SOUTHERN AFRICAN COSMOGENICS AND GEOMYTHOLOGY OF THE GREAT ZIMBABWE CULTURAL COMPLEX SINCE THE MEDIAEVAL TRADE NETWORK ERA

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ABSTRACT

This thesis is an expansion on preliminary methodological systematics to a multi-disciplinary identification of cosmology in sub-Saharan Africa.

The work also draws causal relationships to an explanatory level through rigorous inferences of the observed past across cultural boundaries, specifically amongst the oral traditions, archaeology and ethnography of the Great Zimbabwe cultural complex.

It provides cosmogenic knowledge of sub-Saharan African indigenous astronomy and the geomythology of Great Zimbabwe as evidence suggesting supernova remnant RX J0852.0-4622 / G 266.2-1.2 as an historical event at the turn of the 14th century.

And, that there may be a repository of hidden knowledge amongst other southern hemisphere continental populations that were visibly and physically affected possibly by the nearest, most recent and brightest supernova.

Amongst the newly identified finds announced in the research are various early structures that relate to astronomy, tombs, burials, artefacts, sacred areas, a vast cave system with palaeontological potential, a lost city and a meteorite strewn field associated with impact craters from a recent phenomenal bolide airburst.

The vast socio-political belief system change caused by the impact is discussed, which may also form part of the centuries old origins geomythology, recorded and found amongst the enigmatic genetically-related trader descendants since the mediaeval trade network era of southern Africa.

Furthermore, the work concludes postulates of the 14th century climatic change as a result of the γ-ray flux from the supernova and a host of migrations and affectations throughout the world at the time of the so-called unrecorded event and how the Great Zimbabwe Great Enclosure functioned as a cosmic reference to a unique event.

A Japanese written record on the 13th September 1271 appears to verify and revere a strange orb of light that appeared before dawn which is depicted as a mandala circular ring surrounding a dot. The viewing altitude and azimuth of this orb coincides with the path taken by RX J0852.0-4622 at the exact times recorded in the texts.

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Everything is simply a probability, nothing is certainty

Richard Feynman

I, ……declare that the

thesis/dissertation, which I hereby submit for the degree

……..……at the University of Pretoria, is my own work

and has not previously been submitted by me for a degree at this or any other tertiary

institution.

SIGNATURE: ……

DATE: ……

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OVERVIEW

Historical attempts to identify and characterize astronomical indigenous knowledge in sub-Saharan Africa are limited and infer the consensus that it is non-existent.

Colonial and pre-Colonial scientific endeavour related finds to predominantly exotic and outlandish origins rather than understanding the concepts found in their contextual perspective. This has led to the current attempt of descriptions dealing with star lore, artifacts and structures that were found to possibly relate to celestial aspects. A methodological contribution towards the systematics brought about through years of fieldwork in southern Africa helped deal with the problems of identifying astronomy in sub-Saharan Africa, however, research into these fields is still dominated by foreign interests with, in most instances, a disregard of the ethnic and social perspectives.

Through reviewing archaeological and ethnographic records of astronomical indigenous knowledge systems the present oral traditions, historical narrative together with a newly proposed systematic approach helped formulate structure of past and present cosmogenics.

This analysis drew relationship inferences and conclusions between geo-references and cosmic conceptual links of sub-Saharan star-lore, rain-making, rock-art, geomancy, ritual deaths and burning, folk-tales, myths, structural orientations, trade and celestial references. Within the context of sub-continental early trade, agriculture, metal-work and settlements that collated external and internal cosmology against climatic changes.

In geo-referencing the distribution through time of symbolic notation of cyclical astronomical calendric movements, little definitive evidence supported ideas relating to the earliest records such as is found in most parts of the world in the Palaeolithic. Similarly, sub-Saharan African geoinformatic data in this regard lacks credibility without interpretative frameworks and methodological adjustment to the systematics.

Past astronomical examples are given of cosmogenic codification of natural cycles that present the geographical framework of changes and postulates that relate to the formative trade era networks in southern Africa, with an emphasis on external cosmogenic responses and contributions.

This study attempts to show the correlation between monoliths that were placed into the outer main wall of the Great enclosure at Great Zimbabwe and celestial movements. In surveys comparing the earliest and recently recorded digitized geomatics as well as planetarium software for simulation of the skies at Great Zimbabwe, observations revealed significant alignments with structures. The Platform Area and eastern-facing main outer wall of the Great Enclosure appear to have been used to reference celestial movements of the Sun, Venus and Moon, with the Small Conical Tower specifically relating to these celestial movements and heliacal appearances in a pre-walling phase. The sub-luminous supernova remnant RX J0852.0-4622 / G266.2-1.2 comes into view at the reconstructed tip of the Large Conical Tower from the same vantage point.

Within the relatively unknown cosmology of indigenous knowledge systematics of southern Africa, archaeological information, oral traditions, rituals and rock-art have provided a deeper perspective of specific astronomical data. In an attempt to ascertain geomythology in the African sub-Saharan continent various aspects were found to exist in structures such as at Great Zimbabwe and Mapungubwe together with a rich collection of evidence of how these expressions integrate amongst others.

A relevant cosmic reference of an event in the Vela region, most likely a supernova, has been identified within fourteenth century configured structures at Great Zimbabwe - further substantiated by certain artefacts, oral traditions and a recent meteor event that revitalized social ideologies of the Zimbabwe origins mythology.

These data relate to evidence of a similar period in suggested histories and archaeological data of southern hemisphere cultures in Australasia, South and Central America where the absence of historical records in these predominantly pre-literate societies implied the event may have not been visible in those regions.

Ice-core data reveal that nitrate peaking appears at depths corresponding to known supernovae with two different abundance spikes dated to be within the range of 1070 ± 10 AD and 1320 ± 20 AD.

There are insurmountable problems associated with absolute dating with the ethnographic records of non-literate cultures of the southern hemisphere which offer little of relevance or contribution to applied historical astronomy; however, the Maori traditions document a possible supernova dating to the period 1000 – 1770 AD and amongst the Great Zimbabwe cultural complex sequential exactness are present in a cosmogenic mythology and in arranged and stratified structural references.

Apart from the ice-core results, an historically unrecorded supernova remnant in the Vela Region - RX J0852.0-4622 (Vela Jr.) that has been detected by radio, x-rays, and the ^{44}Ti γ-ray line is the likeliest remnant in the region for the time period, which may have been portrayed as a pinpoint of light with concentric rings in the southern African rock art and other artefacts.

Oral traditions and indigenous knowledge of the Limpopo Province in South Africa suggest a meteor event that occurred in the area several decades ago. This relatively recent significant meteor event with associated features may have contributed to a revitalization of 13th century ancestral geomythology, also based on an astronomical event, and to an ideological transformation that augmented a vast socio-political belief system in sub-Saharan Africa.

Written records provided by an extraordinary event in Japan could be evidence that RX J0852.0-4622 was seen and eventually depicted as an object of Buddhist reverence since 1271 at the advent of a major climatic change

The body of the thesis is encapsulated in five chapters, each reflecting a separate paper, either already published (Chapter 5; Wade et al., 2014) or currently within the international journal review system (Chapter 1 to 6). For this reason, each chapter has a separate bibliography.

CHAPTER ONE

Southern African Trade Era Astronomical Knowledge Systems

Abstract

Archaeological and ethnographic records that afford cognizance of astronomical indigenous knowledge systems relate in part to present cognitive socio-cultural relationships in southern African context.

This proposed systematics attempts to identify and formulate structure of past and present cosmogenics determined by oral traditions and historical narrative together with / rather than literal documentation.

Analysis is made between geo-references and cosmic conceptual links of sub-Saharan star-lore, rain-making, rock-art, geomancy, ritual deaths and burning, folk-tales, myths, structural orientations, trade and celestial references. Inferences and conclusions provide a relationship between the sub-continental early trade, agriculture, metal-work and settlements that collated external and internal cosmology against climatic changes.

Keywords: Great Zimbabwe, Mapungubwe, Tshiendeulu, Cosmogenics, Agricultural Marker Stars, Rain-making, Star-lore.

1 INTRODUCTION

An attempt to determine and identify cosmic references within African indigenous astronomical knowledge systems encompasses challenges in defining astronomical aspects in sub-Saharan Africa.

In the prevailing literature very little exists regarding research into astronomical aspects in sub-Saharan Africa and specifically amongst the Bantu-speaking oral traditions, indigenous knowledge, pre-Bantu and other non-San sources of information and ethnography. The gaps that need further research provide insights pertinent to the objectives of this study (Snedegar 1999); (Holbrook 1998; 2009).

For Africa, in general, almost no astronomical indigenous knowledge systematics exists in the literature other than the recently uncovered exploration of theories and discoveries explained by mediaeval African Muslim scholars in the Arabic manuscripts of Timbuktu in West Africa. Despite this scholarship being largely untapped and unpublished these sources will be included and reviewed where possible;

> *As for the amount of "genuine 'African' contribution" that remains an open question. Even if sixteenth- and seventh-century Timbuktu scholars were not pursuing original astronomical research, it is now beyond doubt that they were conversant in fairly sophisticated mathematical astronomy. (The question of "original material" may also apply to much of the history of Mediaeval European astronomy.) The fact remains that very few people today are studying African cultural astronomy. There are several suggestive but unedited texts such as the Hausa Hisabi 'Assawwakai which could reveal much about the state of astronomical knowledge in West Africa* Snedegar (pers. comm., 20 June 2011) History of Astronomy Discussion Group [HASTRO-L@listserv.wvu.edu]

In respect of the vast archival material of the San ethnological data, and that it would prove superfluous research to the present rock-art programmes, attention is given to the relatively 'unsearched' areas of the Great Zimbabwe complex of cultures of southern Africa (Wade 2009); (Snedegar 1999; Bleek & Lloyd 1911; Bleek 1933).

Through an in-depth study of the astronomical knowledge from Africa by means of analyzing the oral traditions, archaeology, ethnography, rock-art and research into structures, new data can be revealed that these aspects do exist but need to be understood in terms of their relationship contexts as opposed to purely natural descriptions (Krupp 1978; Wade 2009).

Besides the UNESCO program to identify African astronomy (Wade 2009:35), since the 1990's the primary concern has been to identify astronomical aspects in the archaeological record in sub-Saharan Africa due to the hiatus that exists regarding indigenous astronomical knowledge (Snedegar 1999; Holbrook 1998; Lynch & Robbins 1983; Malville et al. 1998), and in this paper an intense literature review will be made of all known ethnographic, archaeological sources with various oral testimonies and interviews done where possible.

As typical representation of the earliest known Bantu period in southern Africa the culture area and study zone would be Great Zimbabwe and Mapungubwe, specifically surveyed for this purpose.

The location of the kind of material available to extract astronomical data from the archaeological record, is varied and unlimited, and outweighs the difference between the social and physical science divisions that exist in using the methodology of archaeoastronomy. Data in the Old World generally is site specific whereas in the New World it is supplemented by ethnographic and historic data. In this study the approach uses techniques from both categories (Wade 2009; Iwaniszewski 2003).

Preliminary surveys show the possible cosmic references that may be significant in this vast sub-Saharan source of astronomical knowledge, that may have as much potential as literal documentation evidence, as well as the preserved geoinformatics which can be extrapolated from the various reconstructions and plan drawings by Whitty in 1958, Swan in 1891, White in 1903, Hall in 1905, Schofield in 1926 and Summers in 1971. (Doyle & Frank 1997; Krupp 2010; Summers 1961; Summers Robinson & Whitty 1961; Lynch & Robbins 1983; 1978; Lynch 1978).

The data to date infers an observation that relevant cosmic references may be present together with evidence that certain structures may have had a stellar function such as within the structural/stratigraphical analysis of Great Zimbabwe's Great Enclosure. In a preliminary archaeoastronomical alignment analysis it proved statistically significant and further investigation revealed a comparative similarity with related structures of the same and later periods within the identified cultural complex. Astrophysical and ethnographic literature together with surveys and interviews will be the primary sources and the secondary sources

are from proceedings of seminars and conferences as well as academic treatises (Aveni 1993; Chaplin 1967; Dornan 1927; Doyle & Wilcox 1986; Frobenius 1923; 1931; 1938; Holbrook 1998; Krige & Krige 1965; McCosh 1979; Ruggles 1987; Snedegar 1995; Stayt 1968; von Sicard 1966; Wade 2009; Wade et al 2014; Swan 1897; 1896; 1892 a-g; 1893a-d; Lynch & Robbins 1983; 1978; Lynch 1978; Malville et al 1998).

The initial work done in this regard was submitted as an MSc thesis to establish the methodological systematics involved in identifying astronomical aspects in sub-Saharan Africa (Wade 2009). The subsequent doctoral thesis is a conclusion of the initial research treatise. In order to examine astronomical aspects it was imperative to establish the grounds by which to research this study area in order to formulate the postulates and documentation process, and that I intend providing techniques, definitions and explanations for data that has been collected, stored and analyzed.

Great Zimbabwe is the most extensive structure that holds immense postulate value within a wide cultural zone over many years, with extensions into the modern era and rich indigenous legacies, which holds high heuristic value and exemplifies a typification of past knowledge. The site has more resources than that which has been researched (Chirikure & Pikirayi 2008: 977).

Structures associated with astronomical knowledge in Africa are extremely rare and any contribution to understanding how astronomical aspects can be identified or even exist in Africa, will enhance the perspective of the rest of the world as well as the awareness for identification through indigenous scientific idioms.

To distinguish how African methods of perceiving space relate to expressive cosmological settlement and constructs is vital to a universal historiography.

Furthermore, the preliminary research has provided very early African astronomical structures found to date such as at Namoratunga, Nabta and Great Zimbabwe which have cosmic or celestial references which could prove of immense value to astronomy, geoinformatics and possibly environmental studies as they represent the only known hard evidence relating to non-literate temporal sources (Wade 2009; Wade et al 2014; Lynch & Robbins 1983; 1978; Lynch 1978; Malville et al 1998).

2 ASTRONOMICAL ASPECTS IN THE GREAT ZIMBABWE CULTURAL COMPLEX

There is a distinct possibility that the ruin called the Great Enclosure, radiocarbon dated to have been built between the 11th and 15th centuries, as well as the Hilltop Ruins (Huffman & Vogel 1991), may have been associated with alignments of planets, specific stars, constellations, solstices, and/or lunar sightings within the Zimbabwe Complex. Various ethnic groups, possibly descendant from the Zimbabwe Cultural Complex (Huffman 2011) - such as the people now referred to as the North Sotho, Venda, Shona, Lemba, Lovedu, Karanga and Tsonga-Shangaan - demonstrate a legacy of knowledge of certain stars as agricultural markers and calendars (Aveni 1993; Chaplin 1967; Dornan 1927; Doyle & Wilcox 1986; Frobenius 1923; 1931; 1938; Holbrook 1998; Krige & Krige 1965; McCosh 1979; Ruggles 1987; Snedegar 1995; Stayt 1968; von Sicard 1966; Wade 2009; Wade et al 2014; Swan 1897; 1896; 1892 a-g; 1893a-d; Lynch & Robbins 1983; 1978; Lynch 1978; Malville et al 1998).

2.1 Zodiac Bowl, Great Zimbabwe, Venda Bowls

A so-called ‘zodiac bowl’ discovered near Great Zimbabwe at the time of the earliest excavations (Bent 1893; Hall & Neal 1902) and possibly contemporaneous to the time of

Great Zimbabwe, was found close to the ruin and is marked with 'zodiac-looking' motifs or temporal notations; it may have been used, according to ethno-history for 'counting days'. Regarded as a divination bowl, the device was known amongst the Venda and Lemba to determine aspects of time (Caton-Thompson 1931; Sekerere & Mavinddize 1975; Stayt 1968): -

> *On the day of the new moon of July, you will arise and proceed southward. The VhaLemba will tell you when those days have come near. Fear nothing everything will go well. The important thing is Ngoma-lungundu, which will help you greatly…* (van Warmelo 1940: 8)

> *Another practice that surprises strangers is their way of shaving their heads. Every month they must shave their hair off completely. And so whenever they say, "Tomorrow is the new moon," the Venda would know that the new moon was about to appear by seeing the Valemba freshly shaven. The moon of the Vhalemba is seen in their wash basin. This shows that they know how to count. As for their wash basin, they filled this with water and they looked into it and saw the moon therein* (van Warmelo 1940: 67)

Figure 1 'Zodiac Bowl' (Bent, 1893: Frontispiece) note also the ndoro symbol at '11 o'clock' position (spiral is on '1 o'clock' position) on the 'Zodiac' bowl found at Great Zimbabwe

Figure 2 BaVenda Divination Bowl found by N. J. Van Warmelo amongst the VhaLemba. (Courtesy Dieter Giesekke). Now on loan to Cape Town Museum – IZIKO

Divination bowls found amongst the Venda/Lemba (Stayt, 1968) are known to have been filled with water and have a central cowry shell that is placed on a raised zone with mastic glue, this effectively 'calibrates' as it were, the orientation of the bowl in order to view new moon reflections through a year, with the submersed underlying carved figures providing the required durational comparison.

> *Stayt (1968: 291) has provided a detailed account of how the diviner used these bowls. Firstly, the mungoma (diviner) brings the bowl concealed in a skin from his hut. Before the consulter or client may look at it, his/her eyes must be treated with a white powder, otherwise he/she will turn blind. The powder, made from the droppings of the kingfisher found under water, is kept in a small horn container. When the eyes are treated, he uncovers the divining bowl* (Duffey 2012:178).

> *The Lembas had a certain powdered substance which they used to pour on to water and then enable them to observe the heavenly bodies. The knowledge of the heavenly bodies made the Lembas to divide the year into twelve months. They have the names of the different phases of the moon. Each phase of the moon lasted for about 10 days. They observed the stars and their positions in the sky. They could read the message of the stars and they could forecast the weather of the following day or month or year* (Mathivha 1992:53).

> *THE MOON'S REFLECTION*

> *One of the most interesting BaLemba customs used to be performed every month in connection with the new moon. At about the time that it was expected, a large black bowl was filled with water and put on the ground outside the hut of each headman, where the mid-day sun would shine directly on it. Just before noon on the day before the new moon became visible to the naked eye in the sky, it could be seen reflected in this bowl of water, following close behind the sun's reflection. The man who first saw this reflection told all his neighbours, and all shaved their heads and spent the rest of the day in fasting. The following day was a day of rest, all work of every kind being strictly tabu. I ascertained that this device was astronomically possible, but although I tried several times to discover the moon's reflection in this way, I was not successful. Unfortunately I was never near an old MuLemba at the time of a new moon.*

> *I was interested to discover later that the BaLemba are not the only South African tribe who anticipated the new moon in this way. There is a reference to a similar custom among the Basia in Ellenberger and MacGregor's book on the History of the Basuto: tradition tells of an ingenious method in use among the Basia, whereby the crescent could be detected in the sunlit firmament with the minimum of trouble to the observer. An earthen pot, made of glazed pottery, was filled with very clear limpid water, and as soon as the crescent appeared, it was reflected in the water even in the most glaring sunlight, and the first observer to discover the reflection in his pot ran to report to the chief, who announced the fact and summoned the feast by messengers. The successful astronomer was, according to custom, declared to be ruler of the feast, and was entrusted with the distribution of the refreshments* (Stayt 1931:232).

The carved figures and designs do not necessarily pertain to constellations or Western astrological/astronomical concepts and are regarded as likely to do with clans and social relationships within groupings of people; however there remains a relationship that originally pertains to an astrological/astronomical East African Trade Era coastal geomantic origin (Van Binsbergen 1996; 1996a; 2004; Davis 1955).

The interpretation and reconstruction of recovered gold foil fragments of the original gold burial M1 or A620 found in the 1930's in a grave on Mapungubwe Hill conclude that they formed part of an elaborately carved wooden divining bowl (Duffey 2012). Similarly, grave goods found with the burnt skeletal remains of burial M6 (field no. 11) pertain to a wooden bowl with metal fragments (Wade, 2009:108; Fouche, 1937:149; Duffey 2012:182).

