenticity. But we notice that the older list fills only partly the latter one. The discrepancies can well be caused by regional differences, but the important fact is that many of these tiny subdivisions are almost identical. We suspect that the nineteenth century compilation could be a distortion trying to fit into the modern 24 hours division frame of the day.

In order to determine the time of the day, the height of the sun over the horizon as well as its visible direction were taken into account. The most primitive way to determine Sun's height was to compare it to the height of a person or length of common tools. Low position of the Sun used to be described as being ***per kačiargą*** *'by poker'*, ***per šienkartę*** *'by hay-barling'*, ***per grėblį*** *'by rake'*, ***per grėbliakotį*** *'by handle of rake'* over the ground. Sun's height over the horizon also used to be approximately measured in feet, spans, or even fingers. More precise measurement used to be expressed in units of Sun's disks: "The Sun was already three circles (disks) up and you had just left to mow" (EAA, Gaška 1985).

Another popular way to define time was to observe the length of a shadow and its changes of direction. It was very common to measure the length of one's own shadow in steps or feet. It is said that in midsummer at noon one's shadow equals one step. Thus shepherds used to bring their herds home at noon when they could step or jump over their own shadow. Quite often shadow length used to be measured in feet. There are references to different shadow lengths at noon – from 4 to 9 feet. In the afternoon, time used to be determined by the length of the shadow as well: "When the shadow is shortest, only one step long, they know it is 12 o'clock, that is exactly noon. And then in each hour it adds one step till 5 o'clock; after 6 in the evening the shadow lengthens by two steps. And similarly from morning till noon" (Butėnas 1935, 82). Elongation of the shadow due to the shortening of the day was also considered: "Now (1st of July) at noon the shadow is one step long. From St. Ann's day, the shadow will be two steps long because the night will be longer for an hour and a half.

It will be better for shepherds" (EAA, Laurinaitienė 1992). "In June the shadow is 4 feet. In each month the shadow lengthens by a foot. When you turn out the livestock in May the shadow is 5 feet long, in June–July – 4 feet, in August – 5 feet…" (EAA, Zablockis 1993).

The shepherds knew how to make a sundial. For that purpose they used to hammer a pole in the ground and drew a circle around it. Then they asked someone what time it was and marked the place of the shadow on the circle. The circle was then divided into 12 parts and the progression of the shadow indicated the change of time.

At home the determination of noon and other hours used to be observed on the south windowsill marked with stripes specially carved on it, or by noting the position of the shadow of the window edge on some notable place inside the room (Dundulienė 1982, 202): "When the shadow used to come through the window across the house to the threshold they said it is noon" (EAA, Legotienė – Vosyliūtė 1992).

Such a method was employed not only for common purposes, but for magical ones as well. It is told that an evil person would try to estimate the so called "bad minute" – that is the precise time when all curses would certainly come true. The curser on a sunny day would watch out what happened at his neighbour's place, and whenever he would notice something going wrong, he would then mark the "bad minute" by the position of the shadow of some certain object or the place where the Sunrays would fall, by hammering a nail or by carving a notch in that place. Later, he would wait for that specific time, when the shadow would reach the same place again, to cast his curses (Dundulienė 1992, 52). Worth mentioning that the so-called "bad minute" is very individual, belongs to a certain person.

It is essential to point out that a special meaning used to be attributed not only to some special moments in time but also to different regular time periods of the day. It was believed that the choice of the time for various events or activities influenced the future result. Therefore working and ritual activities used to be bound to well-determinated moments of the day. For example, it was thought that the choice of different moments of the daytime for planting would play a good or a bad effect on plants and give them different qualities in the same way as, according to astrologists, birth time influenced people's character or destiny (Vaiškūnas 2001, 163). Thus great care was taken to time correctly all activities of everyday life.

Determination of the calendar time

Even nowadays, when collecting ethnographic data in Lithuanian villages, one stumbles upon observation of the Sun for the determination of the calendar time. Up to day, some people use specific places of the landscape to mark the locations of the Sun at its extremes, for example: "On the ***Seliutai*** (a toponym, the land owner's family name) oak rises the Sun and its sets on the ***Pamociškes*** (another toponym) slope in February, and when the days are getting longer then March comes. When the day gets longer we say that the Sun rises on the

Kalnas hill. Every hill or elevation of ours has a name" (EAA, Česnulienė 1994; Vaiškūnas 2003, 34). Here the familiar features of the local surrounding, such as a tree on the neighbour's property is used as a milestone in the calendar. The fact that country people were well aware of the directions of the rising and setting Sun not in the east and west but rather far in the north-east and north-west on the summer solstice days and that they observed it carefully is shown by the expressions used for these times of the year. The location of the midsummer sunrise and sunset are referred to as the ***vasaros aukštieji rytai*** *'High East of the summer'*; and the ***vasaros aukštieji vakarai*** *'High West of the summer'*, and the directions of winter sunrise and sunset – the ***žiemos žemieji rytai*** *'Low East of the winter'* and the ***žiemos žemieji vakarai*** *'Low West of the winter'*. It is thought that during the early phase of the calendar formation, the observation of changes in sunrise and sunset directions determined the duration of calendar celebrations that were connected to summer and winter solstices (Vaiškūnas 1997, 20; 2003, 34). It has been noted that the changes in the sun azimuths slow down considerably at its extreme directions north or south. For some time the sun "stops" and its rising and setting points remain fixed. The determination of the duration of immobility depends of the precision of the observation. If we accept a precision of about a degree for the measures of the azimuth, people must have considered that the Midsummer Sun had reached its extreme position and standstill between more or less June 13th and June 30th, that is a period of up to 18 days. Sun standstill is documented to last the period between ***Joninės*** *'Feast of St. John'* (06.24) and ***Petrinės*** *'Feast of St. Peter'* (06.29): "The Sun ***stovi vietoje*** *'stands in one place'* from St. John to St. Peter and then the days get shorter",[1] and they say about it that "the length of the day 'jumps back'" or, more often, that "the Sun jumps back" (Vaiškūnas 1997, 20; 2003, 34). The expression "jumps back" means the moment when the Sun returns from its northernmost azimuths. A close observation of changes in sunrise and sunset directions is reflected in one of the vivid expressions concerning the lengthening of the day after Christmas: "Between Christmas and Epiphany day becomes longer of a cocks step". The observation of the length of the Sun's path compared to the horizon was a natural mean of determining the length of the days and consequently the periods of the year, but another way of establishing the calendar was to employ a pillar or a stick as a gnomon and a sundial to observe its shadow length and direction. Here follows a more detailed description of such observations: "When the Sun moves furthest north the days are longest. Then it is St. John. The longest days were determined in the following way. Take some tree in the middle of the fields or something isolated and free from shadows. One day the shadow of the tree will be marked at sunset: the shadow is marked by a pole. The next evening the procedure will be repeated […] When the shadow of the tree reaches the furthest point (to the south), and starts to go backwards, it was considered to be the longest day" (LTR 4508/17; Vaiškūnas 2003, 37).