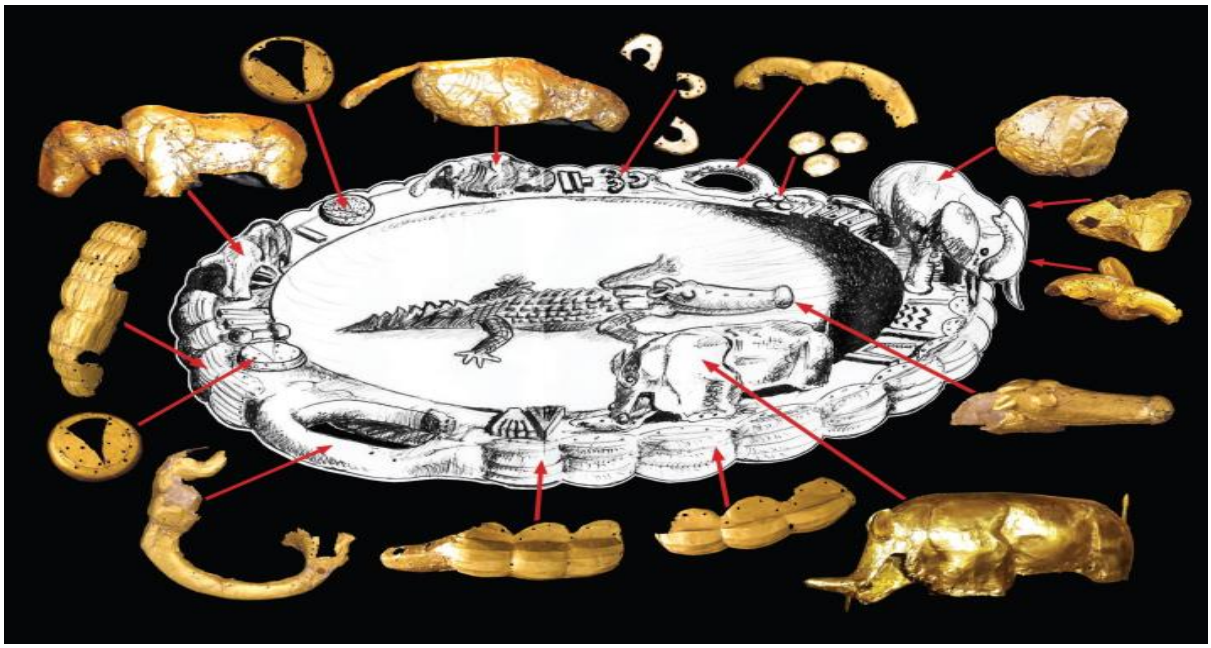


Figure 3 Reconstruction of Mapungubwe gold fragments (Duffey 2012:185). *Mapungubwe: Interpretation of the Gold Content of the Original Gold Burial M1, A620.*

2.2 Tshimedzi Moon – Lunar Conjunction of the Crux and Centaurus Asterism – 'Tuda'

'Tshimedzi' moon is an oral tradition that exists amongst this cultural complex. At a specific time of the year, the first stars visible at dusk are those of the known constellations of Tuda and Makhali, i.e. the prominent marker stars and constellations seem to be chosen from the stars first visible at twilight or sunrise. Amongst eastern and southern African people Tuda seemingly represents the cold/dry season, Makhali the warm/wet season and Tshilimela the

marker of the metamorphoses between the 'seasons.' The conjunction of The Pleiades as well as Tuda and the new moon is therefore a base to the calendar in most of these parts. The Tshimedzi full moon, in general, is an important festival time in most respects throughout eastern Africa. 'Tshimedzi moon' or the new moon's conjunction with this special arrangement of the 'Southern Cross' and its pointers, is the basis of the Shona-Lemba-Venda calendar and is only visible as a calendrical basis from regions in the latitude of Zimbabwe and more specifically from Great Zimbabwe. The new moon that occurs in the 'rain month' of Tshimedzi is the Tshimedzi moon (Stayt 1968: 225-229; Wade 2009:83).

The tradition stipulates that Tshimedzi moon is when,

> *nsadzi is not visible, and ndona is just visible over the horizon soon after sunset and is the first moon that appears when the two lower stars of the constellation Tuda are just below the horizon and the two upper stars just visible* (Stayt 1968: 225-229).

Which is a concept ritualistically passed down in tradition and yet is very difficult to prescribe in areas lower or higher in latitude than Great Zimbabwe and therefore may be the general place of origin for this practice. Nsadzi hardly reaches the horizon at the same time, when south of Great Zimbabwe and to the latitude north of Zimbabwe, nsadzi disappears too soon below the horizon. At Great Zimbabwe nsadzi sets as two stars exactly at the same time on the horizon (Wade 2009:83).

Figure 4 Tshimedzi Moon as seen from Great Zimbabwe occurring 6th October 2013 19h27 but is seen 8 Oct as Venus - Moon conjunction. The moon that appears when the two lower stars of the constellation Tuda are just below the horizon and the two upper stars just visible is the Tshimedzi moon. On this night the rain is said to begin. (Starry Night Pro – Simulation Curriculum version 6.4.3pe EW 1997-2009).

This conjunction of a new moon provides a setting asterism that coincides with the rising asterism of Makhali, which is made up of the three similarly bright stars (Saiph, Alnilam and Bellatrix) of the constellation of Orion that appear on the horizon virtually within 40 minutes.

The opposing asterisms of Tuda (giraffe) and Makhali (rhinoceros) therefore may correspond with the Anwã astronomical concept that was prevalent in pre-Islamic Arabia and still prevailing in Ethiopia (Varisco 1987; Wade 2009:84).

The rainmaking ceremonies performed by rainmakers at the breaking of the drought may also link the descendants of the builders of Great Zimbabwe with the pre-Islamic practice of the anwã system, where the weather is predicted or foretold by counting and naming certain

stars and providing use of the stars as markers to determine seasons, winds and rain or the correct time for planting (Wade 2009:84).

The concept of naw' (plural anwã) represents potential times of rain linked with the risings and a naw' is generally defined as the dawn setting of a star or asterism in the west at the same time as an opposite star rises with the sun in the east as well as with winds and temperature (Varisco 1987; 1989; Wade 2009:85). Terrace farming has existed throughout southern eastern Africa for centuries and is still practiced from Yemen/Ethiopia to South Africa since Trade Network times.

Amongst the terrace cultivators of southern Highlanders of Yemen, the verb to plough - 'talama', associated with one of the earliest references in the tenth century literature with the growing of sorghum (dhurah) by al-Hamdani (al Hasan 1884 -1891), is the root word used in the Yemenite concept of 'agricultural marker stars' – 'ma'ãlim al-zirã'ah', with the emphasis being the root - 'lim' or 'lam':

> *In the Mediaeval Yemeni almanacs reference is made to a special planting period of sorghum called al-'ashr al-mukhtãrah (lit., the ten select days)....the correlation with the Gregorian calendar would be about April 4-14. This period was defined as the middle of a thirty day period which was considered optimum for planting sorghum after the spring rain* (Varisco 1985:61; Wade 2009:86) .

The use of agricultural marker stars (ma'ãlim al-zirã'ah) throughout Yemen involves the use of variations of the classical Arab science of using an astronomical reckoning system of lunar stations (manãzil al-qamar). The idea of substituting locally important stars or asterisms for the classic stations extends back at least to the Rasulid times, and probably to the tenth century. There are variations from region to region and era to era. Another system for planting sorghum amongst the terrace cultivators:

> *in al-Ahjur is a local shadow scheme. As the sun rises in the morning, the top of the plateau of Husn al-'Arus (located east of the valley) casts a shadow (ghawm) on the western side of the valley wall in al-Ahjur. This shadow appears to migrate as the sun moves along the ecliptic during the course of the year. By observing where the shadow falls at dawn, it is possible to construct a simple seasonal calendar. A landmark (ma'lam) is fixed to mark the time when sorghum should be planted* (Varisco 1985: 62-63; Wade 2009:86).
>
> *In the textual tradition two systems of the anwã' have survived.. . The most famous is that of the 28 anwã' equivalent to the lunar stations (manãzil al-qamar) of Arab astronomy and astrology. These 28 anwã' represent stars or asterisms along the zodiacal belt of the celestial sphere. Such an expanded zodiac is also related to the twelve zodiacal constellations, even though few of the anwã' are from the other star groups. ...this system has striking parallels with the lunar zodiac of 27 or 28 naksatras in Indian tradition. As a lunar zodiac, the moon is said to station in a different naw' or manzil each night of its sidereal revolution of 27 and one-third days. The fact that the first naw' is said to be Sharatayn reflects an obvious correlation to the Hellenistic model of the Zodiac starting at the spring equinox. As the noted astronomer al-Sufi (died 376/986) argued, the pre-Islamic Arabs did not use the solar zodiac and did not begin the year in spring. One must conclude with Wellhausen* that the concept of 28 lunar stations was borrowed from the Hindus and merged with elements of Arab star lore* (*Wellhausen, J. 1897. Reste Arabischen Heidentums. Berlin. Page 210, note 4.) (Varisco 1985: 60-62, 71 footnote 29).

The ‘Ndzalama’ rock (verb to plough = ‘talama’), usually chosen from nature or fashioned and found central to a Tsonga-Shangaan settlement, may be named after the shadow-rock used to indicate the ploughing or ‘talama’ period, i.e., the Ndzalama Sacred Rock of the Ndzalama Reserve at S23° 52.472' E30° 23.291'.

Other words like isi**Lim**ela (Pleiades - Zulu) and tshi**lim**ela (Pleiades - Venda) are associated with the pre-Islamic Yemenite word -ma‘ã**lim** al-zirã‘ah (agricultural marker stars) and are found in words like **Lem**ba (traders who traded ‘ploughs/hoes’) abe**Lim**i (farmers - Zulu) to **Lim**a (plough - Zulu) and **Lim**popo (one of the first river valleys to be characterized by ploughing) and the possible origin of the people described as **Lim**iin by Ibn Battuta in 1331 (Varisco 1987; 1989; Wade 2009:87):-

> *Their faces are scarred, like the Limiin at Janada. A merchant told me that Sofala is half a month’s march from Kilwa, and that between Sofala and Yufi in the country of the Limiin is a month’s march. Powdered gold is brought from Yufi to Sofala.* (Defrémery & Sanguinetti 1854: 31).

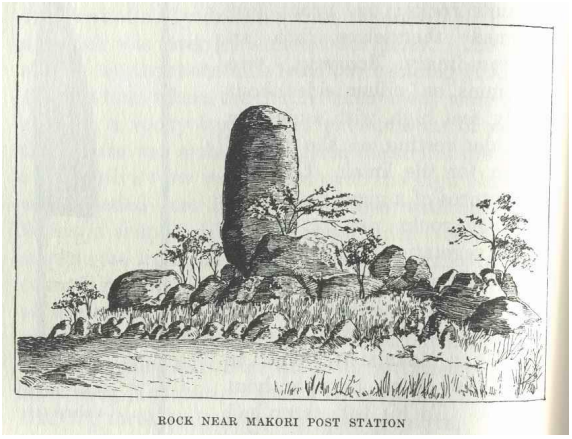


Figure 5 An ‘Ndzalama’ Rock found at Zimbabwe by JT Bent. In Bent, J.T. 1969. (Reprinted from 1896) The Ruined Cities of Mashonaland. Books of Rhodesia. Page 254.

The oral tradition and genetic character of the Lemba form a resilient argument that their astronomical knowledge was part of trader heritage. Specifically, the Mediaeval Islamic cosmogenic school circa the death of Nasīr al-Dīn Tūsī in 1274 C.E., believed to be the most advanced of the time and which was contemporaneous with the emergence of Great Zimbabwe and the demise of Mapungubwe (Ṭūsī 2005)

Tusi’s model for planetary movements (Ilkhanic Tables – Zij-i ilkhani) contains calculations on the value for the annual precession of the equinoxes and accurate astronomical tables for naming the stars and calculating the positions of the planets. (Boyle 1963; Kennedy 1956)

Very specific rituals exist that occur at the equinox and solstice which identify the rain period as beginning on Tshimedzi moon, some of these rituals involved a fire ceremony and were a tradition of charming rain by ritual sacrifice amongst the Shona-Lemba-Venda as well as Lovedu people, which required a procedure of ‘counting’ and ‘naming the stars’ Barbosa in (Freeman-Grenville 1962: 127-134; Frobenius 1923; 1931; Hall 1909; Hall & Neal 1902; Krige & Krige 1965).

From the following extract of a journal published by João dos Santos in Portugal in 1609:

Every year in the month of September, when the moon appears, Quiteve ascends a very high mountain situated near the city called Zimbaoe, in which he dwells, on the summit of which he performs grand obsequies for the kings, his predecessors, who are all buried there…When the king has feasted for eight days, he begins his lamentations for the dead…until the devil enters into one of the Kaffirs of the assembly, saying that he is the soul of the dead king, father of him who is engaged in these ceremonies, come to converse with his son… he begins to cough and speak like the dead king who he represents, in such a manner that it means the Kaffirs recognize that the soul of the dead king has come as they expected… Then all withdraw, leaving the king alone with the demoniac, with whom he converses amicably as if with his dead father, asking him if there will be war, and if he will triumph over his enemies, and if there will be famine or misfortunes in his kingdom, and everything else which he wishes to know (Theal 1898-1903 VII: 197).

Figure 6 Extensive Trade Era terrace cultivation ruin fields near Emgwenya (Waterval-Boven) area South Africa – Johan Heine (Makomati Foundation)

Rainmakers use a similar process to the anwã in that before rain can be foretold, the stars are counted and named according to a very secret incantation – known only to the Rain Queen.

Mathole Motshekga and Mulalo Nemavhandu, (Personal Communication, 18th January 2001) are descendants of the Vhatavhatsinde - Vhakwebho clan of rain-makers in the Venda and Modjadji areas of the Limpopo Province of South Africa. Motshekga also confirmed that monoliths are used to sight certain stars at the Rain Queen's residence in the Tzaneen area and that the astronomer-priests are called 'makuapasi'.

A seemingly magical use therefore, of using the stars as markers to determine seasons, winds and rain based on the astronomy practices shared since pre-Islamic times.

The Karanga term used to describe how the 'stars call the weather' is, rather coincidentally - 'chando chinod**anwa**' (von Sicard 1966; Wade 2009:88).

2.3 Mademba Ndiku-teme Conjunction

Oral traditions and star-lore amongst the Zimbabwe Cultural Complex descendants also share a brutal reverence for the rising Orion stars – Saiph, Alnilam and Bellatrix at a specific time of the year on the night of the first appearance of the Tshimedzi new moon and the Mademba Ndiku-teme asterism (also known as Makhali or Rhinoceros) conjunction with the new moon of Tshimedzi. It is also a perfect example of a naw' (Varisco 1987; Wade 2009:159).

The tradition to charm rain by ritual sacrifice amongst the Lovedu-Shona-Lemba-Venda people, possibly remnant of an earlier practice, is sometimes associated with drum and fire ceremonies which as mentioned, involves a procedure of 'counting' and 'naming the stars'.

The most celebrated heroine of the liberation of Zimbabwe is the rain-maker 'svikuro' (spirit-medium) Nehanda. In order to make the rain fall, a rain-queen is chosen to sacrifice a male victim - by placing the drugged or slain victim on a large fire and **"***the rain falls when the body bursts upon the pyre*.**"** (N.H.W., 1926; von Sicard, 1966; Wilson, 1931).

Also:

> *In his description of the Hungwe rain ceremonies, Leo Frobenius mentions that God is "here" called Ndemba and that the sacrifice, a black, hornless bull, is said to have the same name. In the case of a particularly severe drought the rain priestess Nehanda used to sacrifice to the Mbire rain priest Mavudze. Frobenius stresses the point that the day for the rain offering is determined by the observation of the stars. Then again, in a belletristic form, A. Wilson wrote in NADA, 1931, about the so-called "Darwin murder", the human rain sacrifice at Miti michena in the Tavara country in 1923. One of the main features recurring in her account is the naming and the counting of the stars. When the name of the "rain star" is called out by the priest (A. Wilson does not mention it), the victim is slain. It is improbable in view of the important role of the rain priestess Nehanda in the Tavara cult, that in our case the rain star was called Nehanda (Venus).*
>
> *It may rather have been Ndemba or Mademba, and "Mademba, ndiku-teme" may have been exclaimed by the priest at the moment of the victim's immolation, when he cut its throat…If this explanation of the name can be accepted, then Ndemba or Mademba would not be the name of God, but of the rain star, in spite of the fact that Frobenius (p. 148) mentions Ndemba as alternative for Mwari in a tale told among Makoni's Hungwe. Before arriving at a definite conclusion it would be necessary to ascertain whether the original name of Ndemba does not lead us close to something like a star cult.* (von Sicard, 1966:42-65).

It is also interesting to note that affidavits made by the colonial Rhodesian police concerning arrests made on rain-makers, made mention of the uncanny accuracy of the rain fall

occurring when the victims were sacrificed (Bruwer 1965; Hall 1909; N.H.W. 1926; von Sicard 1966; Wilson 1931).

This can only be attributed to a precision that the rain-makers had to perceive rain indicators as well as the use of a type of sidereal calendar. Ceremonies and rituals were arranged and planned months ahead as opposed to some sort of instant magical manufacture of rain.

2.4 Mapungubwe

A survey done at Mapungubwe revealed structures which were seen as being grain-bin platforms and which later showed in one case to be arranged according to the cardinal points and that had unfortunately been destroyed by the earlier archaeological excavations (Badat 2004; Muller 2004; Wade 2009:94; Fouche 1937; Wade & Broodryk 2011).

A prospector, Richard Rorke, however helped reconstruct a unique structure marking the grave of the 'king' of Mapungubwe in his affidavit of 1928 (Wade 2009:97-111) (Mapungubwe Archive – University of Pretoria UP/AGL/D/68, 51, 52 and 53) -

> *Rorke, (cf. affidavit) who was on site in August '28, notes positively that he found, - on wall side near - depression a circle of 4 upright stones (in inclined position) (monoliths) above 2 to 3 ft high (a fifth lying flat), black, very shiny (polished looking), one with chip out, square shaped [sketches indicate how they are arranged and shows a chip in one monolith] of these found he pulled one out, loosening it with his prospecting hammer. Too heavy, - he left it lying. – Thus 3 still standing – did not dig, - nor did Lottering – Could account for 3' hole we found. Suggests Frobenius.*

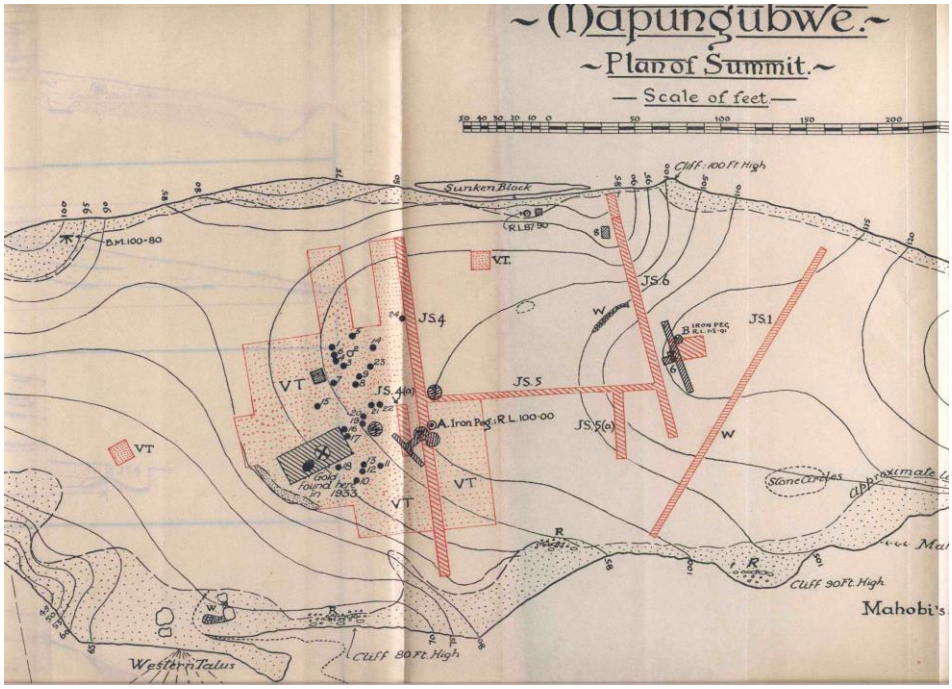


Figure 7 Plan of Mapungubwe Hill showing earliest excavations (Fouche 1937) (Wade 2009:99)

In Volume I of Mapungubwe by Leo Fouché evidence of the extent of a variety of circles – termed 'foundations for grain-bins' are found in the following references: -

> *Fortunately, also, the Transvaal discovery was a sealed site. Besides Lotrie and the van Graans, only two other parties of Europeans are known to have reached the summit of Mapungubwe in recent times. Some prospectors climbed the hill in May 1929, and although they removed some valuable pottery, they did no digging or other damage*[4] [4][according to an affidavit by Mr. R.G. Rorke, a member of the party.] *We found only one sign of recent disturbance on the hill: a stone circle (one of many that appear to have served as foundations for grain-bins) had been excavated to a depth of 4 ft. This may have been the work of Frobenius, who was in the neighbourhood in 1929 and is said to have been on Mapungubwe as well* (Fouche 1937:4).
>
> *Apart from the ornaments recovered (mainly copper bangles, gold plate and tacks and beads of gold, glass and ostrich egg-shell) many flagged-stone and "cemented" platforms, hearths and retaining walls were revealed in the excavations undertaken* (Fouche 1937:5).
>
> *The air photographs revealed…. On the summit, too, terrace walling, hut and grain-bin foundations were clearly shown, where our surface explorations had failed to find them* (Fouche 1937:8).
>
> *When cutting through the surface soil two stone circles came to light, one of which was visible beforehand, while the other was just below the surface. In one of these a small crude pot was found. It was necessary to remove one circle but the other was left intact (pl. vii, 2)* (Fouche 1937:13).

These circular structures appear to have been many and varied, and in some cases may have been grain-bin foundations and supports for milling stones and lower grinders, but may have had cardinal or possible stellar orientations that have been lost to overzealous excavations.

The concept of cremation or human sacrifice may be inferred from another circular stone structure (Fouche 1937:149) with one recorded to have funerary jewelry remains related to the ritual human burials associated with an extensive hearth.

The circle of stone monoliths had two cardinally aligned perpendicular lines of monoliths crossing one another within the circle of monoliths.

The straight lines of stones crossing each other within the circle of monoliths would appear to have aligned precisely east-west and north-south and:-

> *a compass direction is given alongside which when extrapolated for magnetic declination would give an angle of 17˚ from the north-south line of stones. Implying that the east-west line of stones may have aligned with the rising and setting sun of the vernal equinox when they were placed in their positions – Tshimedzi Moon?. There is also a pot found in the midst of the circle* (Fouche 1937:149); (Wade 2009:110).
>
> *This arrangement of stones, pot and the associated charcoal with bones, bangles and beads may be a record of a Mademba-Ndikuteme type rainmaking ceremony. Burnt human fragments are to be expected in association and the skeletal remains at burial M_6 are further evidence to this type of ritualistic human sacrifice or cremation similar to burial methods found at Tshiendeulu.*(Fouche 1937:149); (Wade 2009:110) (Mapungubwe Archive – University of Pretoria UP/AGL/D/68, 51, 52 and 53).

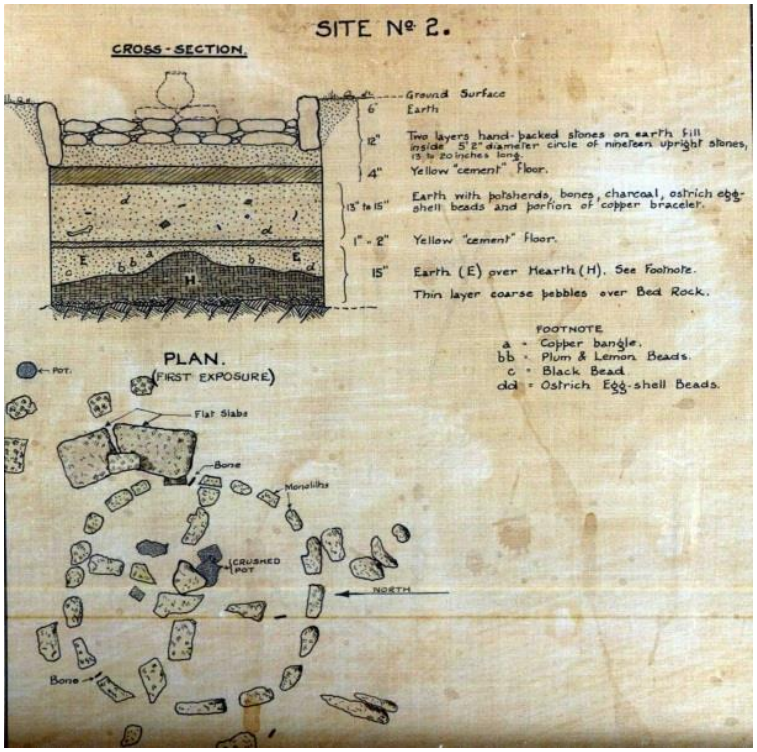


Figure 8 Detail of Site 2 in Plan of excavations titled – Mapungubwe Contoured Plan of Summit by Prof C van Riet Lowe, with details of excavations of sites 1, 2, 4, 5, 6 and 7. First record of excavations signed by the archaeologist Van Riet Lowe May, December 1933, held at the office in Mapungubwe Archives at the University of Pretoria. (Wade 2009:111)

The Vernal equinox falls close to Tshimedzi Moon and the oral traditions and literature provide sufficient suggestion to speculate that a ritual involving fire, sacrifice and invocation for rain would in all likelihood take place at the vernal equinox as opposed to the autumnal equinox.

2.5 Concealed Structure or Possible Burial?

During a survey for possible cosmically referenced structures on the hill of Mapungubwe World Heritage Site (September 2004 and October 2009), based on a cognitive model proposed by (Huffman 2001), the idea that east is related to birth and west to death developed into a search for the opposing or binary opposition of the so-called king's grave in the eastern section of the hill.

Mapungubwe Hill is a world renowned burial site known for the gold artefacts retrieved from some of the graves on the summit of the hill (Schoonraad 1969). The site has been thoroughly investigated since 1930 by various archaeologists and professionals and described in the scientific literature ever since (Fouche 1937).

Awareness to the site appears to have been initiated by a certain Barend Lottering who escorted a group of prospectors to the site in 1928 or 1929. Richard Glen Rorke of Pretoria, Baron von Leesen, A. Parpendorf, and some "natives" were led to the Hill whilst prospecting for metals in the area. They were taken up to the summit where a structure was shown to the party, by 'one of the natives' as being a 'Chief's grave'. This 'grave' was marked as a circular arrangement of shiny, polished-looking, black square-shaped monoliths.

Various affidavits and reports were drawn up at the time by the earliest 'archaeologists' at Mapungubwe to accurately reconstruct the series of disturbances to the area, during the time of desecration of the main grave on the hilltop, below is the affidavit of Richard Glen Rorke signed on the 2 March 1933 at the law firm Adams & Adams of Pretoria :-

> *….Lottering had previously lived with his father on the southern portion of the farm Greefswald and knew about this hill and that it was the burial place of the natives. He took us to the hill and we had to hunt about to find the narrow gulley which afforded, apparently, the only access to the top of the hill…..*
>
> *On the top we found what one of the natives called "the chief's grave". It had four or five stones of about 2ft 6" to 3ft. in length or even longer, which were square stones in shape and possibly polished, the sides of the stones were about 4" x 2-3" thick. I pulled out one of these stones which was buried horizontally in the ground, which was showing about 2 feet out of the ground and about one foot 6"was still buried in the ground. I lifted the stone out and left it there. The other stones were also standing about 2 feet 6"out of the ground. This grave was not disturbed any further by us…..*
>
> *At first the natives would not go with us up the hill but later on one boy, named Franz, who lives about four miles from the farm of Gert Heyendrich, which is west of Greefswald, accompanied us. This boy Franz can speak Dutch. Franz lived about four miles between the farm Samaria and Heyendrich, on the farm "Little Muck". Franz knew all about this farm and says that none of the natives will go up that hill because it is bewitched. Franz was the only one out of six natives we had who would go up with us…..*
>
> *We did not come across any caves during our exploring on Greefswald*. (University of Pretoria - Mapungubwe Archives under pages titled "UP/AGL/D/68" together with "UP/AGL/D/51 UP/AGL/D/52 and UP/AGL/D/53").

The stones that may have once dressed the 'Chief's grave' on Mapungubwe Hill are now lost completely. There may have been others that were removed by Leo Frobenius or by the later desecrators of one of the most sacred burial sites in South Africa. This is truly unfortunate if we take the Rorke affidavit as valid. The same would apply to the many stone circles "*that appear to have served as foundations for grain-bins*", as nothing remains. The most intriguing aspect of these destroyed artefacts is that some may have had cosmic references and probably had no relationship with grain bins (Wade 2007 Jan/Feb; Andrews 2007 March/April).

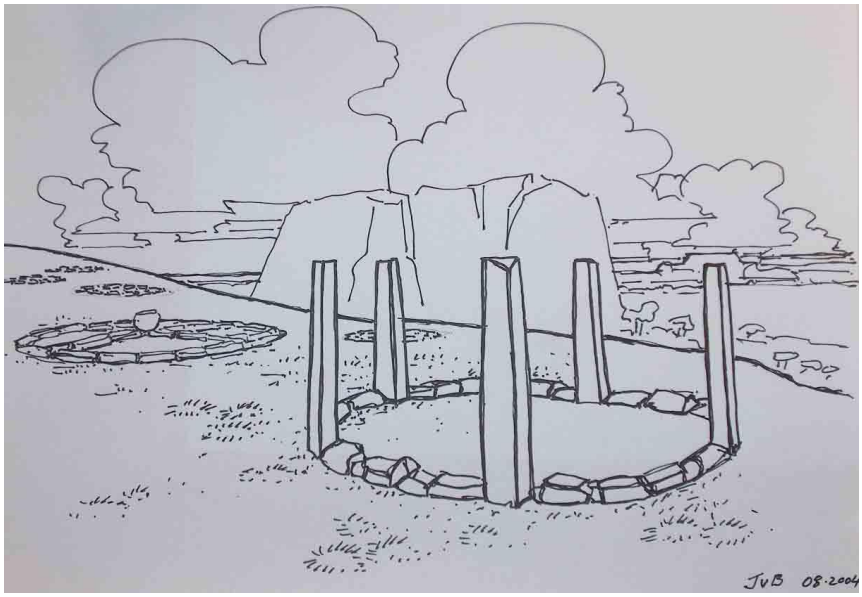


Figure 9 'Stonehenge' of Mapungubwe. Reconstruction of arrangement of 'polished-looking' monoliths over the 'Chief's Grave' - that appear to have been fashioned from crystalline dolerite (columnar-jointed basalt) found at a nearby igneous dyke intrusion – by Jan Willem van Bergen and Richard Wade August 2004. (Wade 2009:107; Wade & Broodryk 2011)

This burial together with several others eventually formed part of the human remains that were recently repatriated on the Mapungubwe Hilltop in a set of cleansing ceremonies and rituals. The actual reports and archaeological research that documented these remains form part of the historiography of scientific exactitudes of the time. Restoration of the gold items and pottery through the years have revealed a rich unknown heritage of a cultural past in southern Africa and although desecration of the sacred human remains took place, scientific endeavour has endured (Steyn 2007; Keough, Nienaber & Steyn 2008; Ralushai 2002; 2003).

At Mapungubwe Hill possible cosmic referenced structures may still be found in the scant remaining stratified sediments but the only evidence of the many that have been destroyed on the premise that these were grain bin foundations, can be found in the Mapungubwe Archives at the University of Pretoria. I refer distinctively to the stone circle of Van Riet Lowe's site no 2 (Wade 2009:109).

It is possible that human sacrifice/cremation may have taken place on the hill of Mapungubwe and that the skeleton M_6 indicates that the remains were interred in a rudimentary grave that went down to bedrock. A likely place of burning is that which is found in the record of excavations signed by the archaeologist Van Riet Lowe May, December 1933, held at the office in Mapungubwe Archives at the University of Pretoria.

In particular I draw attention here to skeleton M_6 that was unfortunately lost after the laboratory work was done and so the only evidence lies in Leo Fouche's report:

> *The remains of this skeleton, which have only recently been handed over to us, are so fragmentary that neither reconstruction nor description could serve any purpose. It is important to note, however, the mode of burial. The skeleton was found lying on bed rock in a very charred condition. Professor Mackintosh, Professor of Forensic Medicine at this University and government*

> *Pathologist, reports that the bones had been burned while the flesh was still on them. They had been subjected to a strong heat over a fairly long period. The charring cannot be due to adventitious burning such as the burning down of a hut, but to deliberate firing. Further, associated with these remains are charcoal fragments of a wooden vessel. The rim is beveled from both faces and seems to have been undercut. Other fragments of the vessel show remains of an incised pattern. There are also evidences of iron ornaments*." (Fouche, 1937:149); (Wade 2009: 109).

At Mapungubwe Archives, references of primary sources were consulted and from a document under the authorship of B.Malan - ID no 1323, code UP/AGL/D/806/1, I noted that the specific skeleton with an original field number 11 later designated M6 was later given a Department number A627 and associated with photograph (No.6). The skeleton was sent for analysis and has since been lost.

The use of having a place for drying out bodies and then cremating the remains like in Tshiendeulu may have been practiced at Mapungubwe and the burnt remains such as the human remains of M_6 could be testimony to this.

At Mapungubwe I searched for such an area based on what I saw at Tshiendeulu and within a concealed rock shelter I located a possible structure in the shelter.

The structure has a large upright orthostat in the centre and it is raised with a circle of stones to make a covering roughly 1m deep. It is located on the easternmost tip of the sacred Mapungubwe hill with the entrance to a shelter made by a huge fallen slab facing north. There is midden material that was brought in and mixed with material from the subsurface to form a fill.

One of the descendants of the Van Graan family recently mentioned that E.S.J. van Graan found a shelter which he exposed by breaking the concealment daga entrance. In this shelter he found upright sitting human remains that appeared to have leopard skins that rapidly disintegrated after he entered. He removed some gold bracelets and a large cricket-ball sized transparent crystal stone that was on the head of one of the upright skeletons.

E.S.J van Graan was the man who opened the grave on the summit and then later reported it. He took 5 years to find it after hearing the tales of an old man. The structure in the tomb-like shelter may provide credence to the legend and it's interesting to note that years after he listened to the mysterious tales told by the hundred year old man in Alldays, concerning Mapungubwe Hill, that E.S.J. van Graan should reiterate so vividly that:

> *Volgens hom sou die witmense wel die Kop ontdek maar die geheimsinnige weg na die kruin sou hulle nooit bestyg nie, en al sou hulle die kruin bereik, sou hulle wel van die goud kry maar baie min. Die egte begraafplaas van die konings met al die skatte sou hul nooit vind nie. Ek beweer dus nog dat die relaas van hierdie ou skepsel eg is, en dat ons nog nie die skatte van Mapungubwe gevind het nie. (Die Universiteit van Pretoria wil dit egter nie glo nie.) Dit moet by die kop wees of in die nabye omgewing...*. (Schoonraad, 1968).
>
> [*According to him the white people will likely discover the hill but not the secret way to the summit, and even if they did, they would get very little of the gold. The real burial grounds of all the kings with all their treasures will never be found. I believe he was telling the truth, and that we have never found the treasures of Mapungubwe. (The University of Pretoria does not believe this.) It must be at the hill or nearby in the vicinity*…]

Figure 10 Structure in a rock shelter at Mapungubwe with central vertical orthostat. Stones are arranged around approximate 1metre deep sediment of mixed seemingly excavated material and rearranged as a mound supported by rudimentary stone walling 2m x 3m in extent. (Photograph by Richard Wade and Nadine Lida Broodryk Tuesday 6 October 2009)

2.6 Tshiendeulu

In comparison, the burial method found to exist amongst the grave keeper community at Tshiendeulu and Thula Mela seems to be relevant.

At Thula Mela it would appear that reinterment was practiced (Steyn 2007) as at Mapungubwe and Tshiendeulu where Samson Netshiendeulu and the Makhadzi of Tshiendeulu (Chieftain), showed us the sacred areas of Tshiendeulu through special permission by the elders, council and (king) Kgoshi Tony Mphephu Ramabulana (Wade 2009:88).

The first known ancestor of the clan of Netshiendeulu was Mbwapenga who was a contemporary of Dambanyika, the first Venda chief who settled south of the Phembe (Vhembe/Limpopo). Mbwapenga was a VhaNgona who was the first group that settled in the new country. On the southern slopes of Lwandali Mountain (now known as Tshiendeulu) he built his first village. When the mountain in effect became the ‘grave’ of Dambanyika, the

keepers of the grave changed their names to Netshiendeulu (Tshiendeulu = place of graves) (Wade 2009: 88; Van Heerden 1959).

See Figures 11 to 19.

Figure 11 Tshiendeulu Valley of the grave-keepers of Tshiendeulu earliest settlement, the shrine, the Tshiswavhathu (Crematorium) and Mudzimungale.

Figure 12 Tshiendeulu Hill-top settlement.

Figure 13 Tshiendeulu Hill-top settlement. Dambanyika Burial Place in collapsed Shelter (left of centre) and Cave of Ngoma Lungundu (right of centre).

Figure 14 Tshiendeulu Hill-top settlement with structures and walling visible (centre).

Figure 15 Tshiendeulu Hill-top settlement with structures and walling visible (centre). Detail marked in black.

Figure 16 Tshiendeulu Hill-top settlement with structures and walling visible (centre). Detail marked.

Figure 17 Tshiendeulu Hill-top settlement viewed from the Shrine Area. Dambanyika Burial Place to right of centre at outcrop of rock on cliffs (Photograph by Richard Wade).

Figure 18 Tshiendeulu Hill-top settlement. Structures and Walling visible ranging up to 2m in thickness. (Photograph by Richard Wade).

Figure 19 Wall surrounding Shrine Structure at Tshiendeulu. (Photograph by Richard Wade).

We were allowed to see the lost city of Mbwapenga, Mudzimungale, the grave of Dambanyika, the sacred cave of Ngoma-Lungundu as well as the shrine of Tshipise. The original settlement of Dambanyika was abandoned when Dambanyika was fatally trapped in the mountain in a rock fall.

The original settlement is extensive and untouched and extremely sacred, measuring roughly 1km^2. Only one keeper is allowed access to the ruins and through the years all eleven keepers have seemingly reached over the age of eighty years as each one has left a spear in the cave of Ngoma-Lungundu. Samson's son Eric is the next keeper.

There is a special area designated for burying corpses of the dead, sometimes for as much as twenty years but generally ten years. It is called the Tshiswavhathu (Crematorium). Thereafter the bodies are exhumed and placed on a platform in a specially built ceremonial hut in a river course. The river is dammed up and then after the hut and remains are burnt, the dam is broken and the remains wash downstream. Persons of very high status are buried in special concealed graves – preferably in shelters and caves. A special monolith is placed in the centre of the mound to denote status and gender.

A possible similar cognitive cosmological principle of spatial organization is found at Mapungubwe and Tshiendeulu that invokes speculation of a royal burial in the eastern aspect of the main hilltop settlement and a Svikuro with divination bowl burial in the western aspect.