[1] This can be the remnant of an older calendrical tradition, as we know the standstill is now on June 21st. Or could have a purely ritual value attached to these two saints.

A mast or a tree was also used to observe the shadows length and determinate the dates of agricultural activities: "Shadow length at noon was used by people to determine the beginning of haymaking" (VUB F81–1050, Gaška 1985). Other objects could also serve the same purpose, and in homesteads, poles were specially raised: "Father used to say that the pole in the yard has been planted near the gate and a piece of iron was on it, and it was used to measure time" (EAA, Kalvaitienė 1994). Another example of such a pole is the Fat Tuesday's pole which has a wheel on top. The inhabitants of Skuodas used to hang and burn ***Morė*** – the jackstraw of Fat Tuesday on it: "The wheel would be left unburnt, and on sunny days its shadow would show the time" (Kudirka 1992, 30). It is also known that the gnomon was used for complex time calculations and meteorological prognosis of the forthcoming year. P. Zablockis from the village of Kražiai witnessed his father and illiterate grandfather using different poles to mark calendar months depending on the length of the shadow. A vertical pole of about human height was used for that purpose. On the 20^{th}–22^{nd} day of every month the length of the shadow would be marked with a stick for each specific month. Six spikes were used. The weather of the current month was marked on the sticks. From June to Christmas, while the shadow got longer, notches were made to the western side of the sticks, for rainy days and to the eastern side for sunny ones. From Christmas onwards, the sticks were marked to the north for rainy or snowy days, and to the south for sunny ones. The sticks were kept as a primitive agenda, and consulted for future prediction of the weather. The same weather conditions were believed to return after every five years (EAA, Zablockis, 1994). The mention of a five years span is of course an important information as it recalls us of Celtic and Indian traditions.[2]

II. The Moon

The common term used for the Moon is ***Mėnulis***, but another word, ***mėnuo*** means at the same time the celestial body – Moon and the time period of a month. This name directly derivates from the Indo-European base **menes-*, **men(n)s-*, 'moon' and 'month', and have a more general meaning of **me-* 'measure' (DSS 54). So, the Moon was used as the natural cosmic instrument of measuring time.

[2] For the Celtic "Coligny Calendar", see: J.M. Lecontel, P. Verdier, *La mesure du temps chez les Celtes, une relecture du calendrier de Coligny*, "Publications de l'Obs. Astr. de Strasbourg, Serie Astronomie et Science Humaines", 1988 No. 2, pp. 117–134, and other papers on the same subject in the following numbers of the same publication: Nos. 3, 4, 8, 9; for the Indian five years calendar, see: A. Karp, *W poszukiwaniu doskonałości*, "Czas i Kalendarz", Papieska Akademia Teologiczna, Kraków, 2001, pp. 273–292, p. 279, citing A. Narahabi, *A note on the Five Year Yuga of the Vedanga Jyotisa*, "Electronic Journal of Vedic Studies" (EJVS) 1997, No. 3–4, pp. 21–28.

Daytime measurement

The Moon was used for night timing by noting the positions of Moon's different phases in respect to different parts of the world. It is especially easy to do this during the fullmoon when the Moon is opposite to the Sun then under the horizon and in the night sky it repeats the day sky movement of the Sun: it rises in the evening, culminates at midnight and sets at dawn.

Calendar time determination

Though Lithuanian chronology has unfortunately not yet been extensively explored and too little data about old calendar systems has been collected, it is still thought that the Moon cycle was of common use. One of the proofs may be

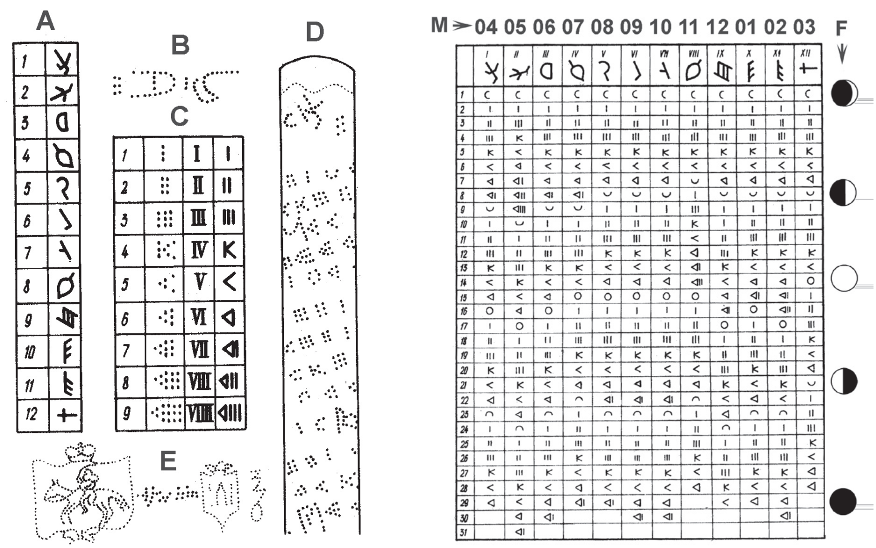

Fig. 1. Calendar stick (D) and explicative tables of the calendar signs written on it: A – the signs of the lunar months, B – an undecipherable inscription, C – the days of the lunar week, E – the armorial marks and an undecipherable inscription, F – Phases of the Moon, M – interpretation of the signs of the lunar month according to M.M. Gusev.

the description of a calendar stick explored by the 19th century Vilnius astronomer M.M. Gusev (Гусев 1865, 335–354). This stick dating to the 14th century was found under the ground on the slope of the Strėva river in the Trakai region. It is a stick with a copper-bound end and a spiral inscription (marks). Marks consist of many small nails (**Fig. 1** D). M.M. Gusev determined that the spiral markings represent twelve lunar months (**Fig. 1** A) and days of the week. Every month is marked with a different original sign and begins with the new moon crescent (**Fig. 1** F). M.M. Gusev found out that month marks depict phenologic aspects of the months and the main agricultural works. According to his opinion, the year in this calendar starts from April (**Fig. 1** M). So the first month is represented by a descending pigeon (Lith. April – ***balandis*** *'pigeon'*). Weekdays are marked with original local tradition of writing numbers, somehow similar to the Roman (**Fig. 1** C).