Samson Netshiendeulu (Moshaisana Nyabela /Navhera) the present consort to the Makhadzi of Tshiendeulu (Chieftain) – Tshinateho Nkonene Netshiendeulu revealed that Dambanyika (Legendary royal ancestor king) is buried in a cave that collapsed on the hilltop's eastern side nearest the shelter that holds the sacred drum of Ngoma Lungundu. Samson Netshiendeulu (Moshaisana Nyabela /Navhera) further revealed that they make use of a 'wizard's bowl' (Ndilo ya Lupangwa) and that the first Svikuro and rainmaker of Tshiendeulu and consort to Dambanyika was buried with a wizard's bowl made of gold in the western aspect of the hilltop.

In comparison, the naming of zones surrounding Tshiendeulu at Dzata ruins are identical to those in Njelele sacred area of the Zambezi River Valley, and also known as Njelele. Similarly Machema ruins 20km south of Mapungubwe has a conical tower reminiscent of the conical tower at the Great Enclosure of Great Zimbabwe.

3 DISCUSSION

Stars are mainly used as agricultural temporal markers, to 'predict' weather, signify ritual times and provide omens and ancestral endorsements to the living. Settlement patterns are dependent on the solar and lunar movement through the ecliptic and records are common to all through narratives, songs and practices.

The Kgatla people note that if the moon sets where Venus and the sun sets then a drought is imminent. Amongst the Limpopo Province population's, droughts or excessive rainfall are associated with the setting locality of Jupiter. Rain can be affected by erecting monoliths.

The main indicator of a new year is the conjunction of the new moon when 'Tuda' (giraffe) forms a large 'L' on the western horizon. The rain fall month 'Tshimedzi' commences strangely coincidentally with the first showers as soon as this occurs. The main rainfall rituals (such as the Mademba-Ndikuteme sacrifice) are enacted when 'Makhali' (rhinoceros) rises in the east on the same evening as the Tuda conjunction. The month preceding Tshimedzi month is characterized by an increase in ritual or muti murders throughout eastern and southern Africa. If Venus forms a conjunction with the crescent moon then ritual regicide is practiced and becomes a noteworthy time of change for the weather to change into a dry or wet period till the same conjunction occurs again roughly seven or eight years later at the same time with the same stellar arrangements.

Fertility rituals and specialized festivities such as the 'domba' practice occur when Venus appears for the first time from behind the sun and becomes an 'evening star'. This happens at the time of Tshimedzi moon conjunction with Tuda in the month of September/October closest to the evening preceding the vernal equinox. The mambo or king selects future wives from those that provide children when Venus changes to a 'morning star' usually after a short disappearance of eight days.

The relevance of the intricate small conical tower's alignment with the vernal equinox sunrise from the viewpoint of the platform area in the Great Enclosure at Great Zimbabwe may signify the origin, since the time of its inception, of this practice. A monolith in the main wall from the same viewpoint also marks the vernal equinox sunrise. Venus rises at the same viewpoint shortly before the sunrise.

No significant astronomical observations were made in the preliminary phase of research from the same point of reference regarding the large Conical Tower other than 'Tuda' or Crux and Vela 'alignments'. The central star of Orion Alnilam or Makhali (Rhinoceros) however, rises directly in line with the small Conical Tower and the monolith on the wall marking Venus and the vernal equinox sunrise. Tuda and Makhali are the only known 'constellations'.

Secrecy and taboo hide the formulations to 'count' and 'name' celestial events and specialized 'rain-makers', diviners, spirit mediums and elders enact ritualizations necessary in daily living. Three monolith markers used to line up the rising stars of Makhali (Rhinoceros) at the forbidden zone of residence to the Queen Modjadji dynasty (rainmaker queen) were not found but were mentioned as being in existence by the elders. They instead depend on sprouting shoots of a sacred tree that signifies their ritual time.

Archaeological artefacts denoting astronomical aspects are rare and no cosmogenic traditions seemed to have prevailed. During initiation times certain hidden knowledge is imparted to the initiates but specialization then becomes sacred. Venus changeover from a 'morning star' to an 'evening star' is characterized by a period of disappearance for roughly fifty days and initiations mainly begin and end when Venus disappears and emerges again as an 'evening star. Initiations occur roughly every two years in any region but appear to rather have occurred every four years in the past, using a special conjunction with the moon to identify this period. Venus makes the same arrangement in a specific section of the sky and with the same constellations at the same time every forty years. But every eight years (known as a Venus year) the constellation background will differ five times till the cycle is repeated exactly, including the lunar phase. The atomic clock replaced Venus a few decades ago as time keeper.

From the viewpoint of the Platform Area, the small Conical Tower and monolith on the wall at Great Zimbabwe reveal a rudimentary solar, lunar and sidereal calendar. Venus is seen to appear and disappear in its synodic cycle from the same location. The two monoliths immediately either side coincidentally mark Saiph and Bellatrix of Orion. These three stars Saiph, Alnilam and Bellatrix are commonly referred to as the Three Sisters or Three Kings. They are known otherwise as Makhali (Rhinoceros) or Nguruve (Wild pigs). The Queen Modjadji bush pig totem is one of the three 'wild pigs' or nguruve (rhinoceros, bush pig, warthog).

More detail is discussed in a separate chapter concerning the equinoctial and planetary markers or cosmic references found at Great Zimbabwe. Including the Dhlo-dhlo stone which may be an example of an attempt to codify the Venus synodic period and even possibly to predict eclipses as can be inferred from the crescent and circle ciphers. (Hall & Neal 1902; Wade 2009: 80; Clark and Carrington 2002)

A survey made at Great Zimbabwe infers a pre-outer walling phase that used a platform as observation point and a small conical tower to mark the equinoxes. A later outer wall then blocked observation of the horizon from the platform. Stelae placed in the outer wall replaced the celestial positions on the horizon of planetary movements and the sun. A large conical tower exceeds the height of the outer wall and provides one more cosmic reference.

4 CONCLUSION

The evidence of external astronomical knowledge is limited. The introduction of sorghum and the method of terrace farming together with etymology may point to the introduction of

the anwã system into the sub-continent. Evidence of trade between the mediaeval Arabic and Middle East is found amongst other aspects of the use of divination bowls.

The practice of divination bowls for astronomy and the 'diffusion' of the geomancy (van Binsbergen, 1996) and the elaborate golden bowl found at Mapungubwe and the bowls found at Great Zimbabwe as well as the many divination bowls described in the ethnography form a persistent link of evidence of trader astronomical exchange (Duffey 2012; Mathivha 1992; Caton-Thompson 1931; Bent 1969; Stayt 1968; Hall & Neal 1902)

Introduction of the concept of Tshimedzi Moon as the main timing reckoning for the rain and therefore the advent of the year, fertility of the land and procreation is prevalent mainly since Great Zimbabwe and Mapungubwe. A concept that seems to coincide with the introduction of sorghum as a staple and the method of terrace farming in mist belt zones.

These were aspects of the pre-Islamic astronomical knowledge of Middle East. Trade likewise increased the yield of goods to the north through Yemenite ports, the Wadi Hadhramaut and eventually Nabatean gateways, and to the north-east via Ubar to the rim countries of the Gulf of Persia.

The advent of the rain is characterized by ritualization at the time of the substitution of agricultural markers stars in southern Africa since probably the 10th century through the conjunction of the new moon and Tuda asterism – Tshimedzi Moon. Originating at a time of formative Bantu-formation period with nucleation at Mapungubwe, Great Zimbabwe that involves gold, sorghum and an exchange of cosmogenics.

Ritual deaths and burning still prevail in some parts prior and at the time of the first rains mainly in the regions associated with the concept of a bowl that reveals the heavens and movements of the sun and moon as a trans-ancestral vestibule which manifests sacred social binding.

These possible similarities of cognitive cosmological principles of spatial organization relate to the cosmogenic world-view of sacred zones known for their astronomical practices and oral traditions.

The undisturbed status of Tshiendeulu makes the research of that area unique. The possible unidentified burial in a concealed shelter at Mapungubwe may have been severely compromised by the use of the shelter as a cache for arms during South African Defence Force military jurisdiction; however, the remaining wall and orthostat have never been described or examined.

The earliest structures at Mudzimungale (Wade 2009: 89), Tshiendeulu, Machema need to be cosmogenically surveyed and likewise, the vast terrace farmed zones that may relate to the Nguni formative period epitomised by walled settlements at Emgwenya (Waterval-Boven) areas. This includes the oral traditions and practices of the descendant populations.

5 REFERENCES

Andrews, J. 2007 March/April. Mapungubwe Outcry! Discussion Forum. In the Voyage of the Planet. Issue #3. Pages 38-42. JCA Archaeological Foundation for Research JCA Management Services. South Africa. ISSN 1991-5039

Aveni, A. 1993. 'Africa's Socialized Astronomy', in Ancient Astronomers, Montreal: St. Remy Press

Badat, Noor-Jehan Yoro. 25 September, 2004. The real Lost City is back on the map. The Star Newspaper (South Africa). http://www.thestar.co.za The real Lost City is back on the map

Bent, T. Ruined Cities of Mashonaland. London. 1893. (Rhodesiana Reprint Library. Volume Five facsimile reproduction of the third edition).. Books of Rhodesia, Bulawayo.1969

Bleek, D. 1933. Belief and customs of the /Xam Bushmen. From material collected by Dr. W.H.I. Bleek and Miss L.C. Lloyd between 1870 and 1880. Edited by D.F.Bleek. Rain. Bantu Studies VIII: 297-312.

Bleek, W.H. & Lloyd, L.C. 1911. Specimens of Bushman Folklore. London: G. Allen.

Boyle, J. A. 1963. The Longer Introduction to the Zij-i Ilkhani of Nasir ad-Din Tusi , Journal of Semitic Studies (1963) 8(2), pp.244-254

Caton-Thompson, G. 1931. The Zimbabwe Culture: Ruins and Reactions. Oxford: Clarendon Press.

Chaplin, J.H. 1967. Vernacular month names from Zambia. African Studies 26: Issue 3, pages 145 – 169.

Chirikure, Shadreck & Pikirayi, Innocent. 2008. Inside and Outside the Dry Stone Walls: revisiting the material culture of Great Zimbabwe. Antiquity 82 (2008): 976-993.

Clark, Stuart and Carrington, Damian. 12:53 04 December 2002. Eclipse Brings Claim of Medieval African Observatory. © Copyright Reed Business Information Ltd.
NewScientist.com. http://www.newscientist.com/news/print.jsp?id=ns99993137.

Davis, S. 1955. Divining Bowls: Their Uses and Origin: Some African Examples, and Parallels from the Ancient World. Man – Royal Anthropological Institute of Great Britain and Ireland. Vol. 55, (Sep., 1955), pp. 132 – 135.

Defrémery, C and Sanguinetti, B.R. 1854. Les Voyages d'Ibn Batoutah. Vol II. Paris. Pp 179 – 96 in Freeman-Grenville, G.P.S. 1962 Select Documents From The First To The Earlier Nineteenth Century by Clarendon Press. Oxford.

Dornan, S.S. 1927-29. Rainmaking in South Africa. Bantu Studies III: 185-195.

Doyle, L.R. & Wilcox, T.J. 1986. Statistical Analysis of Namoratunga: An Archaeoastronomical Site in Sub-Saharan Africa? Azania 21: 125-129.

Doyle, L., Frank, E. 1997. "Astronomy in Africa". Encyclopedia of the History of Science, Technology, and Medicine in Non-Western Cultures, Helaine Selin, Dordrecht: Kluwer

Duffey, A. 2012. Mapungubwe: Interpretation of the Gold Content of the Original Gold Burial M1, A620. Journal of African Archaeology, Volume 10 (2), 2012, pages 175-187, DOI 10.3213/2191-5784-10223. p 178

Fouche, Leo. 1937. Mapungubwe: Ancient Bantu Civilization on the Limpopo. Reports on Excavations at Mapungubwe from February 1933 to June 1935, edited on behalf of the Archaeological Committee of University of Pretoria by Leo Fouche. London Cambridge University Press. 1937. Page 149.

Freeman-Grenville, G.P.S. 1962 Select Documents From The First To The Earlier Nineteenth Century by Clarendon Press. Oxford. See Barbosa Page 127-134

Frobenius, Leo. 1923. Das sterbende Afrika :Veröffentlichung des Forschungsinstitutes für Kulturmorphologie. München: O.C. Recht.

Frobenius, L. 1931. Erythräa: Lander und Zeiten des heiligen Königsmordes. Berlin: Atlantis Verlag.

Frobenius Leo & Fox Douglas C. 1938. African Genesis: Folk Tales and Myths of Africa. Faber & Faber Ltd UK.

Hall, R.N. & Neal, W.G. 1902. The Ancient Ruins of Rhodesia. Methuen.

Hall, R.N. 1909. Prehistoric Rhodesia. London: Maskew & Miller.

Holbrook, J. 1998. African Astronomy. Essays from Archaeoastronomy & Ethnoastronomy News, The Quarterly Bulletin Of The Center For Archaeoastronomy and ISAAC. Number **28** June Solstice 1998.

Huffman, T.N. 1982. Archaeology and ethnohistory of the African Iron Age. Annual Review of Anthropology **11**: 133–50.

Huffman, T.N. 1986. Iron Age settlement patterns and the origins of class distinction in southern Africa.In: F. Wendorf & E. Close, eds., Advances in World Archaeology 5. New York: Academic Press, pp. 291–338.

Huffman, T.N. & Vogel, J.C. 1991. The Chronology of Great Zimbabwe. The South African Archaeological Bulletin **46** (154): 61-70.

Huffman, T.N. 1996. Snakes & crocodiles: power and symbolism in ancient Zimbabwe. Johannesburg: Witwatersrand University Press.

Huffman, T.N. 2001. The Central Cattle Pattern and interpreting the past. Southern African Humanities **13**: 19–35.

Huffman, T.N. 2011. Debating Great Zimbabwe. South African Archaeological Bulletin **66** (193): 27-40, 2011

Iwaniszewski, S. 2003. The erratic ways of studying astronomy in culture. In Mary Blomberg, Peter E. Blomberg and Göran Henriksson. Calendars, Symbols and Orientations: Legacies of Astronomy in Culture (Proceedings of the 9th annual meeting of the European Society from Astronomy in Culture (SEAC), Stockholm, 27–30 August 2001. Uppsala. pp. 7–10. ISBN 91-506-1674-9.

Kennedy, E. S. 1956. A Survey of Islamic Astronomical Tables, Transactions of the American Philosophical Society, (1956) 46(2), pp. 3, 39-40.

Keough,N., Nienaber,W.C., Steyn,M. 2008. Repatriation of the Mapungubwe human remains: an overview of the process and procedure (2008). UPSpace at the University of Pretoria (South Africa), http://hdl.handle.net/2263/7390

Krige, E.J. and Krige J.D. 1965. The Realm of the Rain-Queen – A study of the Pattern of Lovedu Society. Oxford University Press

Krupp, E. C., ed. 1978. In Search of Ancient Astronomies. Garden City, N.Y.: Doubleday & Company, 1978 (and New York: McGraw-Hill Book Company, 1979 paperback reprint).

Krupp, E.C. 2011. Personal Communication Thursday 16th June 2011 00h55. Dr. E.C. Krupp eckrupp@earthlink.net

Lynch, B.M. 1978. The Namoratunga Cemetery and Rock Art Sites of North-Western Kenya: A Study Of Early Pastoralist Social Organization. Unpublished Ph.D. Thesis, Michigan State University, Michigan.

Lynch, B.M. & Robbins, L.H. 1978. Namoratunga: The First Archaeoastronomical Evidence in Sub-Saharan Africa. Science 200: 766-768.

Lynch, B. M., Robbins, L. H., 1983. " Namoratungu: The first archaeoastronomical evidence in sub-saharan Africa", in Blacks in Science: Ancient and Modern, Van Sertima, I., New Brunswich, N.J.: Transaction Books, New Brunswich, NJ, 1983.

Malville, J.M., Wendorf, F., Mazar, A.A., & Schild, R. 1998. Megaliths and Neolithic astronomy in southern Egypt. Nature 392: 488.

Mathivha, M.E.R. 1992. The Basena / Vamwenye / Balemba. Morenster. Published by Prof. M E R Mathivha Copyright © 1992 First Edition/ First impression 1992 Morester Printers (01521) 931831 South Africa. p53.

McCosh, F.W.J. 1979. The African Sky. NADA 12: 30-44. The Southern Rhodesia Native Affairs Department Annual, See page 34. Edited by A. B. D. Spicer. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Muller, Karl. 25 September 2004. Rainmaking, the stars, and a song of sacrifice. . The Star Newspaper (South Africa). http://www.thestar.co.za Rainmaking, the stars, and a song of sacrifice

Nasir al-Din al-Tusi, Zij-i Ilkhani, British Museum, MS Or.7464.

N.H.W. 1926. Note on Darwin Ritual Murder. In N.A.D.A. - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. pg. 61 - 62. Edited by Guy A. Taylor. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Ralushai, N.M.N. 2002 January. A preliminary Report on the Oral History of Mapungubwe: Mapungubwe Oral History Project - Commissioned by the Dept of Environmental Affairs & Tourism South Africa and NORAD

Ralushai, N.M.N. 2003 February. Additional Information on the Oral History of Mapungubwe: Mapungubwe Oral History Project - Commissioned by the Dept of Environmental Affairs & Tourism South Africa and NORAD.

Ruggles, C. 1987. The Borana Calendar: Some Observations. Archeaoastronomy Supplement II, pg 35, 1987

Sekerere, G.T. & Mavindidze, A. 1975. The Shona Calendar. Unpublished MS. Gweru Teachers' College, Gweru.

Schoonraad, M. 1968 August.. The Discovery of Mapungubwe. The South African Archaeological Bulletin, Vol. 23, No. **90** (Aug., 1968), pp. 52-53 Published by: South African Archaeological Society Stable URL: http://www.jstor.org/stable/3887758

Snedegar, K. 1995. Stars and Seasons in Southern Africa. Vistas in Astronomy, vol. 39, Issue 4, pp.529-538

Snedegar, Keith. 1999. Sub-Saharan Africa: Cultural Astronomy's Heart of Darkness. Essays from Archaeoastronomy & Ethnoastronomy News, The Quarterly Bulletin Of The Center For Archaeoastronomy and ISAAC. Number 32 June Solstice 1999.

Summers, R. 1961. Excavations in the Great Enclosure. Occasional Papers of the National Museums of Southern Rhodesia 3(23A): 236-88.

Summers, R., K. Robinson & A. Whitty. 1961. Zimbabwe excavations. Occasional Papers of the National Museums of Rhodesia 3(23A): 15-332.

Stayt, H.A. 1931. Notes on the Balemba. The Journal of the Royal Anthropological Institute of Great Britain and Ireland, Vol. **61** (Jan. - Jun., 1931), pp. 231-238. Page 232.

Stayt , H.A. 1968. The Bavenda. London: Frank Cass & Co. Ltd. (Cass Library of African Studies - General Studies - No 58)

Steyn, M 2007, 'The Mapungubwe gold graves revisited', South African Archaeological Bulletin, vol. **62**, no. 186, pp. 140-146. [http://www.archaeology.org.za]

Swan, R.M.W. in Chapter 5 p 147 - 'On the Orientation and Measurements of Zimbabwe Ruins' in Bent, T. 1893. Ruined Cities of Mashonaland. London. (Rhodesiana Reprint Library. Volume Five facsimile reproduction of the third edition).. Books of Rhodesia, Bulawayo.1969- pages 141 - 178).

Swan, R.M.W.1892a. Notes on the Geography and Meteorology of Mashonaland. Proceedings of the Royal Geographical Society and Monthly Record of Geography (New Monthly Series). 14 (5):299-302

Swan, R.M.W.1892b. The Orientation of the buildings at Zimbabwe. Proceedings of the Royal Geographical Society and Monthly Record of Geography (New Monthly Series). 14 (5):306-309

Swan, R.M.W.1892c.Some Features of the Ruined Temples of Mashonaland. The Scottish Geographical Magazine. 8:539-544.

Swan, R.M.W.1892d. On the Orientation and Measurements of Zimbabwe Ruins. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 120-149. London: Longmans, Green & Co.

Swan, R.M.W.1892e. Appendix A: Notes on the Geography and Meteorology of Mashonaland. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 347-354. London: Longmans, Green & Co.

Swan, R.M.W.1892f. Appendix B: List of Stations in Mashonaland astronomically observed, with altitude. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 355-357. London: Longmans, Green & Co.

Swan, R.M.W.1892g. Appendix C: Addenda to Chapter V. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 358-361. London: Longmans, Green & Co.

Swan, R.M.W.1893a. The Orientation and Architectural Features of the Ruined Temples of Mashonaland. Report of the British Association for the Advancement of Science – 1892. 62:816.

Swan, R.M.W.1893b. The Geography and Ethnology of Mashonaland, with a Brief Account of the Ruins Zimbabwe. Proceedings of the Philosophical Society of Glasgow. 24:29-50.

Swan, R.M.W.1893c. The Ruins of Mashonaland. The Geographical Journal. 1: 275-276

Swan, R.M.W.1893d. The Ruins of Mashonaland. The Geographical Journal. 1: 465.

Swan, R.M.W.1896. Some Notes on the Ruined Temples in Mashonaland. The Journal of the Royal Anthropological Institute. 26:2-13

Swan, R.M.W.1897. Some Notes on the Ruined Temples in Mashonaland. The Journal of the Royal Anthropological Institute of Great Britain and Ireland. 26:2-13

Theal, G. McG.1898-1903. Records of South Eastern Africa. Cape Town: Government Printers. 9vols. Vol. VII, p.197

Ṭūsī, Naṣīr al-Dīn Muḥammad ibn Muḥammad; Badakchani, S. J. (2005), Paradise of Submission: A Medieval Treatise on Ismaili Thought, Ismaili Texts and Translations **5**, London: I.B. Tauris in association with Institute of Ismaili Studies, pp. 2–3, ISBN 1-86064-436-8
Van Binsbergen, W.M.J., 1996, 'Transregional and historical connections of four-tablet divination in Southern Africa', Journal of Religion in Africa, 26, 1: 2-29

van Binsbergen, W.M.J., 1996, 'The astrological origin of Islamic geomancy', paper read at The SSIPS/ SAGP 1996, 15th Annual Conference: 'Global and Multicultural Dimensions of Ancient and Medieval Philosophy and Social Thought: Africana, Christian, Greek, Islamic, Jewish, Indigenous and

Asian Traditions', Binghamton University, Department of Philosophy/ Center for Medieval and Renaissance studies (CEMERS), October 1996 (PDF)

van Binsbergen, W.M.J., 2004. Cupmarks, stellar maps, and mankala board-games: An archaeoastronomical and Africanist excursion into Palaeolithic world-views.

Van Heerden, Pieter. 1959. Die Bouvalle van Vendaland. Bantoe 11. Page 3-20

Van Warmelo, N.J. (ed.) 1940. The Copper Miners of Musina and the Early History of the Zoutpansberg: Vernacular accounts by S.M. Dzivhani, M.F. Mamadi, M.M. Motenda,, E. Mudau. Pretoria: Government Printer. (Ethnological Publications Vol. VIII).p 8

Varisco, D. M. 1987. The Rain Periods in Pre-Islamic Arabia. Arabica, Tome xxxiv, Pages 251 -256.

Varisco, D. M. 1989. The Anwã' Stars According to Abu Ishãq al-Zajjãj. In Zeitschrift Für Geschichte Der Arabisch-Islamischen Wissenschaften. Band 5. Johann Wolfgang Goethe-Universität, Frankfurt am Main.

Varisco, D. M. 1985. The Production of Sorghum (Dhurah) in Highland Yemen. Arabian Studies (Cambridge). 7:53-88.

Von Sicard, H. 1966. Karanga Stars. NADA 9: 45. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Wade, R.P. 2007 Jan/Feb. Mapungubwe and Tshimedzi Moon. In the Voyage of the Planet. Issue #2.pages 38-42. JCA Archaeological Foundation for Research JCA Management Services. South Africa. ISSN 1991-5039

Wade, R P. 2009. A Systematics for Interpreting Past Structures with Possible Cosmic References in Sub-Saharan Africa. MSc Thesis. University of Pretoria. http://upetd.up.ac.za/thesis/available/etd-05052009-174557/

Wade, R. P & Broodryk, N. L. 2010. Systematics of interpreting cosmic references in sub Saharan Africa. Proceedings International Astronomical Union. http://www.communicatingastronomy.org/cap2010/posters.html PDF (1.80MB)

Wade R.P, Eriksson, P.G, Duncan G.A, Rautenbach C.J de Wet. 2014. Southern African cosmogenic geomythology ("following a star") of the Zion Christian Church. Transactions of the Royal Society of South Africa. Taylor & Francis U.K.

Wilson, Agnes. 1931. The Human Sacrifice. In N.A.D.A. - The Southern Rhodesia Native Affairs Department Annual, No. 9, 1931. pg. 6 - 10. Edited by A. B. D. Spicer. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

CHAPTER TWO

CODIFICATION OF THE VENUS SYNODIC PERIOD IN THE GREAT ZIMBABWE CULTURAL COMPLEX

Abstract

In geo referencing the distribution through time of symbolic notation of cyclical astronomical calendric movements, little definitive evidence supports ideas relating to the earliest records such as is found in most parts of the world in the Palaeolithic. Similarly, sub-Saharan African geoinformatic data in this regard lacks credibility without interpretative frameworks and methodological adjustment to the systematics.

Comparisons are drawn from the ancient origins of artifacts and examples are provided in relation to the Great Zimbabwe Cultural Complex of cosmogenic codification of the Venus synodic period pertaining to the formative trade era networks in southern Africa

Key Words: Ethno mathematics, gestation, menstruation cycles, Venus synodic period, rock art, geomancy, divination bowls, eclipses, meteorology, geomythology, star lore, Mapungubwe, Great Zimbabwe, zodiac bowl, Islamic-Arab astronomy, ma'ãlim al-zirã'ah, Qajar, Anwã, east African Trade network, indigenous knowledge.

6 INTRODUCTION

The aim of identifying cosmic references within the sub-Saharan East-African Trade Network archaeological era is problematic without an interpretive framework. By assessing such data through revised methodological systematics that includes interdisciplinary referencing, cosmographic codification can be identified (Wade 2009).

Postulates are presented in this study that specifically shows how Islamic-Arab geomantic diffusion may have affected local traditions and indigenous knowledge systems.

Palaeolithic examples of identified calendric notation such as the decorative items, abstract figurines and cave art of the emergent part of complex symbol systems have provided the earliest definitive advances regardless of their tentative characteristics (Pásztor 2010; Pásztor & Priskin 2011; Rappenglück 2004; Bednarik 1997; d'Errico 1989; Frank & Bengoa 2001; Gibbon 1964; Joseph 2011; Marshack 1972; Rogers 1998; Rossano 2010; Roy 1984; Vértes 1965; Wilk 2000)

Various items apart from the cave art may indicate lunar cycles, solar cycles, Venus cycles (de Heinzelin 1962; Gerdes 1991; Brooks & Smith 1987; Robinson 1992), such as the conical hats or golden cones (Schmidt 2002; Springer 2000; Zaslavsky 1992), the research

on menstruation notation, carved bone calendars, decorative items, abstract figurines that emerge as part of complex symbol systems (Bednarik 1993).

In Africa the earliest evidence of early human symbolizing is retrievable from the African Pleistocene as mainly figurative portable art of the Early and Middle Stone Age (Henshilwood et al. 2011; Wendt 1974; Singer & Wymer 1982; Beaumont, de Villiers & Vogel 1978; Volman 1984; Beaumont 1992; Bednarik 1993; Henshilwood 2013).

During the East African Indian Ocean Trade Network Era the Swahili corridor was created from the interchange between formative Bantu–speaking people who developed extensive trade with lands as remote as China and India for mainly iron, ivory and gold. The spread of Islam brought Arabic traders to East Africa over the course of several centuries, from 600-1600 (Pouwels 2005).

Certain objects and geomantic artefacts found in the archaeological and ethnographic record of southern Africa pertain to the earliest origins in the Near and Middle East. Oral tradition and indigenous knowledge indicate use of the Venus synodic period and the trade network relationships provide examples of cosmographic codification and calendric notation.

7 EAST AFRICAN INDIAN OCEAN TRADE NETWORK ERA ASTRONOMICAL KNOWLEDGE IN SOUTHERN AFRICA

The Red Sea and Gulf of Aden kingdoms and states of Sabaea and Hadhramaut, and later Axum, which flourished for over a thousand years in the years before Christ lived (1,000 BC-100AD) provide some of the earliest historical evidence of the maritime exploration such as is described in the Periplus of the Erythraean Sea (Freeman-Grenville 1962; Casson 1989), of the Indian Ocean and virtual contact with east Africa and the west coast of India.

Our knowledge about the extent of peoples' familiarity with astronomy in the Arabian Peninsula in pre-Islamic times is limited. However, it is known that they were familiar with the sun's journey through the zodiacal signs, and that they adopted a lunar calendar, defined lunar mansions by identifying certain fixed stars and asterisms, and used the rising and setting times of certain specific stars to predict seasonal and meteorological phenomena.

In the time interval between Ptolemy (2nd century AD) and Copernicus (16th century), the major developments in observational and theoretical astronomy took place from North Africa to Central Asia—during late Antiquity, and then in pre-Islamic and finally Islamic societies.

With the founding of Mecca, Medina, and then Baghdad, between 610 and 750, as new emerging centres of Islam, first with Mohammed and then the Umayyad and Abbasid Caliphs, the Islamic world spread from the Near East through north and east Africa to southern Spain. The remarkable growth in craftsmanship distinguished itself in glass and metalwork, glazed earthenware and tile making. The movement and distribution of Islamic ware, beginning with the 9th and extending to the 13th century, was extraordinary.

The legend of the Ngoma lungundu that relates to Ark of the Covenant mythology (Van Wamelo 1944; Le Roux 2003; Thomas et al 1999), the custom of circumcision, burial practice, dietary laws, concepts of following a star, migration oral tradition, absence of mosque architecture and agricultural marker star concepts likely provide clues to the origins of astronomical knowledge through trader contact. Specifically the people referred to by the Arab traders as the 'people of Zion' ('Sayuna')(Lewicki 1974) and who later become known as BaSena, Lemba and VaMwenye (Mathivha 1992).

Although the trade is predominantly known to be 'Arabic' there were other traders such as the BaSayuna, VaMwenye, Lemba, Chinese, Indian, Persian as well, as described in their accounts 'of sailing with the Arabs in their dhows, in the red sea, around the coasts of Arabia, and to the Zanzibar and Tanganyika: Pearling in the Persian Gulf: and the life of the shipmasters, the mariners and merchants of Kuwait' (Severin 1982; Villiers 1969).

To a certain extent genetic studies have substantiated the oral traditions of the Lemba as being remnant populations of the pre and post Islamic 'Jews' that translocated from the Saudi peninsular and were referred to by the earliest accounts as the 'people of Zion' (Thomas et al 1999).

The archaeological work done in the Limpopo Province a few kilometres south and east of the Mapungubwe show the continuity of the abandonment of Mapungubwe in a range of settlements that eventually made up the Venda people.

Foremost is the settlement of Tshiendeulu, Dzata and the later Machema that has a similar conical tower to that of the Great Enclosure at Great Zimbabwe with a predominant 'Lemba' contingent that existed during the decline of Great Zimbabwe (de Vaal 2002). Further research is being done and is not conclusive but a wall 'decoration' reveals that white stones form possible characters in proto-Arabic that read as '*the place of Shem*'.

Figure 20 Machema wall motifs that resemble letters similar to proto Arabic

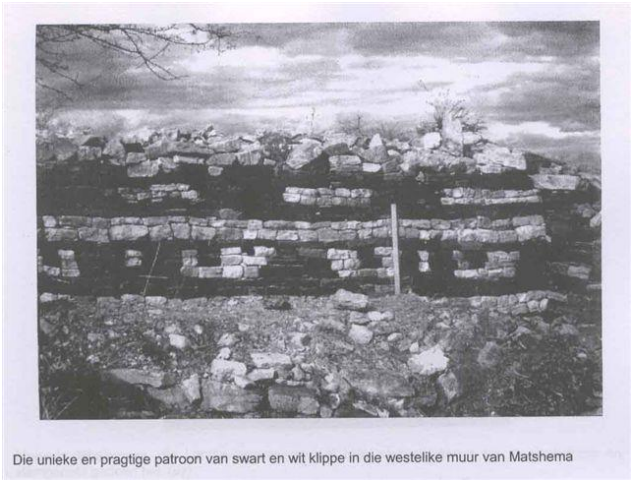


Figure 21 Machema wall motifs that resemble letters similar to proto Arabic. (Caption in photo reads – The unique and pretty pattern of black and white stones in the western wall of Machema) courtesy de Vaal 2002 Mapungubwe Archive – University of Pretoria

سـام = Shem (modern Arabic)

Figure 22 Modern Arabic script for the word – '*Shem*'.

The 17500 B.P. Palaeolithic Lascaux cave art (Rappenglück 2004) and the Dendera zodiac seemingly constructed in the Ptolemaic dynasties (Krupp 2001) have possible relations with the soapstone birds found at Great Zimbabwe (Huffman 1985; Matenga 2008).

The Nasr idols were perched mythical vultures, falcons or hawks in 'Arabia Felix' amongst the proto-Semitic pre Islamic polytheistic deities. Similar to the perched figures of Horus. Nasr (Arabic: نسر "vulture") in the Qur'ān (71:23) seen as a deity at the time of the prophet Noah– "and they say: by no means leave your gods, nor leave Wadd, nor Suwa'; nor Yaghuth, and Ya'uq and Nasr" (Qur'an 71:23).

Historically Nasr was the god of the Himyar, a powerful south Arabian kingdom (among the six major south Arabian, or 'happy Arabian', kingdoms: Himyar, Sheba, Qataban, Ma'in, Awsan and Hadramaut). The Himyar adopted Nasr as their city's chief god, and worshiped him at a place called Balkha (Abdullah 1946).

> *"Nasr remained a prominent god, being carried by the tribes that came out of Himyar up until they came around Makkah, where the idol of Nasr was set up around the Kaaba. The five gods worshiped at the Kaaba were also worshiped in a Himyaritic temple called Ri'am. These gods were: Wadd, Suwa, Yaghuth, Ya'uq, and Nasr.*
>
> *Nasr is seen as a wise elder god, being connected somewhat with old age and the wisdom it brings. He is the god to be sought if needing wisdom. He is also connected to death, as the vultures feed on the corpses of the dead left out in the desert. It is also possible that the ancient Arabs practiced ritual de-fleshing before burial at funerals, where they left the corpse at a high place on a rock or cliff to be eaten by vultures, although evidence for this has only recently been uncovered among the Nabateans and not the Himyarites, it still is interesting to note that Nasr may be connected to this ritual. It is important to remember that Nasr is not a bad or evil deity, he is seen instead as a force of change and power, to be feared but also respected"* (Hawting 1999).

Figure 23 Zimbabwe Soapstone Bird. (Hall 1909: 74)

The Dendera Zodiac in Egypt represents a similar part of the 'sky map' rendered in the 'shaft of the dead man' as seen from the Lascaux Cave in the Palaeolithic era. The figures may represent similar stars and constellations which have changed over the millennia.

Figure 24 Dendera Zodiac in the Temple of Hathor Egypt. Trevisan, Camillo. 1997. La rappresentazione delle costellazioni nello zodiaco circolare di Dendera. IUAV - DPA. http://www.iuav.unive.it/dpa/ricerche/trevisan/dendera.htm

Figure 25 Dendera Zodiac in the Temple of Hathor Egypt .Detail of Sothis Bull (representing Sirius constellation), Horus as Bird on column and Osiris with staff (representing Orion constellation). Trevisan, Camillo. 1997. La rappresentazione delle costellazioni nello zodiaco circolare di Dendera. IUAV - DPA. http://www.iuav.unive.it/dpa/ricerche/trevisan/dendera.htm

Figure 26 Lascaux Cave art Woolly Rhinoceros (possibly representing Sirius constellation), Dead Man (possibly representing Orion constellation), Bird on a Stick and Bison (possibly representing

Taurus constellation) – in the Shaft of the Dead Man. Image by N. Aujoulat courtesy Lascaux Museum http://www.lascaux.culture.fr/. From Rappenglück, M. 1998. A Skychart from the Ice Age? - A Contribution to the Early History of Astronomy and to the Palaeoastronomical Methodology, the Scene "Le Puits" in the Cave of Lascaux (Com. Montignac, Dép. Dordogne, Rég. Aquitaine, France).

In this scenario, the 'bird on the stick' changes over time in the Dendera Zodiac to Horus the son of Osiris and would appear to be in the region of Monoceros in the 'sky map' and Dendera Zodiac. Isis changes from a rhinoceros in the sky map to Sothis in the Dendera Zodiac and represents Sirius constellation. Osiris or Usiris transliterated as Asar, Asari, Usir and is identified as god of the afterlife, the underworld and the dead.

The etymological root similarity of the Shona name of the soapstone birds found at Great Zimbabwe is strangely coincidental to the Nasr/Osiris that spanned millennia as a deity in the Saudi peninsular - "bird of heaven"- *shiri ye denga* (Huffman 1985; Wade 2009).

8 MEDIAEVAL ISLAMIC-ARAB ASTRONOMY AND GEOMANCY

Between the 9th and 15th centuries Muslim scholars adapted Indo-Persian astronomical knowledge and Ptolemaic planetary hypotheses with improved observations and accuracy in instrumentation and observatories. This developed into several non-Ptolemaic models more compatible with Aristotle cosmology such as with the concept of the zījs that is derived from the Middle Persian - zīk or *zīg* (cord) is a tabular arrangement of observed celestial motion (reference).

Mosques were aligned toward the prayer-niche (mihrāb) or local direction of Mecca (qibla) which is the Ka'ba or pre-Islamic pagan shrine and since the 8th century the problem of determining the qibla of any locality became considerably sophisticated. Thereafter the main geodesic issues were timekeeping, the determination of the sacred direction (*qibla*), and the regulation of the lunar calendar. The position of the sun determined the five daily prayers (King 2005).

Research by Varisco on the origins of Anwã establish a relationship between the pre-Islamic Arab lunar station (manãzil al-qamar) and an Islamic mixing of the Indian zodiacal grid, as the 28 marker distinctions did not exist in Arabia prior to Islam (Varisco 1991).

A possible Mediaeval Arab-Islamic bowl researched by Hostetter has affinities with similar Persian metal divination / magic bowls produced between the 8th and 13th centuries in the Middle East. Specifically produced during the Seljuk rule (11th-13th CE) were bowls with decoration/artwork of astrological images of the Moon, Venus and celestial cycles. (Hostetter 1979).