In the Great Lithuanian Dukedom, already before Christianity, the Julian calendar was used together with both the Byzantine chronology (counting years since the creation of Earth – Annus Mundi AM – 5508 years before Christ), and the Roman Era count (counting from birth of the Christ – Anno Domini AD). But conservative folk still used phenologic and Sun-Moon calendar for their agricultural needs much later. Lithuanian traditions of the 19th–20th centuries are rich with examples of coordination of Sun and Moon cycles. Even recently recorded stories still tell about the differentiating between "heavenly months" and "earth months". It is said that the "heavenly month" starts earlier than the earthly one, therefore it can be used to judge the upcoming calendar month: "On the sky the months are counted. My mother knew that. Now the haymaking is coming but on the sky a different month comes. On the sky July, it goes by one month ahead. On the Earth nobody cuts hay but the sky shows haymaker. The sky month determines which one is coming. If our month comes first there is no knowing. When the sky showed the month with snow and rain, then we see what month is coming" (EAA, Mažrimas 1992). This statement refers to the fact that the beginning of the lunar month and its name may precede the beginning of the corresponding solar month. The solar cycle was the main phenologic indicator, but the Moon variations were also very important in the life of farmers. The changes in Moon phase changes was divided into two main lunar periods – ***jaunas*** *'young'* (waxing Moon) and ***senas*** *'old'* (waning Moon), which were further separated from one another by – ***tuščias*** *'empty'* (New Moon) and ***pilnas*** *'full'* (Full Moon) phases. Each of two main Moon phases already mentioned was again divided into ***priešpilnis*** *'before full'* (Waxing Gibbous), and ***senagalis*** *'old end'* or ***delčiagalis*** *'wane end'* (Waning Crescent).

Moon variations in folk tradition even nowadays are quite important – they are usually related to favourable and unfavourable time periods. A lot of country folk still strongly believe that various agricultural activities should be coordinated with different Moon phases. Whatever is started while the Moon is waxing is supposed to grow and proliferate too, while what is started during the decay of the Moon, decays and shrinks as well. Therefore the period of growing Moon is sometimes called ***dosnus*** *'generous'*, while decrescent Moon is called ***šykštus*** *'skimpy'*.

It is worth explaining here in more detail the opinion of the people about favourable and unfavourable Moon periods, because such attitude obviously demonstrates an archaic attitude to the natural environment and time. The analyse of an abundant but contradictory ethnographic data about the coordination of various agricultural activities with the Moon phases shows some general regularities in the popular categories of positive and negative aspects of Moon phases:

I. The waxing Moon is supposed to be favourable to the growth in general and for any starting processes. Still to day, we observe important variations in the acceptation of the start and end of this period:
   1. While the Moon grows from the first crescent to the first quarter (Waxing Crescent) all starting processes will undergo a strong growth. They say that during that time plants grow into stems, leaves, blossom abundantly, and that even foundation stones under construction, come up to the surface. This period is bound to strong growth, luxuriance, humidity, liquidity, and at the same time tenderness, softness, and weakness. Though active vegetation takes place, it is not fruitful. It is a favourable time for various pests.
   2. The growth of the Moon from the first quarter to the full Moon (Waxing Gibbous) is also favourable to all growing processes but this time it will be also fruitful, leading to full-fledged formation of the fruit, to maturity.

II. Although the whole second period is associated with decay and wane, its first and second part are somewhat different as well:
   3. It is a common belief that the period of shrinking of the Moon from the full Moon to the last quarter (Waning Gibbous) is the least favourable to start anything. Everything started during that period is condemned to decay.
   4. The period that starts after the last quarter (Waning Crescent) presents certain positive aspect of the waning process. Therefore the last crescent is again considered as favourable for all activities bound to conservation or even sterility. It is a time to prepare all the food conservation, to cut timbers, to salt or smoke meat, etc. It seems as if an additional force pointing downwards came to action, and therefore offers also favourable conditions for planting beets and root vegetables, gathering their energy underground.

At the end of the month, when the Moon vanishes from the sky for 2 or 3 days, there is a period, which is believed to be a "time in vain" and any work would be done in vain (Vaiškūnas, Lovčikas 1999).

As we see, the observation of Moon changes used not only to mark calendar time, but was also indicating some sort of time quality. Though it is now often heard that the phases of the Moon "have an effect", namely that they influence various phenomena, folk tradition does not speak of any direct physical influence of the Moon.

It seems that the popular old tradition pictures the Moon not only as a time marker or even a time factor but also as a quality mark for certain time periods. But all this is difficult to establish with certainty, because it has been also often observed that the favourable and unfavourable Moon periods are absolutely parallel to menstrual cycles. Does the general symbolism of growing in the nature accords with the visible aspect of the Moon? Or is it rather that a certain time has a growing quality influencing the whole of nature including the Moon? In fact, such logical questions have no object in folk culture, based only on direct observation and logical-symbolical classification. This is confirmed by the general confusions found in all Indo-European languages between the categories of chronological time and weather conditions.

III. Stars

During the late autumn or winter, when people got up still in the dark, they used to estimate the time according to the position of prominent stars or constellations in the sky. According to ethnographical data we know that in the 19th–20th centuries they were:

1. Pleiades (Lith. ***Sietynas, Sietas*** *'the Sieve'*, ***Žvaigždžių sietas*** *'Sieve of stars'*).
2. Orion (Lith. ***Šienpjoviai, Šienpjūviai*** *'the Mowers'*, ***Kūlėjai*** *'the Threshers'*, ***Trys karaliai*** *'Three Kings'*).
3. Ursa Major (Lith. ***Gryžulo ratai*** *'Grįžulas wain'*, ***Grigo ratai*** *'Grigo wain'*).
4. Venus (Lith. Morning Star – ***Aušrinė*** *'Dawn* (*star*)*'* and Evening Star – ***Vakarinė*** *'Vesper'*).

Night time was determined by memorizing the positions of some constellation relatively to the horizon at various moments of the night. For the date determination people waited for some constellation to appear in the cardinal positions (rising, culmination, or setting) just before sunrise or just after sunset. For this purpose the following annual observable positions of near ecliptic stars are especially convenient:

1. *Morning* (*heliacal*) *rising* – the first appearance at the eastern horizon in the morning dawn before sunrise.
2. *Morning culmination* – culmination just before sunrise at the end of night.
3. *Morning setting* – setting just before daybreak.
4. *Evening (achronal) rising* – rising just after sunset.
5. *Evening culmination* – culmination just after sunset.
6. *Evening (heliacal) setting* – the last visibility in the evening after sunset.

1. Pleiades

1.1. Hour estimation

During long autumn and winter nights people could guess the time quite precisely according to the movement of the Pleiades. That is why they are sometimes compared with a clock: "***Sėtynas*** shows time as a clock" (LTA 1300[4]), "***Sėtynas*** served as a clock for us in Butniūnai..." (LTR 4286[121]). People noticed that the Pleiades cluster, situated near the ecliptic, moves during long November nights in similar fashion as the summer Sun: "that *Sietynas* goes just like Sun in summer, in the same path". People used this corespondance to guess the hour of the night in a similar way as they did during daylight with the Sun. In November the Pleiades culminate at about midnight and it was known that: "when ***Sietynas*** rises up – that means it is before midnight, when it goes down – it is after midnight" (LTA 2256[103] also: LTA 2246[51], LTA 2249[81], LTA 2312[414]); "***Sietynėlis*** is going down, the day will come soon" (EAA, Čibirienė 1989). People could guess the time even more precisely. If the Pleiades are in the East and as they say "takes one quarter of the sky", that means it is 8 p.m. If they are in the "middle of the sky" that means it is midnight. And if they are turned to the west and "take half of the sky" – it is 3 a.m. (LTA 2260[88] also: LTA 2312[418],[423]; LTA 2240[62] etc.). People guessed the time from the position of the Pleiades according to separate objects of the surroundings: "***Sėtynas*** on the granary, so let's go to bed" (LTA 2257[184]); "***Sėtynas*** /.../ on the granary it's time to get up" (Vaiškūnas 1993a, 20; 1999a, 227).