Figure 27 Chihil Kilid (Forty Keys) Divination Bowl with Inscriptions, Zodiac Signs, and Four Plaquettes From Western Iran Safavid dynasty circa 1679 CE. On the interior, the inscriptions in naskhi script appear in round, overlapping medallions. On the exterior, inscriptions also appear in round medallions; however, within a border below the rim, the inscriptions alternate with depictions of the zodiac signs. Inscriptions also cover the surface of the everted rim. There is an inscription on the bottom stating the date of the piece 1090 AH/1679 CE and a blessing to the owner (his name is not given). 1989.149.11_PS2.jpg. Brooklyn Museum photograph, 2009 http://www.brooklynmuseum.org/opencollection/objects/3007/Chihil_Kilid_Forty_Keys_Divination_Bowl_with_Inscriptions_Zodiac_Signs_and_Four_Plaquettes

Figure 28 Bowl of Ishtar – Clive Hostetter

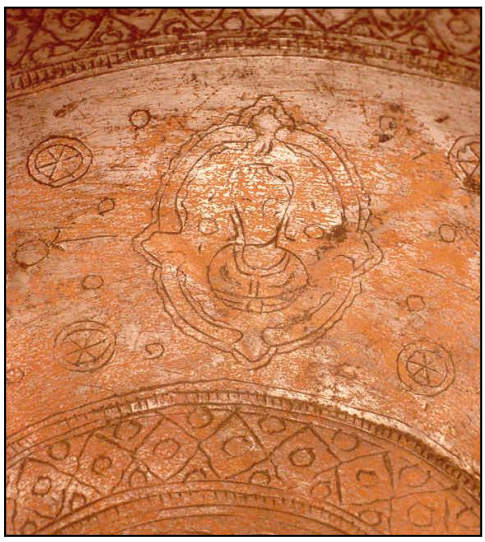


Figure 29 Bowl of Ishtar – Clive Hostetter (Detail)

The inscriptions denote a kind of cosmographic codification similar to the zījs that existed Arab-Islamic world. The intricate iconography of the Venus synodic period possibly used to predict eclipses as described by Hostetter exemplify extremes of this aspect (Hostetter 1991; 1979; Thompson 2014).

The 13th Century Muslim philosopher/astronomer Nasir al-Din al-Tusi completed the possible source document of these codifications - *Kitab al-Zij al-Ilkhani* in 1270 CE. Providing the "*theory and tables to calculate the position of the sun, moon and five naked-eye planets, with the ability to predict eclipses, the lunar crescent and planetary visibility*". (Hostetter 1991; 1979; Thompson 2014).

The use of the Anwã and divination bowls can be found in the Great Zimbabwe Cultural complex as well as records of the Venus synodic period (Duffey 2012; Wade 2009).

Figure 30 Wooden BaVenda divining bowl in the British Museum, Af1946 04.1a, with whistle and bag for seeds, 19th century (photo credit: © Trustees of the British Museum). In Duffey, A. 2012. Mapungubwe: Interpretation of the Gold Content of the Original Gold Burial M1, A620. Journal of African Archaeology, Volume 10 (2), 2012, pages 175-187, DOI 10.3213/2191-5784-10223.page 177.

9 VENUS SYNODIC PERIOD AND RAIN MAKING

The synodic cycle of Venus: After the Moon, Venus is the brightest object in the night sky. From a shamanic and historical perspective, this is exceedingly important. It draws the eye, especially on a moonless night without light pollution. Though subtle, at times, Venus' brightness can even cast a shadow here on Earth.

Venus has a 584 day synodic cycle and has 5 synodic cycles every 8 years. A synodic cycle is when a planet or other celestial body comes back to the same place in the sky. In Venus' case, it happens the first time she appears as a 'morning star', just before sunrise.

Venus also categorizes the arrangements of the asterisms once every eight years, when the Tshimedzi new moon almost occults Venus in a very close conjunction, similar to the Islamic crescent moon symbol, relatively at the same time in the evening.

The relationship between Venus and the sun is vital to the Shona-Lemba-Venda astronomical indigenous knowledge tradition (Lan 1987) and is seen as the indicator for rain periods. Tshimedzi Moon usually occurs on the Vernal Equinox and Venus appears from behind the sun at this time for the first time in the Venus Synodic Period. It is used in almost all aspects of life and represents the rain and rain-making concepts like Mhondoro, the

fertility of the land and women and is paramount to understanding vast socio-political facets of Great Zimbabwe culture (Wade 2009).

Rituals involving fertility, rain, Venus still exist in the 'domba' practice (Blacking 1985) and would seemingly be the method of selecting new queens for the king that are regarded to have been housed in the Great Enclosure (Huffman 1996) It would therefore be fitting to have markers for the vernal equinox that could act as a marker for Venus's path through the firmament after it reappears and disappears behind the sun. The progeny would be seen to be children of Venus in the same way that Venus is regarded as being the true wife of the sun in some belief systems but in this case the moon. (Lan 1987; Frobenius & Fox Douglas 1938: 237-242; 261-265

Zimbabwe today still has a title bestowed on the ministry for agriculture – 'Nehanda' and President Robert Mugabe placed a ban on all weather reports unless sanctified by his office possibly due to the nature and proclivity of rain foretelling.

Rain-making in early Zimbabwe relates most likely to the anwã system that recorded weather patterns through time by partitioning the movement of the heavens into recognizable portions in the same way that the zodiac is used to divide a year or the way the moon waxes and wanes in one earth revolution about the sun. Sorghum trade would infer the means to identifying the way to timing its cultivation. Eventually through time the exact 'counting' of the stars would give way to incantations and formulas to identify the stars that brought the rain that would later be magicized into rituals and sacrificial attempts to force the rain (Wade 2009; Tiley & Webster 2004; Frobenius & Fox Douglas 1938 237-242; 261-265; N.H.W. 1926; Von Sicard 1966; Wilson 1931)

Predictability is made possible through the use of this basic sidereal calendar and rain patterns and the 'Venus' clock (Venus synodic period) (Aveni 1997; 1993) somehow became embedded in later formulations and songs to 'count' and predict the advent of the rain period. External astronomical knowledge and marker stars were substituted by local asterisms and incorporated into the formative astronomical indigenous knowledge systems (N.H.W. 1926; Von Sicard 1966; Wilson 1931)

If the Great Zimbabwe use of rain predicative rituals existed then the question remains whether these formative systems were also in use earlier at Mapungubwe and later in the Monomotapa periods of Zimbabwe. This research endeavours to ascertain the interpretative framework from these standpoints by means of interpreting structural arrangements, art, artefacts and oral traditions in relationship to astrophysical and ethno-archaeological data.

> *Some Zimbabwe Cultural Complex monoliths may also support the idea that astronomy was important to those who erected them. Several have intricate geometrical notations, which suggest an astronomical connection and one in particular indicates what appears to be a 'diaper' pattern, whose number and arrangement may correspond to the possible records of Venus and Mars as depicted in the Mayan Dresden Codex.*

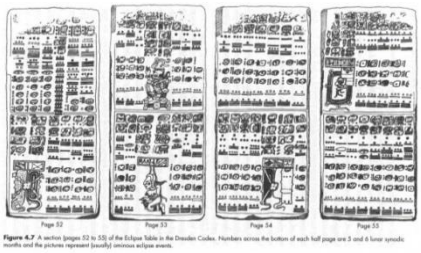


Figure 31 Mayan Dresden Codex. (Aveni 1997: 110).

> *The stone was found at Dhlo-dhlo and is inadvertently regarded as a status phallus symbolized and decorated with snake and crocodile motifs (Huffman 1996) it has what is referred to as a 'diaper' pattern with sections of 'chevron'. The 'diapers' are basically rough diamond-shaped peck marks made a few millimeters into the polished surface of the stone, with incised chevron' zigzags. These notations/pockmarks could have been made as a result of recording the daily sightings, for instance, of the planet Venus, on the horizon and may involve the Venus synodic period and a method of tabulating lunar or solar eclipses amongst the Karanga, similar to the Mayan method as seen in the Codex* (Aveni 1997; Wade 2009: 97 – 111).

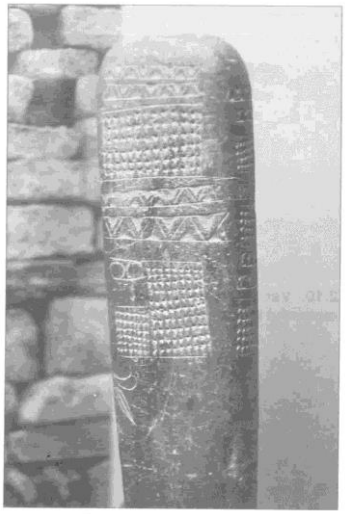


Figure 32 A Monolith Stone originally found at Dhlo-dhlo now in the Zimbabwe National Museum reproduced in Huffman, T.N. 1996. Snakes and Crocodiles – Power and Symbols in Ancient Zimbabwe. Johannesburg. Witwatersrand University Press.

> *The cyclical observable period for Venus in its synodic period, has a four phase motion – appearance (263 days), long disappearance (50 days), appearance (260 days), short disappearance (8 days) = 583.9 days. (Intervals fluctuate widely but commonly lie within about ten days of the quoted values) This means that any notation of this cycle could be recorded in a similar pattern, and the pockmarks on the Dhlo-dhlo stone are divided in this fashion and seem to be the tallied records of a naked-eye planet/moon observation with a circle and a crescent. There are many oral traditions concerned with Venus and its relationship to the moon and sun, as this planet plays a major role in the Karanga/Shona culture* (Aveni 1997; Wade 2009; Clark &Damian 2002; Lan 1987; Frobenius 1931; Latham 1986)

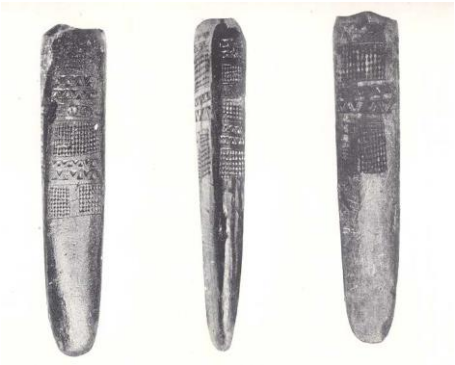
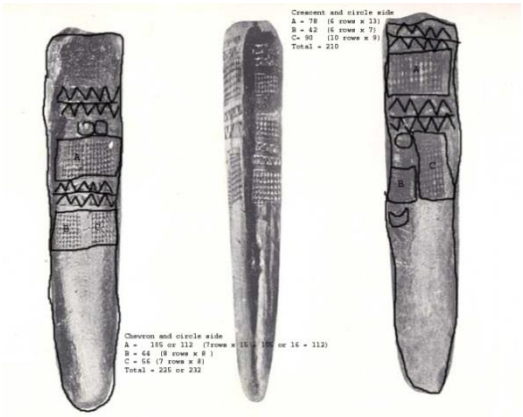


Figure 33 The Monolith Stone originally found at Dhlo-dhlo now in the Zimbabwe National Museum in (Hall & Neal 1902: 236)



Crescent and circle side
A = 78 (6 rows x 13)
B = 42 (6 rows x 7)
C= 90 (10 rows x 9)
Total = 210 (210 chevron units on Great Enclosure wall ?)

Chevron and circle side
A = 105 or 112 (7rows x 15 + 105 or 16 = 112)
B = 64 (8 rows x 8)
C = 56 (7 rows x 8)
Total = 225 or 232

Figure 34 Amounts of diaper peck-marks in each division on the Monolith Stone originally found at Dhlo-dhlo now in the Zimbabwe National Museum in (Hall & Neal 1902: 236)

Table indicating average models of Venus Synodic Period including Great Zimbabwe latitude observable average

Intervals (in Days) Used in Simple Models to Predict Future Appearances of the Planet Venus [Annotated from Aveni, A. 1997. Stairways to the Stars – Skywatching in Three Great Ancient Cultures. John Wiley & Sons, Inc. Astronomy in the Maya Codices: 183]				
	Babylonian Model (Ammizaduga Tablet)	*Maya Model (Dresden Codex)*	*Great Zimbabwe Model*	*Actual Observable Average*
Phenomena	*Days*			
Massassi Morning Star (visible in east)	245 (8 mos., 5 days)	236	251	(263)
Disappearance Period (eastern disappearance to western disappearance)	90 (3 mos.)	90	71	(50)
Morongo Evening Star (visible in the west)	245 (8 mos., 5 days)	250	247	(263)
Disappearance Period (western disappearance to eastern disappearance)	7	8	14	8 (0-20)
Total Cycle	587 (19 mos., 28 days)	584	583	584 (583.92)

10 VENUS SYNODIC PERIOD AND LEGENDS

Below are two examples of oral legends or folklore that are recorded by Leo Frobenius and translated into English, one of which clearly reveals knowledge of the Venus synodic period – of how Venus as a morning star changes over to being an evening star with an 8-day short disappearance interlude. There are many such legends and oral traditions that have been untapped for their astronomical aspects. The legends also confirm the relationship between the concepts of Moon, Venus, rain, fertility and sacrifice:-

10.1 *The Moon and his Wives (Wahungwe)*

The Moon and his Wives
(Wahungwe)

Maori (God) made the first man and called him Mwuetsi (moon). He put him on the bottom of a Dsivoa (lake) and gave him a ngona horn filled with ngona oil. Mwuetsi lived in Dsivoa.

Mwuetsi said to Maori: 'I want to go on the earth.' Maori said: 'You will rue it.' Mwuetsi said: 'None the less, I want to go on the earth.' Maori said: 'Then go on the earth.' Mwuetsi went out of Dsivoa and on to the earth.

The earth was cold and empty. There were no grasses, no bushes, no trees. There were no animals. Mwuetsi wept and said to Maori: 'How shall I live here?' Maori said: 'I warned you. You have started on the path at the end of which you shall die. I will, however, give you one of your kind.'

Maori gave Mwuetsi a maiden, who was called Massassi, the morning star. **[Venus as morning star]** *Maori said: Massassi shall be your wife for* ***two years****.' Maori gave Massassi a fire-maker. In the evening Mwuetsi went into a cave with Massassi. Massassi said: 'Help me. We will make a fire. I will gather chimandra* [kindling] *and you can twirl the rusika* [revolving part of the fire-maker]. *Massassi gathered kindling. Mwuetsi twirled the rusika. When the fire was lighted Mwuetsi lay down on one side of it, Massassi on the other. The fire burned between them.*

Mwuetsi thought to himself: 'Why has Maori given me this maiden? What shall I do with this maiden, Massassi?' When it was night Mwuetsi took his ngona horn. He moistened his index finger with a drop of ngona oil. Mwuetsi said: 'Ndini chaambuka mhiri ne mhiri.' ('I am going to jump over the fire.') [This sentence is many times repeated in a melodramatic, ceremonial tone]

Mwuetsi jumped over the fire. Mwuetsi approached the maiden, Massassi. Mwuetsi touched Massassi's body with the ointment on his finger. Then Mwuetsi went back to his bed and slept.

When Mwuetsi wakened in the morning he looked over to Massassi. Mwuetsi saw that Massassi's body was swollen. When day broke Massassi began to bear. Massassi bore grasses. Massassi bore bushes. Massassi bore trees. Massassi did not stop bearing till the earth was covered with grasses, hushes, and trees.

The trees grew. They grew till their tops reached the sky. When the tops of the trees reached the sky it began to rain. Mwuetsi and Massassi lived in plenty. They had fruits and grain. Mwuetsi built a house. Mwuetsi made an iron shovel. Mwuetsi made a hoe and planted crops. Massassi plaited fish traps and caught fish. Massassi fetched wood and water. Massassi cooked. Thus Mwuetsi and Massassi lived for ***two years****.*

After two years *Maori said to Massassi: 'The time is up.' Maori took Massassi from the earth and put her back in Dsivoa. Mwuetsi wailed. He wailed and wept and said to Maori: 'What shall I do without Massassi. Who will fetch wood and water for me? Who will cook for me?'* ***Eight days*** *long Mwuetsi wept.*

Eight days *long Mwuetsi wept. Then Maori said: 'I have warned you that you are going to your death. But I will give you another woman. I will give you* ***Morongo, the evening star****.* [Venus as evening star] *Morongo will stay with you for* ***two years****. Then I shall take her back again.' Maori gave Mwuetsi Morongo.*

Morongo came to Mwuetsi in the hut. In the evening Mwuetsi wanted to lie down on his side of the fire. Morongo said: 'Do not lie down over there. Lie with me'. 'Mwuetsi lay down beside Morongo. Mwuetsi took the ngona horn, put some ointment on his index finger. But Morongo said: 'Don't be like that. I am not like Massassi. Now smear your loins with ngona oil. Smear my loins with ngona oil.' Mwuetsi did as he was told. Morongo said: 'Now couple with me.' Mwuetsi coupled with Morongo. Mwuetsi went to sleep.

Towards morning Mwuetsi woke. As he looked Over to Morongo he saw that her body was swollen. As day broke Morongo began to give birth. The first day Morongo gave birth to chickens, sheep, goats.

The second night Mwuetsi slept with Morongo again. The next morning she bore eland and cattle.

The third night Mwuetsi slept with Morongo again. The next morning Morongo bore first boys and then girls. The boys who were born in the morning were grown up by nightfall.

On the fourth night Mwuetsi wanted to sleep with Morongo again. But there came a thunderstorm and Maori spoke: 'Let be. You are going quickly to your death.' Mwuetsi was afraid. The thunderstorm passed over. When it had gone Morongo said to Mwuetsi: 'Make a door and then use it to close the entrance to the hut. Then Maori will not be able to see what we are doing. Then you can sleep with me.' Mwuetsi made a door. With it he closed the entrance to the hut. Then he slept with Morongo. Mwuetsi slept.

Towards morning Mwuetsi woke, Mwuetsi saw that Morongo's body was swollen. As day broke Morongo began to give birth, Morongo bore lions, leopards, snakes, and scorpions. Maori saw it. Maori said to Mwuetsi: 'I warned you.'

On the fifth night Mwuetsi wanted to sleep with Morongo again. But Morongo said: 'Look, your daughters are grown. Couple with your daughters.' Mwuetsi looked at his daughters. He saw that they were beautiful and that they were grown up. So he slept with them. They bore children. The children which were

born in the morning were full grown by night. And so Mwuetsi became the Mambo (king) of a great people. **[5 'nights' could represent the 5 weeks or average 50 day disappearance of Venus]**

But Morongo slept with the snake. Morongo no longer gave birth. She lived with the snake. One day Mwuetsi returned to Morongo and wanted to sleep with her. Morongo said: 'Let be.' Mwuetsi said: 'But I want to.' He lay with Morongo. Under Morongo's bed lay the snake. The snake bit Mwuetsi. Mwuetsi sickened.

After the snake had bitten Mwuetsi, Mwuetsi sickened. The next day it did not rain. The plants withered. The rivers and lakes dried. The animals died. The people began to die. Many people died. Mwuetsi's children asked : 'What can we do?' Mwuetsi's children said : 'We will consult the hakata [sacred dice] .' The children consulted the hakata, The hakata said : 'Mwuetsi the Mambo is sick and pining. Send Mwuetsi back to the Dsivoa.'

Thereupon Mwuetsi's children strangled Mwuetsi and buried him. They buried Morongo with Mwuetsi. Then they chose another man to be Mambo. ***Morongo, too, had lived for two years in Mwuetsi's Zimbabwe****.'*

[*Zimbabwe means, roughly, 'the royal court'. The enormous prehistoric ruins near Fort Victoria are called 'The Great Zimbabwe'; other stone ruins throughout Southern Rhodesia are called 'Little Zimbabwe'*] (Frobenius & Fox 1938: 237-242).

10.2 *Mbila — The Rain Sacrifice*

Mbila—The Rain Sacrifice

A long, long time ago no rain fell for a whole year. Thereupon the Wanganga ordered that a . Mukaranga be sacrificed. The Wanganga said: 'It must be a marriageable musarre [princess] who has never lain with a man. The musarre must be virgin.' The Mambo called his first wife and said: 'Seek among the musarre for one who is marriageable and innocent of man, one whom we can sacrifice.' The king's first wife summoned all the wasarre (princesses, plural of musarre) and asked: 'Which of you has not yet slept with a man?' The king's daughters laughed and said : 'is it our business to live as other maidens live?' The king's first wife said: 'Lie down.' The wasarre lay down, each on a mat. The king's first wife found among the marriageable wasarre not one who had not had intercourse with a man.

The king's first wife went to the king and said: 'Mambo, among the marriageable wasarre there is not one who has not had intercourse with a man?' The king summoned the Wanganga and said: 'Among the wasarre is not one who has not had intercourse with a man. Tell me, what shall be done?' The Wanganga said: 'Mambo, the Mukaranga must be sacrificed. If there is no marriageable musarre who is still innocent of man, then we must seek the oldest of the wasarre who have not yet reached marriageable age. This musarre must be imprisoned at the place of sacrifice and must remain

imprisoned till she has reached a marriageable age. And then she can be sacrificed as a Mukaranga.' The king called his first wife and. said: 'Seek among the unmarriageable wasarre for a musarre who is innocent of man.' The king's first wife summoned the small girls of the Simbawoye (royal court). She found a child who was still innocent of man. Her breasts were not yet grown.