In September people got up to trash when the Pleiades were in the south-east (LKŽ XII 534). In October – when they were culminating. At that time the time was guessed in the following way:

> The Pleiades rise – it is evening.
> The Pleiades in the south-east – it is 8–9 p.m.
> The Pleiades are in the south – it is 2–3 a.m.
> The Pleiades are going down it is 7–8 a.m. (LTA 2312[420] and also: LTR 4286[123], LTR 4287[26]).

In December about Christmas the culmination of the Pleiades (2-3 hours before midnight) was the sign for children to go to bed (EAA, Armonaitytė 1992; Vaiškūnas 1993a, 20; 1999a, 227).

1.2. Timing of agricultural activities and meteorological observations

Ethnographical data show that some particular days of the year were associated with the following positions of Pleiades:

1. Evening (heliacal) setting (April 23).
2. Morning (heliacal) rising (July 10).
3. Morning culmination (September 15).
4. Morning (cosmic) setting (November 30).

According to these ethnographical data, the heliacal setting has been considered especially important.

1.2.1. Evening (heliacal) setting

The heliacal setting of Pleiades was associated with St. George's day (April 23). This position of Pleiades indicated the beginning of spring and outset of agricultural activities. It was known that the lower the Pleiades appear after the sunset, the nearer the spring is. People said: "If ***Žvaigždžių sietas*** 'the Sieve of stars' is high, so spring is far" (LTA 2319[13]); "If the ***Žvaigždžių sietas*** 'the Sieve of stars' went down with the evening glow, it would be warm (spring) soon" (LTA 2259[89]); "***Sietas*** disappears and a cuckoo starts to call" (LKŽ XII 532). When the Pleiades entered the evening glow people started to plough fields, got ready for spring sowing. It was said: "***Sietynas*** in the glow, the bull in a furrow" (EAA, Jezerskis 1992 and Vaiškūnas 1993b, 332); "***Sietynas*** in the glow, the grey (horse) in the meadow (just before St. George)" (EAA, Andriukaitienė 1992); "If ***Žvaigždžių sietas*** 'the Sieve of stars' is not in the glow it's not yet the time to let your horse into the meadow" (LTA 1480[22]; Vaiškūnas 1993a, 21; 1999a, 228).

1.2.2. Morning (heliacal) rising

In early July, when the Sun takes distance from the Pleiades, they become visible again over the north-eastern horizon. As many other nations worldwide, the Lithuanians apparently also associated the beginning of summer's rainy days with the heliacal rising of the Pleiades (Allen 1963, 398; Gładyszowa 1960, 161, 170–176; Lebeuf, 1996). The first visible (heliacal) rising of the Pleiades coincides roughly with the folk calendar's day of the seven *sleeping brothers* (July 10). Accordingly to the weather on this day people guessed the quantity of precipitation for the second half of summer. They fell sure that if it is raining on that day, it will be raining for 7 days, or even 7 weeks. The relation of the 7 stars of the Pleiades with the day of the 7 *sleeping brothers* is proved by a legend according to which the stars of the Pleiades are 7 brothers who fell asleep in the basement of the church built by themselves (Vaiškūnas 1994, 17–18; 1999a, 223–224).

During hay harvesting, the forecasting of the rainy days during the end of summer time was very important. Summer mostly ends with rainy days in our country. As the widespread saying goes, "In vain even the entire folk begs for the rain before St. John, whereas later on just a single voice serves" (LT V 383). The Russians also waited for the appearance of the Pleiades at that time. They even called the 11th of July (old style) ***Яфимии стожарницы*** (Russ. *Стожары* – the Pleiades; КГ 280).

1.2.3. Morning culmination

The other significant position of the Pleiades was their culmination before the sunrise, which indicated the middle of the autumn sowing period. In the 17th century M. Pretorius wrote that a certain position of the Pleiades was a good sign for the start of sowing (BRMŠ III 176, 283). People said that God had put the Pleiades into the sky for people to know when it was time to sow rye (LTA 2247[20]). "If ***Sietynas*** comes to the south before dawn, it is time to sow rye" (LT 382); "***Sietynas*** turns to the south, it means time has come to sow rye…" (LTR 4508[7]). When the Pleiades appeared in the south-west before dawn, it was the end of September and people picked potatoes (Vaiškūnas 1993a, 21; 1999a, 229).

1.2.4. Morning (cosmic) setting

The setting of the Pleiades in the morning dawn has been associated with the start of Advent period. Despite the official ecclesiastical calendar, which started Advent at the fourth Sunday before Christmas, folk tradition begins it at the St. Andrews (November 30). The return of longer days was expected if the Pleiades set before Advent, and vice versa. If the Pleiades set before morning, it was an indication that the Sun would soon return: "They say, when the ***Sietynas*** goes down before Christmas, so the day is already getting longer" (LTA 2261[39]; Vaiškūnas 1993a, 21; 1999a, 229).

1.2.5. Evening (achronal) rising and evening culmination

Very little lore is left about the first evening rise of the Pleiades. In October, when the Sun is down, they are already seen in the east: "In the evening it (the ***Sietynas***) is in the east. Then it comes later and later. That means that later it won't be seen in summer" (EAA, Laurinaitis 1992). Nevertheless, this position of the cluster might have been originally associated with some form of Day of the Dead celebrated during the October/November boundary (later replaced by the Christian All Hallows Day and Halloween celebrated during November 1 and 2). Many peoples associate this position of Pleiades with the rites of the dead (Allen 1963, 401).

We lack information about the observation of the evening culmination of the Pleiades. All we know is that "***Sietynėlis*** is in the middle of the sky in the evening and it goes down where the Sun rises. Then we know that the day will come soon" (LTA 2247[44]).

2. Orion

2.1. Hour estimation

Orion (***Šienpjoviai, Šienpjūviai*** *'the Mowers'*, ***Kūlėjai*** *'the Threshers'*) was used for this purpose in a similar way as the Pleiades. The rising of Orion by the end of summer was a signal to get up: "As ***Šienpjūviai*** have risen, it was time to get up. Maybe around four or so turned up" (EAA, Leonavičius 1989). Or, "***Šienpjūviai***, so to say, around September are eastwards. I call up, when ranging horses, if ***Šienpjūviai*** appear, then the dawn starts, (...) and as they came out to the full, then we must go to Suvalkai, because it is morning already"

(EAA, Krakauskas 1989). Indeed, Orion, following some period of invisibility, appears first in the eastern sky just before sunrise, and then rises constantly and become quite visible in the morning by September. During late autumn, people used to get up when Orion had already moved to the South: "…as ***Šienpjūvės*** were just about south then folk took ride to the town, Suvalkai that is. This was a good time" (EAA, Krakauskas 1989). In November people got up when Orion moved from south to west, and in December – when it set. People noticed that in December Orion moves in the sky "like the Sun in summer": "In winter ***Šienapiūviai*** go like the summer Sun. When ***Šienapiūviai*** come where the Sun is at noon, then it is just midnight…" (LTR 4235[268]). So, during the long December nights this constellation served as a fine time mark. It rises at east in the evening, culminates at south by midnight, and sets at west before morning.

During the long nights of Advent people got up to threshing when culminating Orion shone in the South (as the saying goes: straightly, flatly, directly against south, upright, midway the heaven) i. e. just about midnight or a bit later, after culmination: "When the night is great, time is learned from ***Šienapiūviai***: when they rise, is just after evening, when they are high, then it is midnight, when they go down, then dawn nears" (LTR 4235[105]); "***Šienapiūviai*** rise in the east. Around twelve they are upright. When they begin to get down, then for us it is time to get up. Some people can even tell the hour by The Mowers" (LTR 4235[178]); "By ***Šienpjovės*** – they told which time it is. When to get up. When straight in the south, then they got up. They guessed the time only around Christmas, when nights are long" (EAA, Vaitonienė 1984);[3] "At winter, when nights are great, The ***Šienapjūviai*** are very visible. When they straight (in south – J.V.), then just about midnight (like 12 in older days), and when a bit turned round, then some two o'clock... time to get up and go threshing the rye. As by summer, ***Šienapjūviai*** are almost not seen" (LTR 4235[321]).[4] It is because of this that the position of the constellation has been associated with the time of threshing, Orion in some places has been called ***Kūlėjai*** *'Threshers'*, ***Spragilas ir kūlėjas*** *'Flail and Thresher'* (Vaiškūnas 1996, 142; 1999b, 168).

2.2. Estimation of calendar day

The very name of Orion ***Šienpjoviai*** *'The Mowers'* might come from the fact that their morning (heliacal) rising occurring at the beginning of August coincides with the beginning of the second turn of hay harvesting and with the harvesting of rye. In any case, in Eastern Lithuania, the mowers have been also called simply ***Pjovėjai*** *'The Croppers'* because their heliacal rise was the time to stand up and start beating the crops: "***Šienpjoviai*** *'The Mowers'* are seen in the morning near the place where the Sun rises. And when they come up, it is good to get up to move cattle, and to mow hays" (EAA, Žibudienė 1989); Those ***Pjovėjai*** *'The Croppers'* just rise – let us get up, for ***Pjovėjai*** are up. They rise, take scythe, ding-dong, to the meadows. This way it goes" (LKAR 2/228/).[5]

[3] Also see Gładyszowa 1960, 197, inskr. 281.

[4] Also see: LTA 2261[41]; LTA 2257[182]; LTA 2257[189]; LTA 2312[422]; LTR 4235[149]; LTR 4235[49]; Gładyszowa 1960, 186, inskr. 64; 187, inskr. 104.

[5] Compare in Polish: *"O, już kosy wschodzą (rano), to już jesień jak już koszą drugie siana, tj. po żniwach, czyli 21 IX. Powiadają mądrzy ludzie: już będzie jesień, bo już kosy wschodzą"* (Gładyszowa 1960, 188).

Because of its position relatively to the ecliptic, Orion is a good indicator of day lengthening during winter solstice, when it is almost in opposition to Sun and rise just after sunset (evening, or achronal rising). Noticing the elevation of Orion over the horizon immediately after sunset it was possible to estimate the degree of day lengthening. Whereas by Christmas the three prominent Orion stars are barely visible just after sunset, by the *Three Kings Day* (The Epighany or Adoration of the Magi celebrated on January 6th) they are already approximately 6 degrees above the horizon at dusk. Such well noticeable increase in altitude of the constellation was a good indicator of the length of the days. This 'step' made by Orion probably is reflected in a widespread folk saying that "from Christmas till *Three Kings Day* the day extends by the step of a rooster". The association of the constellation with the Adoration of Magi is supported by another extant name of the Orion – ***Trys karaliai*** *'Three Kings'*. On the base of folk materials from the Švenčionys district, P. Dundulienė says explicitly that from Christmas till Three Kings Day "day becomes longer by the step of a rooster, or by the leap of a ram, i.e. the way made by Orion" (Dundulienė 1988, 57).

3. Ursa Major

3.1. Hour estimation

During clear weather, the circumpolar constellation of Ursa Major (***Grįžulo ratai*** *'Grįžulas wain'*, ***Grigo ratai*** *'Grigo wain'*) which is never setting, was used as a good time marker: "***Grigo ratai*** they ascend in evening. One can estimate the time (by their position)… The Polar star stays in its position, but the ***Grigo ratai*** are going around the Pole star; and when the night is long they appear on the left side of the pole star. /.../ *They spin each day*" (EAA, Blazgys 1992). Such position of Ursa Major is observed in January – March. But, as ethnographic data indicates people better recall Ursa Major positions of long November – December nights (**Fig. 2**) It was noted that the "thill" ("horses" or "stallion" – Eta, Zeta, Epsilon UMa) of *Grižulas's wain* are at that time always directed towards the Sun, still situated under the horizon, and that is why Ursa Major served as the very useful indicator of the hours of night: "Humans guess the time according to ***Grįžulo ratai***, because it always moves with his thill towards

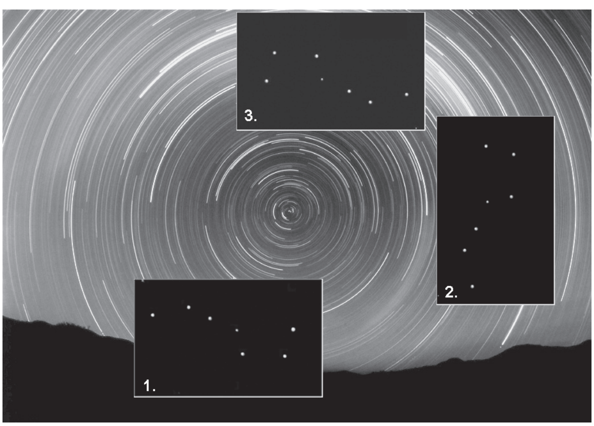

Fig. 2. Positions of Ursa Major in November and December: 1. Evening; 2. Midnight; 3. Morning.

the Sun. It is the clock of the sky" (LTA 2259[105]). The orientation of the "thill" (or the "horses") of *Grįžulas's wain* towards the West indicated evening (**Fig. 2.1**), while their orientation downwards to the horizon, towards the northern azimuth indicated midnight (**Fig. 2.2**). When they point to the east they indicate the coming morning (**Fig. 2.3**): "In the evening, the horses of ***Grįžulo ratai*** face to the northwest, at midnight – to the north, in the morning – to the east" (LTA 2260[87]) and "In the evening, the thill is towards west, in the mornings towards east, turned in the direction of dawn" (EAA: Deveikienė); "…When the thill turn towards east side, its means that the day is coming" (Davainis-Silvestraitis 1973, 162).