The young musarre was brought to the place of sacrifice. ***The place of sacrifice was a high wall (circular, like that of a hut, and with an entrance. The wall was built not of wood and mud but of stone.) In the centre stood a large antheap****.* **[Great Enclosure and Conical Tower?]** *On the antheap grew a tree. The maiden was brought into the place of sacrifice. The entrance was closed with heavy stones. Every day the grown wasarre brought the Mukaranga food and drink. They handed it down over the wall. The Wakaranga kept watch to see that no man approached the place of sacrifice.*

The maiden grew. ***Two years passed*** *before the maiden was grown and had breasts. In the course of these two years no rain fell. All the cattle died. Many people died. The rivers dried up. The grain did not take root. One day the maiden was marriageable.*

The Wanganga went to the king. The Wanganga said: 'The Mukaranga is marriageable. The Mbila can begin.' The king summoned all his people. The people gathered at the place of sacrifice. The Wanganga opened the entrance to the place of sacrifice. The Wanganga dug out a chamber beneath the roots of the tree on the antheap. The Wanganga shouted (sang) the Mizimu (Unfortunately it was impossible to obtain the exact text of the song). The Wanganga strangled the Mukaranga. The people danced around the place of sacrifice. The Wanganga buried the maiden in the antheap beneath the roots of the great tree. The priests shouted the Mizimu. The people danced around the place of sacrifice.

As soon as the Mukaranga was buried beneath its roots, the tree began to grow. The tree grew and grew. It grew the whole night through. The tree grew for three days. For three days the people danced. As the morning drew near again the crown of the tree reached the sky. ***In the sky there appeared the morning star (Venus) for the first time (after having set as the evening star some time before)****. The crown of the tree spread out along the sky. One could no longer see the stars and the moon. A great wind came. The leaves of the tree turned into clouds. It began to rain. It rained for* ***thirty days****. Since then the Wazezuru sacrifice a maiden whenever there is a long drought".* (Frobenius & Fox 1938: 261-265).

[Concepts of Ant-heap associated with the Conical Tower and rain. Sacrifice and fertility and a 30 day period]

11 CONCLUSION

The Nasr idols were perched mythical vultures or hawks in 'Arabia Felix' amongst the proto-Semitic pre Islamic polytheistic deities. Nasr (Arabic: نسر "Vulture") shares an etymological relationship with the Great Zimbabwe soapstone birds, is it possible that the earliest traders from Arabia Felix brought with them the concepts of their deity before they were destroyed by Mohammed?

The formidable exchanges of ideas between the earliest trader regions and peoples cannot be ignored and seems to have introduced the external aspect of formative cultural formation of the southern Bantu together with the inherent nucleus of hunter-gatherer San and Khoi. The oral traditions recorded from the descendants of these origins are contaminated by colonial aspirations and tribal state formations. The trader descendant Lemba have the widest variety of mixing into several descendant cultural groups emanating from Great Zimbabwean origins and have provided a rich oral tradition specifically in relation to astronomical knowledge systems.

It is not by chance that the two examples of oral legends or folklore as recorded by Leo Frobenius should have days relating to times of disappearance and appearance of the Venus synodic period. The oral tradition clearly provides a means to formulating cycles non-literally. Even the naming of Venus as a morning star and then evening star requires skilled perception that involved years of careful observation.

The Dhlo-dhlo stone has pock marks arranged in squares. They are not haphazardly pecked in a random artwork. This requires certain forethought as if intentionally arranging the differences expected through prior observation of an astronomical event. The crescent and circle symbols on the stone either refer to the waxing and waning of Venus or a partial or full eclipse of the moon or sun and crescent shadows are made during an eclipse of the sun.

Hostetter provides an elaborate explanation of carved symbols on a bowl that somehow draw attention to the possibilities of non-literate records that may exist in the bowls for astronomical reasons. Although his estimates of age are unfounded when compared with the mediaeval Islamic divination and astrological bowls, evidence is clear of the potential use of the bowls as a form of recording for instance the Venus synodic period. Perhaps in an attempt to foresee eclipses.

Lemba ethnography similarly confirms the divination bowls of southern Africa to have a predictive capability and calendrical tool. They are used to visualize lunar movements through the year and have a central cowrie placed in some sort of form of calibration. With the aid of this ‘sidereal calendrical’ device the Lemba were known to predict the weather in advance.

Machema holds clues to the mysteries of Mapungubwe and Great Zimbabwe and was researched by J B de Vaal over decades. The research is housed in the Mapungubwe Archive of the University of Pretoria and was compiled after his death by his son years later and is vital to understanding the relationship of the Lemba people to the Shona and Venda. The ‘so-called’ decoration in the western wall at Machema requires more research and it was always my contention before seeing de Vaal’s report that it is an inscription of great value rather than a decoration.

The conjunction of Venus and the new crescent moon appears to have been ‘tabulated’ somehow into the bowls and the Tshimedzi Moon (conjunction of Tuda asterism and new moon) provided a form of reckoning time. The Lemba still today shave their heads at a new moon and meet in a large gathering at the time when Tshimedzi moon and Venus appear in conjunction at the vernal equinox.

The vernal equinox, Tshimedzi moon and the conjunction of Venus may be the ideal sort for, for timing the selection of the king's wives. As can be inferred from the oral legends, domba dances and songs dealing with Venus, the time for procreation of a future queen is when Venus disappears at the vernal equinox and the birth occurs at the reappearance of Venus at the winter solstice. Detailed evidence relating to the supposed legendary home of the queens is provided for the Great Enclosure at Great Zimbabwe. Venus synodic movements are marked by stelae on the outer wall and are dealt with in a separate chapter.

The relationship of Venus is paramount to understanding many features in southern African cultures since the mediaeval trader era and remnants can be found in the ethnography recorded amongst the descendants of the origins mythology. Specifically to do with the fertility of the land through trade, rain and procreation. Ideals based on astronomical metaphors and further perpetuated through the subsequent successes and failures of the earliest agriculture of the land and the concept of Nehanda, as svikuro of Venus, speaks volumes in this regard.

12 REFERENCES

Abdullah Yusuf Ali. Ibn al-kalbi's Kitrâb-ul-asnâm, of the late second century of the Hijra. pp. 1612-1623 of the holy Qur'an, text, translation and commentary. 1946.

Aveni, Anthony, Stairways to the Stars – Skywatching in Three Great Ancient Cultures. (John Wiley & Sons, Inc. Astronomy in the Maya Codices. 1997).

Aveni, Anthony, Africa's Socialized Astronomy, (Ancient Astronomers, Montreal: St. Remy Press, 1993).

Bednarik, G. B. 'The global evidence of early human symboling behaviour', Human Evolution Vol. 12, no. 3 (1997), pp. 147–168.

Bednarik, R.G., 'Wonders of Wonderwork Cave', The Artefact Vol. 16 (1993), p 61.

Beaumont, P., de Villiers, H. & Vogel, J., 'Modern man in sub-Saharan Africa prior to 49,000 B.P.: a review and evaluation with particular reference to Border Cave' South African Journal of Science Vol. 74 (1978), pp. 409–419.

Beaumont, P., 'The time depth of aesthetic and symbolic behaviour in southern Africa'. Paper presented to the Biennial Conference of the Southern African Association of Archaeologists, Johannesburg. 1992.

Blacking, John. 'The Great Enclosure and Domba' Man Vol. 20 (1985) pp.542-3. Page 76-99.

Brooks, A.S. & Smith, C.C. 'Ishango revisited: new age determinations and cultural interpretations', The African Archaeological Review, 5 (1987), pp. 65-78.

Bunton, George and Ciotti, Joseph. 'Stonehenge A Fifty-Six Year Eclipse Cycle?' Griffith Observer, (April 1976).

Casson, Lionel. The Periplus Maris Erythraei: Text With Introduction, Translation, and Commentary. (Princeton University Press, 1989). ISBN 0-691-04060-5.

Clark, Stuart and Carrington, Damian. 'Eclipse Brings Claim of Medieval African Observatory'. (12:53 04 December 2002) © Copyright Reed Business Information Ltd. NewScientist.com. http://www.newscientist.com/news/print.jsp?id=ns99993137.

Davis, S. 'Diving Bowls: Their Uses and Origin: Some African Examples, and Parallels from the Ancient World'. Man – Royal Anthropological Institute of Great Britain and Ireland. Vol. 55, (Sep., 1955), pp. 132 – 135.

d'Errico, F. 'Palaeolithic Lunar Calendars: A Case of Wishful Thinking?' Current Anthropology, Vol. 30, No. 1 (Feb., 1989), pp. 117–118.

de Heinzelin, Jean. 'Ishango', Scientific American, 206:6 (June 1962) 105-116.

de Vaal, J.B. (edited by de Vaal P) Die Matšhema Bouval. Mapungubwe Archive 2002 – University of Pretoria, South Africa.
Duffey, Alex, 'Mapungubwe: Interpretation of the Gold Content of the Original Gold Burial M1, A620'. Journal of African Archaeology, Volume 10 (2), 2012, pages 175-187, DOI 10.3213/2191-5784-10223.

Frank, M. R., Bengoa, J. A. Hunting the European sky-bears: on the origin of the non-zodiacal constellation. In Ruggles, C., Prendergast, F., Ray, T. (eds) Astronomy, Cosmology and Landscape. (Leicester: Ocarina Books 2001) pp 15–44.

Freeman-Grenville, G.P.S. Select Documents from the First to the Earlier Nineteenth Century (Clarendon Press. Oxford 1962).

Frobenius Leo & Fox Douglas C. African Genesis: Folk Tales and Myths of Africa. (Faber & Faber Ltd UK 1938). pp 237-242; 261-265

Frobenius, Leo Erythräa: Lander und Zeiten des heiligen Königsmordes. (Berlin: 1931. Atlantis Verlag).

Gerdes, Paulus. On The History of Mathematics in Africa South of the Sahara, African Mathematical Union, Commission on the History of Mathematics in Africa. 1991.

Gibbon, W. B. 'Asiatic Parallels in North American Star Lore: Ursa Major', The Journal of American Folklore, Vol. 77, No. 305 (1964) pp. 236–250.

Hawting, G.R. The idea of idolatry and the emergence of Islam: from Polemic to History (Cambridge Studies in Islamic Civilization) Kitab al-aṣnām / 'an abī al-mundhir hishām ibn muḥammad ibn al-sāʾib al-kalbī ; bi-taḥqīq aḥmad zakī. Aḥmad zakī, 1866 (ca.)-1934. Published al-qāhirah : al-maṭba'ah al-amīrīyah, 1914. Original from Cornell University. And Ibn al-kalbī, d. 819? Kitāb al-aṣnām / 'an abī al-mundhir hishām ibn muḥammad ibn al-sāʾib al-kalbī ; bi-taḥqīq aḥmad zakī. (al-qāhirah : al-maṭba'ah al-amīrīyah. Published al-qāhirah: al-maṭba'ah al-amīrīyah, 1914. Http://onlinebooks.library.upenn.edu . Cambridge university press. 1999.
Al-muqaddasarabianblog.blogspot.com/2011/09/deity-nasr.html

Henshilwood, Christopher S., et al. 'A 100,000-Year-Old Ochre-Processing Workshop at Blombos Cave, South Africa'. Science, 334 (2011), pp 219-222.

Henshilwood, C.S. Origins of symbolic behaviour. In: McGraw-Hill Yearbook of Science & Technology 2013.

Huffman, T.N. 'The soapstone birds from Great Zimbabwe'. African Arts, 18 1985, pp 68-73.

Huffman, T.N. Snakes and Crocodiles: power and symbolism in ancient Zimbabwe. Johannesburg: Witwatersrand University Press 1996.

Hostetter, Clyde. Star Trek to Hawa-i'i : Mesopotamia to Polynesia. (San Luis Obispo, California: Diamond Press 1991.

Hostetter, Clyde. 'The Bowl of Ishtar', Griffith Observer, Volume 43, Number 7, July 1979, pages 14-?).

Hostetter, Clyde. 'A 56-Year Eclipse Prediction System', Archaeoastronomy: The Bulletin of The Center for Archaeoastronomy, Volume III, Number 2, April-June 1980, pp 29-30.

Joseph, R. 'Evolution of Paleolithic Cosmology and Spiritual Consciousness, and the Temporal and Frontal Lobes'. Journal of Cosmology, 14. (2011)

King, David . 'The Sacred Geography of Islam'. In Koetsier, Teun; Bergmans, Luc. Mathematics and the Divine: A Historical Study (1st ed.). Amsterdam: Elsevier Science. pp. 161–178. 2005. ISBN 0-444-50328-5.

Krupp, E.C. 'E. C. Krupp winks at the Sphinx from Giffith Observatory in Los Angeles'. Sky & Telescope. March 2001.pg 86-88 http://www.siloam.net/denderah/marchs&t/krupp.html

Lan, David. Guns & Rain : Guerrillas & Spirit Mediums in Zimbabwe._James Currey London and University of California Press Berkeley and Los Angeles 1987.

Latham, C.K.J. 'Mwari and the divine heroes : guardians of the Shona : pan Shona religion as an inspiration for nationality'. (M.A. Thesis Rhodes University, Grahamstown 1986).

Le Roux, Magdel. The Lemba: A lost Tribe of Israel in Southern Africa? University of South Africa Press 2003.

Lewicki,T. 1974. 'Arabic External Sources For The History of Africa To The South Of Sahara'. Polska Akademia Nauk - Oddzial W Krakowie. Prace Komisji Orientalistycznej Nr 9. London - Curzon Press, Lagos - Pilgrim Books (1974)

Marshack, A. The Roots of Civilization. London: Thames & Hudson 1972.

Matenga, Edward. Soapstone Birds of Great Zimbabwe: Symbols of a Nation. (Harare: African Publishing Group 2008) ISBN 978-1779011350.

Mathivha, M.E.R. The Basena / Vamwenye / Balemba. Morenster. Published by Prof. M E R Mathivha Copyright © 1992 First Edition/ First impression 1992 Morester Printers (01521) 931831 South Africa.

N.H.W. 'Note on Darwin Ritual Murder'. N.A.D.A. - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. pg. 61 - 62. (Edited by Guy A. Taylor. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers).

Pásztor, E. 'Retracing Ancient Cosmologies in Bronze Age Central Europe: a Prehistoric Puzzle'. Journal of Cosmology. Vol 9 (2010). Online, Open Access.

Pásztor, E. and Priskin, A. 'Celestial symbols revisited. Palaeolithic sky lore: fiction or fact?' Interdisciplinaria Archaeologica – Natural Sciences in Archaeology (2011) (IA NSA)

Pouwels, Randall L. The African and Middle Eastern World, 600-1500. Oxford University Press. 2005. pp. 130–1. ISBN 9780195176735.

Rappenglück, A. M. A 'Paleolithic Planetarium Underground – the Cave of Lascaux' Migration & Diffusion, Volume 5, Issue Number 19, p. 6–47. (Odyssee-Verlag-Wien 2004).

Robinson, Judy. 'Not counting on Marshack: a reassessment of the work of Alexander Marshack on notation in the Upper Palaeolithic'. Journal of Mediterranean Studies vol 2, no.1, pp 1-16 1992.

Rogers, J. H. 'Origin of the ancient constellations: I. The Mediterranean traditions'. Journal of the British Astronomical Association vol 108 no 2 pp 79-89 1998.

Rossano, M. J. 'Making Friends, Making Tools, and Making Symbols' Current Anthropology Volume 51, Supplement 1, June. S89-S97 (2010).

Roy, A.E. 'The origin of the constellations'. Vistas in Astronomy vol 27, pp 171–197, 1984.

Schmidt, Mark 'Von Hüten, Kegeln und Kalendern oder Das blendende Licht des Orients', Ethnographisch-Archäologische Zeitschrift. Berlin 43.2002, p. 499-541. ISSN 0012-7477

Singer, R. & Wymer, J., The Middle Stone Age at Klasies River Mouth in South Africa. (Chicago: University of Chicago Press 1982).

Severin, Tim. The Sinbad Voyage. (Hutchinson, London, England 1982).

Springer, Tobias. 'The Golden Cone of Ezelsdorf-Buch: A Masterpiece of the Goldsmith's Art from the Bronze Age', in: Gods and Heroes of Bronze Age Europe, Strasbourg 2000; p. 176-181

Stayt, H.A.. 'Notes on the Balemba'. The Journal of the Royal Anthropological Institute of Great Britain and Ireland, Vol. 61 (Jan. - Jun., 1931), pp. 231-238. Page 232.

Thomas, M.G, Parfitt, T, Weiss, D.A, Skorecki, K, Le Roux, M, Bradman, N & Goldstein, D.B. 1999. 'Y- Chromosomes Travelling South: The Cohen Modal Haplotype and the Origins of the Lemba - The "Black Jews of Southern Africa"'. University College of London - Dept. of Biology. American Journal of Human Genetics vol 66 no 2, 2000, pp 674-686.

Thompson G.D 'Critique of Clyde Hostetter's Ideas on Mesopotamian Bronze Age Astronomy'. accessed Saturday, April 5, 2014, 2.00 am http://members.westnet.com.au/gary-david-thompson/page9n.html

Tiley, Sian & Webster, Roger (ed) The 2004 Mapungubwe Calendar. Editorial. In Mapungubwe Museum. Mapungubwe Archive, Pretoria University. Pretoria University Press 2004. .

van Binsbergen, W.M.J., 'Transregional and historical connections of four-tablet divination in Southern Africa', Journal of Religion in Africa, vol 26, no 1 (1996) pp 2-29

van Binsbergen, W.M.J., 'The astrological origin of Islamic geomancy', paper read at The SSIPS/ SAGP 1996, 15th Annual Conference: 'Global and Multicultural Dimensions of Ancient and Medieval Philosophy and Social Thought: Africana, Christian, Greek, Islamic, Jewish, Indigenous and Asian Traditions', Binghamton University, Department of Philosophy/ Center for Medieval and Renaissance studies (CEMERS), October 1996 (PDF)

van Binsbergen, W.M.J., 'Cupmarks, stellar maps, and mankala board-games: An archaeoastronomical and Africanist excursion into Palaeolithic world-views'. 2004.

Van Warmelo. The Copper Miners of Musina and the Early History of the Zoutpansberg: Vernacular accounts by S.M. Dzivhani, M.F. Mamadi, M.M. Motenda,, E. Mudau in Ethnological Publications Vol. VIII Edited and supplemented by other material by N. J. VAN WARMELO Government Ethnologist - Department of Native Affairs. Printed in the Union of South Africa by the Government Printer, Pretoria 1940 (G.P.S. 1843-1940-800).

Varisco, D. 'The Origin of the Anwâ' in Arab Tradition'. Studia Islamica, vol 74, 1991, pp 5-28.

Vértes, L. '"Lunar Calendar" from the Hungarian Upper Paleolithic'. Science vol. 149. 20 August 1965. pp. 855–856.

Villiers, A. Sons of Sinbad. (Charles Scribner's Sons. New York 1969).

Volman, T., 'Early prehistory of southern Africa'. In (R. Klein, ed.) Southern African prehistory and palaeoenvironments, pp. 169–220. (Rotterdam: Balkema 1984).

Von Sicard, H. 'Karanga Stars'. NADA vol 9, no 45. Published by the Southern Rhodesia Native Affairs Department 1966. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Wade, Richard Peter, 'A Systematics For Interpreting Past Structures With Possible Cosmic References In Sub-Saharan Africa'. (M.Sc. Thesis. 2009, University of Pretoria) http://upetd.up.ac.za/thesis/available/etd-05052009-174557/

Wade R.P, Eriksson, P.G, Duncan G.A, Rautenbach C.J de Wet. 'Southern African cosmogenic geomythology ("following a star") of the Zion Christian Church'.Volume 69 No.2. Transactions of the Royal Society of South Africa. (Taylor & Francis U.K. 2014).