Ursa Major used to be described as standing in the south, being "near the middle of the sky", high above head or visually characterized as "overturned cart" in their culmination. The position of this constellation in November – December was used to determine the time to get up: "If the ***Sietynas*** (Pleiades) is low and ***Grižulio ratai*** is upside-down it means that the day is coming up soon" (LTA 2316[35]). Quite often such a position of this constellation was described as Ursa Major being "on the roof". The master of the house used to say: "***Grižratis*** is already on the roof, it's time to get up!" (EAA, Martišius 1992). A neighbour who used to sleep long used to be spurred on by – "Juliau, Juliau (a name) get up! / – What is that? / – ***Grigo ratai*** is on the roof! / – Probably it was brought by the devil there!" (EAA, Juodaitis 1992) or: "Juozai, get up, ***Grįžulo*** is on the barn!" (EAA, Spangelevičius 1992).

Sometimes, by comparing the morning and evening position of Ursa Major, it is said that they "turn around" before the day, or "turn over" or "reverse": "***Grižulio ratai*** turn around before day" (LTA 2254[67], LTA 2255[72]); "***Grižula ratai*** turn around before day and ***Sietynas*** (Pleiades) go to west" (LTA 2246[50], [52]); "***Griga ratai*** in the evening is on one side but later it turn over to another side"(EAA, Jonadt-Šimėnienė 1990); "***Ratai*** already had turned – it means that morning is coming they say" (EAA, Leonavičius 1989).

Sometimes it is explained that ***Grįžulo ratai*** before the morning turns or faces to the East: "***Grigo ratai***. Before day it turns to the east" (EAA, Maciulevičius 1993); "If the ***Grižulo ratai*** are facing the east it is going to be morning soon" (LTA 2257[188]; EAA, Maciulevičius 1993). But during the collection of materials in fieldwork, statements are often puzzling, because sometimes, they do not mean the direction of "the thill" but speak of the position of the constellation as a whole. And then, this does not indicate the mor-ning and evening hours in November – De-

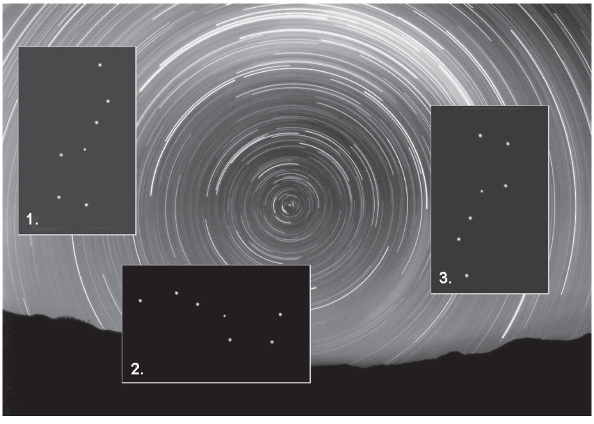

Fig. 3. Positions of Ursa Major in end of August and September: 1. Evening; 2. Midnight; 3. Morning

cember but rather at the end of August and in September (**Fig. 3**). This position of Ursa Major was a good indicator for the villagers, who guarded their horses in the pastures: "I remember that when we were guarding the horses at night, the sky was clear. The wheels were up and the thill was pointed to earth, and we knew that day soon would come" (EAA, Kuliešius 1989) (**Fig. 3.3**).[6] Such a situation appears only in late summer and the beginning of autumn: "Wheels down, and the stallion up: evening. And when the stallion is down and the wheels up: morning is near (so was it when we guarded the horses at summer night" (EAA, Savulienė 1987) (**Fig. 3.1,3**).[7] So midnight at that time was indicated by the constellation straight in the north, close to the horizon, the same as during the evenings in November (**Fig. 3.2**): "If ***Grįžulio ratai*** is in the north – midnight" (LTA 2312[418]).

4. Venus

It was also common to determine the approaching morning by the morning rise of Venus – Morning Star (***Aušrinė*** *'Dawn (star)'*). With ***Aušrinė*** rising people used to get up and start working too: "Well, there this ***Aušrinė*** star could be seen in the east by the morning. Then soon the dawn breaks and it (the star) disappears. No need for a clock – you spot it and you know it will dawn" (EAA, Nenortienė 1990); "Boys used to say – let's scamper away from girls – the Morning Star has already risen – we will have to hammer the scythe. Already before the sunrise we hammer the scythe and go hay harvesting..." (EAA, Dubinskis 1992). Women used to sing an altered strophe of the morning song to the overslept lady: "Hello the bright Morning Star, / the mistress still puts her legs up" (EAA, Jezerskis 1992 and Vaiškūnas 1993b, 332). These resemble strikingly the cuneiform inscription in a list of astrological prognostications: "When Venus is high, brilliant – pleasure of copulation".[8]

Approaching morning used to be deduced from the height of Venus over the horizon: "When we used to wake up without a clock – it is cockcrow. We used to wake up and check ***Aušrinė***. When ***Aušrinė*** is seen – time to wake up. (When? In winter or in summer? – Question by J.V.) Not needed in summer since nights are short. We used to look up in winter when nights are long. ... Maybe it used to rise after twelve, but it could not be seen. Would check the height of ***Aušrinė***... They say when ***Aušrinė*** is in one ***sagene***[9] high it is time to get up. … They mostly watch in December. In November not as often. … ***Aušrinė*** shows time as a calendar or a clock" (EAA, Savickienė 1992). "They used to guess the time according ***Aušrinė***. The higher ***Aušrinė*** is the latter time it is. … When you are outside then you see how ***Aušrinė*** is gaining height. … When ***Aušrinė*** has already arisen they say it is morning" (EAA, Čepulienė 1994).

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[6] Comp. in Polish: *"Kiedy dyszel od woza na dół pokazuje, jest czas do wstawania"* (Gładyszowa 1960, 152).

[7] Item *"Before day its (Ursae Majoris) thill pointed downward"* (LTA 2249[83]).

[8] B.L. Van der Waerden, *Science Awaking II: The Birth of Astronomy*, Leyden 1974; quotation after Lebeuf 1995, 595.

[9] An ancient measure, the distance from one hand to the other with extended arms.

On flax breaking or flailing nights, workers used to get food according to Venus rising: "When ***Aušrinė*** is rising they are eating first time on flax breaking" (J 178; LKŽ I 513); "Before ***Aušrinė*** rises, on flax breaking they are warming the beer for the workers" (EAA, Dargėnaitė-Beniušienė 1994). Because of that this eating was called ***aušrinė*** (LKŽ I 513).

The rising of Venus – Evening Star (***Vakarinė*** *'Vesper'*) was the sign to finish work (EAA, Grigas 1992). When the Evening Star sets it is time to go to bed (LTR 4508[27]).

IV. Time conception in traditional Lithuanian culture

A cosmic wheel is the best image to express the idea of the circular calendar year based on azimuth observations of sunrises and sunsets. The wheel visually conveys together the idea of time and space, as well as the idea of physical and spiritual cycles of human life (Razauskas 2000). A rolling wheel represents as well the time cycle of the day. The formal similarities in the changes of both natural cycles could be expressed by the same image of the wheel, a circle, or a closed cycle. This symbolical isomorphism equals day to summer, night to winter, dawn to spring and dusk to autumn. Further, noon and midnight are equivalent to summer and winter solstices and sunrise and sunset to spring and autumn equinoxes. This model associated with the Moon cycle (monthly cycle) and the proper movement of the starry sky produces a complex model of wheels of time, which expresses the time conception in traditional folk culture as Mircea Eliade has shown (Eliade 1959). This fundamental idea of time as a wheel or a circle was never conceived independently from its spatial correspondence, or wheel of the world. So the same cardinal solar directions were used to name also basic time divisions of days and years and served as a general frame for popular worldview (Vaiškūnas 2005). In this cosmology this cosmic wheel appears as an integrated system of time and space coordinates perceived as a whole and can properly be named a chronotope. This chronotope includes all the aspects of human life and its surrounding. The life of man itself with its landmarks of birth, youth, mature age, old age and death reproduced the same division and give birth to such expressions as the spring or the morning of life, or its autumn, the dusk of life, etc. The practice of celestial observation left marks in the general world-view. For example the equivalents of the term *cosmos* are in Lithuanian *Pasaulis* – the World, the Universe, but means literally the *space under the Sun, Space that opens due to the sun* that is to say – space being created and limited by movement of the sun. The same is in Russian ***Свет*** meaning *'light'* – the World, the Universe, as the place which becomes visible, distinct at dawn. As if the time and the space texture of this world was created by the cyclic dynamics of the light or lights (Sun and other celestial bodies). The movement of the Sun in respect to the Earth observed during the day and year cycles has led to a 4, 6 or 8-parts model of space-time structure. In the folk world-view time is not a monotonous homogeneous stream that can be divided into similar units that have no quality (Greimas 1990, 189–190), "time is not an empty form, but has its quality, every instance is specific" (Gurevičius 1989, 89). The Moon cycle, in which every interval has its own quality demonstrates vividly this archaic heterogeneous conception. Moon in its growth and waning is a main indicator of the quality of time. The same can be said about the Sun and the stars, which not only serve as time markers, but also indicate favourable or unfavourable conditions.

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Abbreviations

BRMŠ *Baltų religijos ir mitologijos šaltiniai*, vol. I: Nuo seniausių laikų iki XV amžiaus pabaigos, 1996; vol. II: XVI a., 2001; vol. III: XVII a., 2004 / Sudarė N. Vėlius, Vilnius.

DSS *A Dictionary of Selected Synonyms in the Principal Indo European Languages by carl Darling Buck*. The University of Chicago Press.

EAA Personal ethnoastronomy archives by J. Vaiškūnas (specified in the "Unpublished sources" section below).

J Юшкевич 1904.

LKAR Archives of people's art at the Lithuanian Folk Culture Centre, Vilnius.

LKŽ *Lietuvių kalbos žodynas*, vol. I, 1968; vol. X, 1976; vol. XII, 1981, Vilnius.

LTV *Lietuvių tautosaka*, vol. V, Vilnius, 1968.

LTA Archives of Lithuanian folklore. The materials in this archive now belong to LTR (see below). LTA and LTR are distinguished in the article in order to help the reader separate older information (LTA information was recorded between 1935 and 1940) from more recent data (LTR information has been recorded since 1940).

LTR Archives of manuscripts of Lithuanian Folklore in the Institute of Literature and Folklore at the Lithuanian Academy of Sciences, Vilnius.

VUB RS Manuscript Department in Vilnius University Library.

КГ *Круглый год. Русский земледельческий календарь* / Составитель А.Ф. Некрылова, Москва 1989.

СД *Славянские древности: этнолингвистический словарь в 5-ти томах* / Под ред. Н.И. Толстого, Т.1: А–Г, 1995; Т.2: Д–К, 1999; Т.3: К–П, 2004, Москва.

Bibliography

Allen R.H.
1963: *Star names: Their lore and meaning*, New York.

Butėnas P.
1935: *Laiko matavimo būdai* [in:] "Tautosakos darbai", Kaunas, vol. 1, pp. 64–85.

Daukantas S.
1976: *Raštai*, vol. 1, Vilnius.

Davainis-Silvestratis M.
1973: *Pasakos, sakmės, oracijos,* Vilnus.

Dundulienė P.
1982: *Lietuvių etnografija*, Vilnius.
1988: *Lietuvių liaudies kosmologija*, Vilnius.
1992: *Akys lietuvių pasaulėjautoje*, Vilnius.

Eliade M.
1959: *Cosmos and History: The Myth of the Eternal Return*, New York.

Gładyszowa M.
1960: *Wiedza ludowa o gwiazdach*, Wrocław.

Gurevičius A.
1989: *Viduramžių kultūros kategorijos*, Vilnius.

Kudirka J.
1992: *Užgavėnės*, Vilnius.

Lebeuf A.
1995: *Maria Magdalena, the Morning Star*, "INSAP Special Number of Vistas in Astronomy", vol. 39, part 4, pp. 591–603.
1996: *The Milky Way, a Path of the Souls* [in:] "Astronomical Traditions in Past Cultures", edited by V. Koleva and D. Kolev, Sofia, pp. 148–161.

Razauskas D.
2000: *Ryto rato ritimai*, Vilnius.

Vaiškūnas J.
1993a: *Ar pažino senoliai žvaigždes? Sietynas. Jo išvaizda, vardas ir judėjimas,* "Liaudies kultūra", No. 2, pp. 19–23.
1993b: *Apie žvaigždes Kražių apylinkėse* [in:] "Kražiai. Lietuvių katalikų Mokslų akademijos ir Lietuvių kraštotyros draugijos leidinys", Vilnius–Kaunas, pp. 330–340.
1994: *Ar pažino senoliai žvaigždes? Sietynas dainose. Sietynas sakmėse,* "Liaudies kultūra", No. 1, pp. 16–20.
1996: *Litauische Sternkunde* [in:] "Proceedings of the Second SEAC Conference Bochum, August 29th - 31st, 1994", ed. W. Schlosser, Bohum, pp. 139–149.
1997: *Kai kurie archeoastronominiai Rasos šventės aspektai,* "Liaudies kultūra", No. 3. pp. 20–21.
1999a: *Pleiades in Lithuanian Ethnoastronomy* [in:] "Actes de la Véme Conférence Annuelle de la SEAC Gdansk 1997" ed. T. Mikocki, Warszawa–Gdańsk, pp. 225–237.
1999b: *Etnoastronomia litewska* [in:] "Etnolingwistika", vol. 11, ed. J. Bartmińsky, Lublin, pp. 165–173.
2001: *Birth and celestial bodies in Lithuanian and Latvian tradition* [in:] "Astronomy, Cosmology and Landscape", ed. C. Ruggles, F. Prendergast, T. Ray, Leicester, pp. 158–166.
2003: *Some Aspects of Lithuanian Folk Observations of the Sun During the Summer Solstice Period* [in:] "Calendars, Symbols, and Orientations: Legacies of Astronomy in Culture", ed. M. Blomberg, P.E. Blomberg, G. Henriksson, Uppsala, pp. 33–39.

2005: *Representations of an Ancient Cosmovision on Lithuanian Distaffs* [in:] "Proceedings of the SEAC 2002 Conference in Tartu" (in print).
2005: *Verpstė ir Visata: archaiško pasaulėvaizdžio atspindžiai lietuviškų verpsčių puošyboje,* "Liaudies kultūra", No. 1–2.

Vaiškūnas J., Lovčikas S.
1999: *Lithuanian Folk Knowledge of the Moon* [in:] "Ancient Times, Modern Methods" ed. F. Stanescu, Sibiu, pp. 129–139.

Гусев М.
1865: *Древний литовский календарь* [in:] "Известия императорского археологического общества", vol. 5, pp. 335–354.

Толстая С.М.
1995: *Время* [in:] СД I 448–452.

Юшкевич А.
1904: *Литовскій словарь А.Юшкевича съ толкованіемъ словъ на русскомъ и польскомъ языкахъ*, vol. I, С. Петербургъ.

Unpublished sources

Armonaitytė Ona, born 1910, Paluobiai village, Šakiai region. Written down by J. Vaiškūnas, 1992.
Blazgys Juozas, born 1906, Griškabūdis, Šakiai region. Written down by D. Vaiškūnienė & J. Vaiškūnas, 1992.
Čepulienė Emilija, born. 1924, Preičiūnai village, Pakruojis subdist. Written down by R. Jurgaitis 1994.
Česnulienė Malvina, born 1916, Žiurai village, resid. in Mančiagirė village, Marcinkonių subdist., Varėna region. Written down by J. Vaiškūnas, 1994.
Čibirienė, Lione, born 1923, Dudeniškis village, Ignalina region. Written down by J. Vaiškūnas, 1989.
Dargėnaitė-Beniušienė Marija, born 1911, Gegrėnai village, Žemaičių Kalvarija subdist., Plungės region. Resid. in Paparčiai village, Barstyčiai subdist., Skuodas region. Written down by R. Nagaitytė 1994.
Deveikienė Aldona, born 1939, Tauragnai, Utena region. Written down by J. Vaiškūnas.
Dubinskis Juozas, born 1918, Varlakojai village, Kražiai subdist., Kelmė region. Written down by J. Vaiškūnas 1992.
Gaška Alfonsas, born 1906, Pandėlys, Rokiškis region. Written down by L. Jatulionytė 1985.
Grigas Leonas, born 1923, Galiniai village, Griškabūdis subdist., Šakiai region. Written down by J. Vaiškūnas 1992.
Jezerskis Vincas, born 1916, Papilė village, Šakiai region. Written down by J. Vaiškūnas 1992.
Jonadt-Šimėnien Helena Marija, born 1918, Kaukėnai (nowadays Jasnoje, Kaliningradskaja oblastj, Russia). Written down by D. Vaiškūnienė and J. Vaiškūnas 1990.
Juodaitis Bronius, born 1925, and Juodaitytė Salomja, born 1917, Griškabdžiai village, Šakiai region. Written down by D. Vaiškūnienė, J. Vaiškūnas and J. Šorys 1992.
Kalvaitienė Elena, born 1923, Telišioniai village, Pakruojis region. Written down by R. Petrauskas 1994.
Krakauskas Juozas born 1904, Žvikeliai village, Seinai (Poland – Sejny) powiat, Podlasie Voivodship, Poland. Written down by J. Vaiškūnas 1989.
Kuliešius Antanas, born 1920, Žagarė village, Seinai (Poland – Sejny) powiat, Podlasie Voivodship, Poland. Written down by J. Vaiškūnas 1989.

Laurinaitienė Regina, born 1920, Degutinė village, Griškabūdis subdist., Šakiai region. Written down by J. Vaiškūnas and D. Vaiškūnienė 1992.

Laurinaitis Juozas, born 1909**,** Degutynė village, Šakiai region. Written down by J. Vaiškūnas, 1992.

Legotienė-Vosyliūtė Ona, born 1909, Tupikų village, Igliauka subdist., Marijampolė county. Since 1940 resid. in Degutinė village, Griškabūdis subdist., Šakiai region. Written down by G. Žiemys 1992.

Leonavičius Jonas, born 1928, Vilkapėdžiai village, Seinai (Poland – Sejny) powiat, Podlasie Voivodship, Poland. Written down by J. Vaiškūnas 1989.

Maciulevičius, Kirdeikiai village, Saldutiškis subdist., Utenos region. Written down by J. Vaiškūnas 1993.

Martišius Vincentas, born 1899, Paluobiai village, Griškabūdis subdis., Šakiai region. Written down by J. Šorys 1992.

Mažrimas Jonas, born 1933, and Narbutaitė Elena born 1941, Pupėnai village, Kražiai subdis., Kelmė region. Written down by J. Vaiškūnas 1992.

Nenortienė Albina, born 1925, Leoniškiai village, Leoniškiai subdis., Šakiai region. Resid. Saugai, Šilutės region. Written down by J. Vaiškūnas 1990.

Savickienė Julė, born 1914, Kolegijos – 5, Kražiai. Written down by J. Vaiškūnas 1992.

Savulienė Zosė, born 1909, Miežionys village, Modžiūnai subdis., Švenčionys region. Written down by S. Lovčikas 1987.

Vaitonienė Ona, born 1905, Staciškiai village, Lazdijai region. Written down by A. Vaicekauskas 1984.

Zablockis Petras, born 1936, Janapolis village, Kražiai subdis., Kelmė district. Written down by J. Vaiškūnas 1993–1994.

Žibudienė Rožė**,** born 1915, Žagarai village, Seinai (Poland – Sejny) powiat, Podlasie Voivodship, Poland. Written down by J. Vaiškūnas 1989.