Wendt, W.E., 'Art mobilier aus der Apollo 11 Grotte in Südwest-Afrika'.Acta Praehistorica et Archaeologica, vol 5, 1974, pp 1–42.

Wilk, S.R. Medusa: Solving the mystery of the Gorgon. (Oxford 2000).

Wilson, Agnes. 'The Human Sacrifice'. N.A.D.A. - The Southern Rhodesia Native Affairs Department Annual, No. 9, 1931. pp. 6 - 10. (Edited by A. B. D. Spicer. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers).

Zaslavsky, Claudia: 'Women as the First Mathematicians', International Study Group on Ethnomathematics Newsletter, Volume 7 Number 1, January 1992.

CHAPTER THREE

Astronomical Observations and Computer Simulations for the Great Enclosure of Great Zimbabwe in the Mediaeval Trade Network Era

Abstract

This study attempts to show the correlation between monoliths that were placed into the outer main wall of the Great enclosure at Great Zimbabwe and celestial movements. In surveys comparing the earliest and recently recorded digitized geomatics as well as planetarium software for simulation of the skies at Great Zimbabwe, observations revealed significant alignments with structures.

The Platform Area and eastern-facing main outer wall of the Great Enclosure appear to have been used to reference celestial movements of the Sun, Venus and Moon, with the Small Conical Tower specifically relating to these celestial movements and heliacal appearances in a pre-walling phase.

The sub-luminous supernova remnant RX J0852.0-4622 / G266.2-1.2 comes into view at the reconstructed tip of the Large Conical Tower from the same vantage point.

Key Words:, Venus synodic period, Geomythology, Star lore, Gestation, Mapungubwe, Great Zimbabwe, East African Trade Network, Indigenous Knowledge, RX J0852.0-4622, G266.2-1.2.

13 INTRODUCTION

13.1 Aim

To determine any significant relationship between the celestial movements and appearances and the structures built in reference to these movements and appearances. Search for Venus or Moon and Sun alignments with mainly the structures at east-facing wall of great enclosure at great Zimbabwe as seen from the Platform Area vantage point. Ascertain the starting points on the horizon or monoliths on the wall of the morning appearance of Venus.

13.2 Hypotheses

That the small conical tower was used as a reference for vernal/autumnal equinox sunrise, moon and Venus from the Platform area? And that there may be a correlation between monoliths and celestial events for timing.

13.3 Method

Using Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform. And confirmed with early surveys of the Great Enclosure by Franklin Wright (in MacIver, R.D. 1906. Medieval Rhodesia. London. Macmillan. Page 74 plate XXV Plan drawn and surveyed by Franklin White - President of the Rhodesian Scientific Association). And again by Heinz Ruther. See Photogrammetric image calibrated 2007. Ruther et al 2008. ALUKA. University of Cape Town. Geomatics. http://www.aluka.org/action/showMetadata?doi=10.5555/AL.CH.DOCUMENT.UCTZIM0000101

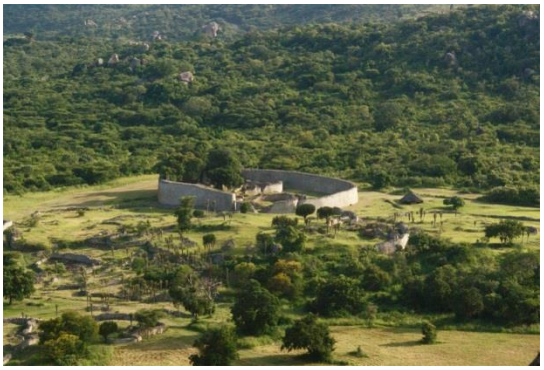


Figure 35 Great Zimbabwe Great Enclosure viewed from Hill-Top Complex. (Rüther et al., 2008). ALUKA University of Cape Town, Geomatics. http://www.aluka.org/action/showMetadata?doi=10.5555/AL.CH.DOCUMENT.UCTZIM0000762

The Great Enclosure was built over roughly 200 years and the platform and the small conical tower were later surrounded by the high outer wall. The outer wall and the large conical tower appear to have been built at 1320 +/- 30 C.E.

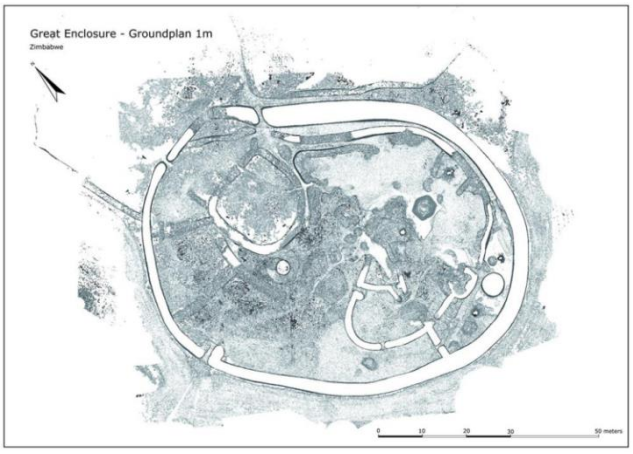


Figure 36 Ground plan of Great Enclosure at Great Zimbabwe. (Rüther et al., 2008). ALUKA University of Cape Town, Geomatics. http://www.aluka.org/action/showMetadata?doi=10.5555/AL.CH.DOCUMENT.UCTZIM0001486

Various observations made on site together with indigenous knowledge and historical ethnographic data, inferred Venus as an object of tentative veneration that initialized the survey of the Venus synodic period from various points at Great Zimbabwe.

The Platform Area in the Great Enclosure, as determined by Franklin White (MacIver, 1906:74 plate XXV), in accordance with the sporadic array of the monoliths in the outer wall, drew attention that something was possibly being observed and marked from that point. The

stelae in the outer walls are not equidistant from one another and steadily become compacted to one side on the wall.

The monoliths are roughly 2m length long stones placed into the wall that is widest on the eastern side of the Enclosure. There are hardly any found to have existed on the western thinner wall.

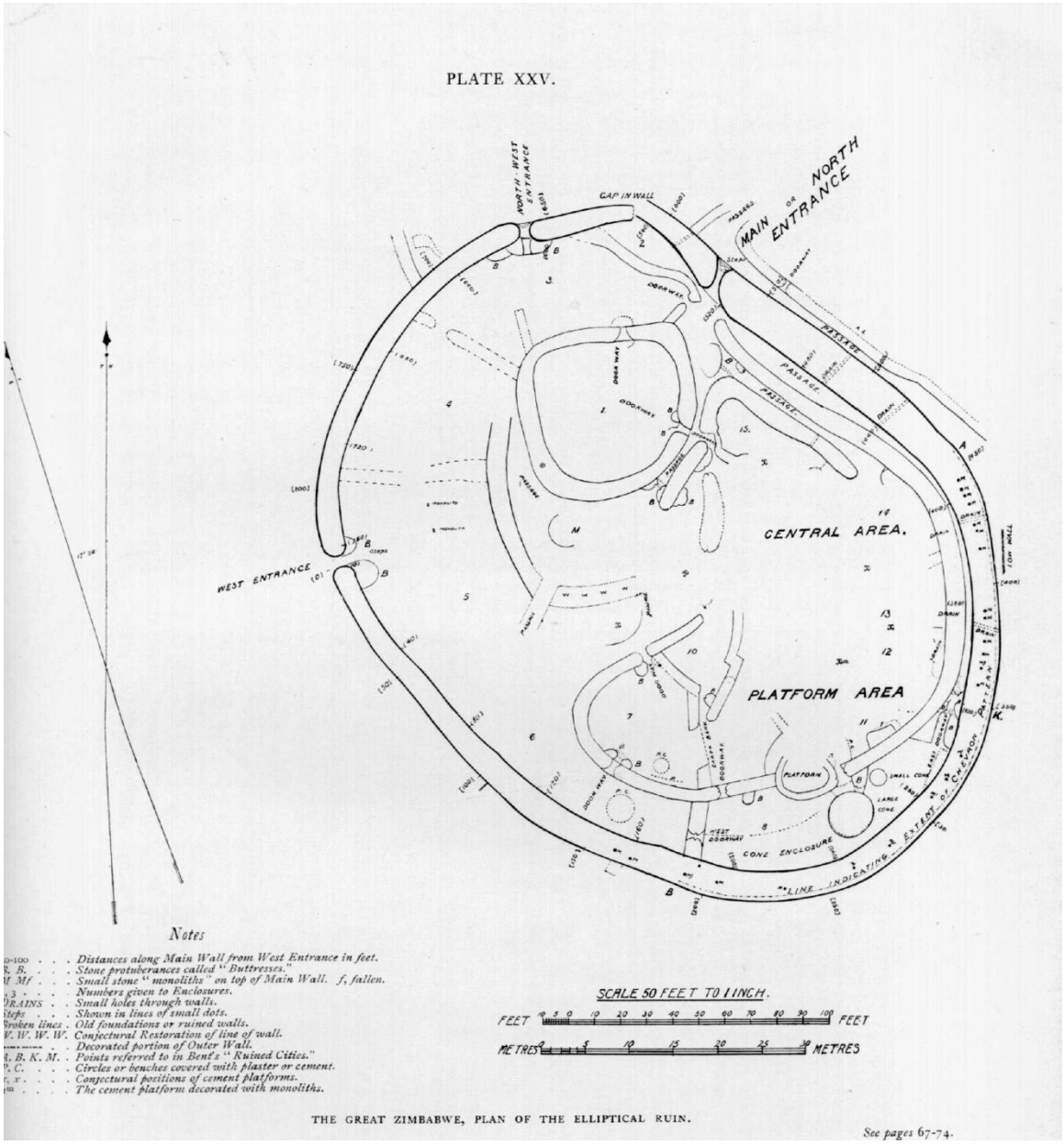


Figure 37 Plan of Great Enclosure surveyed and draughtsmanship by Franklin White (MacIver, 1906:74 plate XXV).

The equinox sunrise over the Small Conical Tower from this vantage seemed strangely coincidental and led to related likewise observations of the Moon and Venus and what the Large Conical Tower may possibly mark.

Venus synodic patterns, such as noted in Meso-American contexts (Aveni 1997) drew comparisons specifically when viewed from the Platform Area.

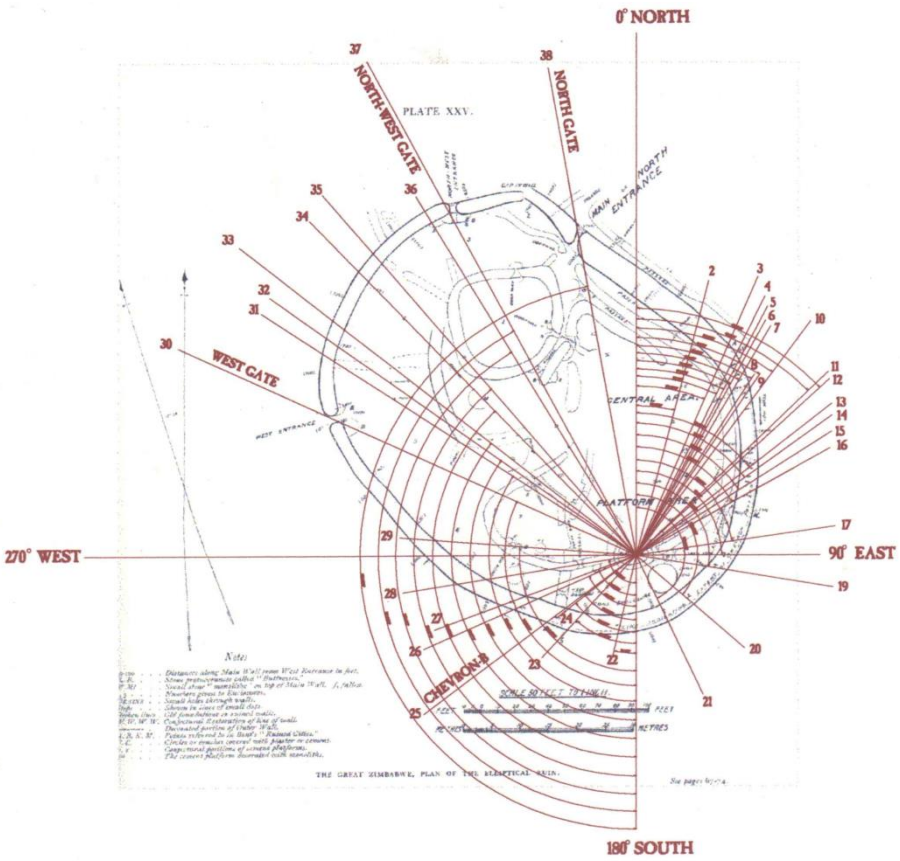


Figure 38 Plan of Great Enclosure surveyed and draughtsmanship by Franklin White (MacIver, 1906:74 plate XXV). Reconstruction of alignments – RP Wade (Wade 2009)

The disconformity of the stelae on the outer wall of the Great Enclosure of Great Zimbabwe, regarded as male symbols used in status (Huffman 1996) and coincidental alignments from the Platform Area of Venus and the stelae drew attention to recording the full synodic pattern as denoted further in this text.

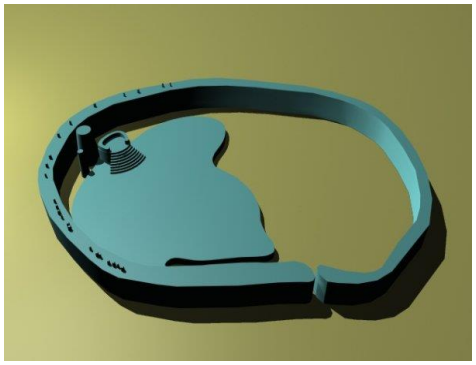


Figure 39 Reconstruction of Great Enclosure at Great Zimbabwe showing extent of monoliths in relation to the platform area and conical towers by Jan-Willem Van Bergen and Richard Peter Wade

The relationship of ‘Pattern 5’ (detailed in section 2, below) and the stelae from the Platform vantage particularly corroborated the possibility of astronomical intention.

Figure 40 The ruined Platform Area and the Large Conical Tower in the Great Enclosure at Great Zimbabwe. Photogrammetric image calibrated 2007. (Ruther et al., 2008). ALUKA. University of Cape Town. Geomatics. http://www.aluka.org/action/showMetadata?doi=10.5555/AL.CH.DOCUMENT.UCTZIM0000101

Figure 41 Large Conical Tower at Great Enclosure of Great Zimbabwe. (Nadine Broodryk van De Wetering for scale – Photographed by R Wade).

Figure 42 Small Conical Tower at Great Enclosure of Great Zimbabwe. . (Nadine Broodryk van De Wetering for scale – Photographed by R Wade).

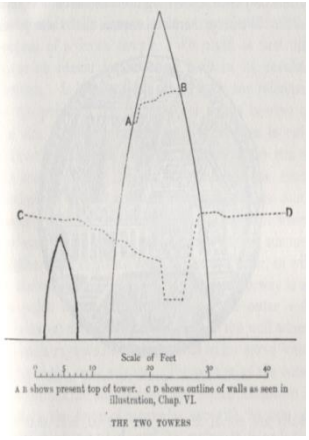


Figure 43 Large Conical Tower and Small Conical Tower in the Great Enclosure at Great Zimbabwe. As reconstructed by Bent & Swan (Bent, 1893:157).

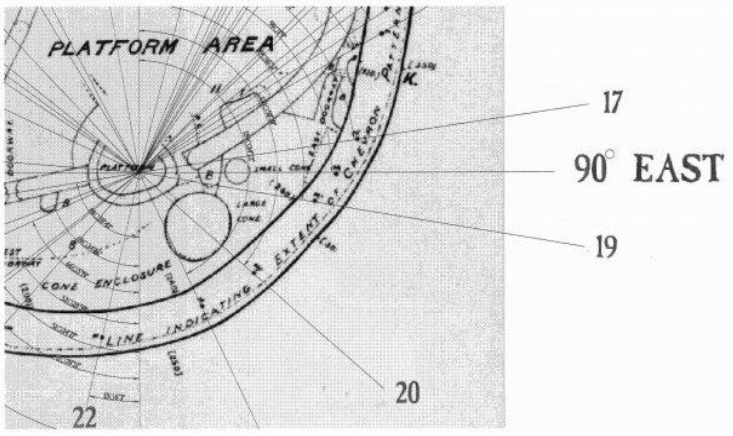


Figure 44 Detail of Plan of Great Enclosure surveyed and draughtsmanship by Franklin White (MacIver, 1906:74 plate XXV). Detail of reconstruction of alignments – RP Wade

14 Observations and Planetarium Software Simulations for the Great Enclosure at Great Zimbabwe

The random hypothetical dating for these simulations of Venus against the back drop of the Main Wall has been selected from 1339 C.E. to 1348 C.E. The Venus synodic period patterns and various significant possible alignments or cosmic reference markers are presented together with simulation of the skies as follows:-

14.1 Pattern one (morning star for 271 days – 8 months 3 weeks 5 days)

1st Appearance of Venus on horizon May 13th 1339 07h07

Venus aligns with Monolith no.13 May 20th 1339 07h07

Venus occults Moon on September 1st 1339 07h07 (no alignment with wall)

Venus occults Jupiter on September 28th 1339 07h07 (no alignment with wall)

Disappears behind the sun February 8th 1340 07h07 (no significant structural alignment)

Reappears as evening star April 3rd1340 07h01 after 54 days at western side (no significant alignment)

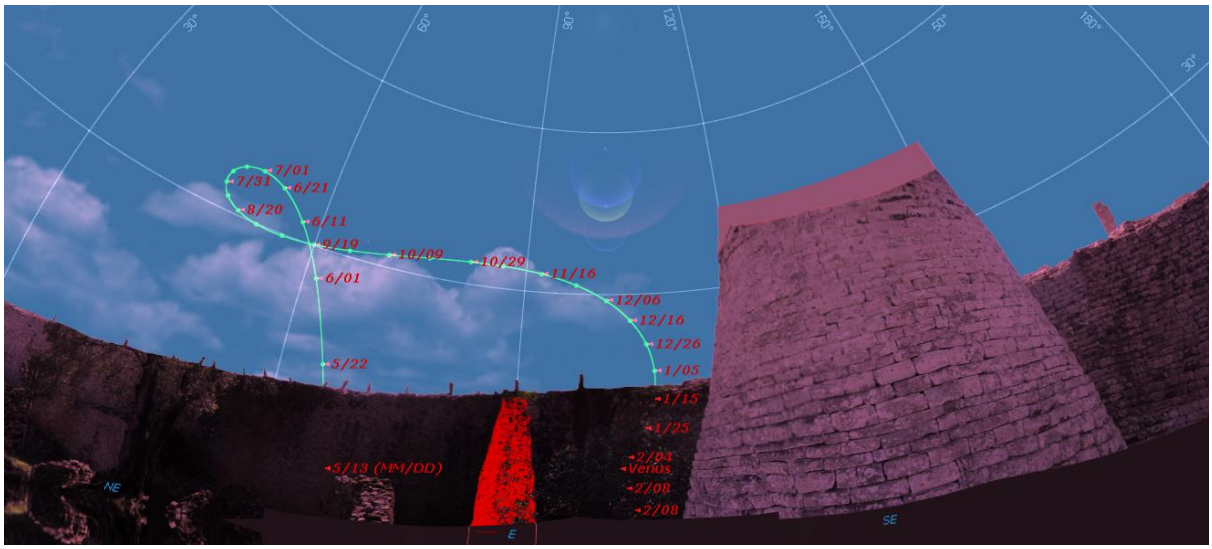


Figure 45 Pattern One - Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1339 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Disappearance after Pattern One for 54 days
- Evening Star after Pattern One for 247 Days

  (Occults Crescent Moon on wall at first evening appearance May 29th 1340)

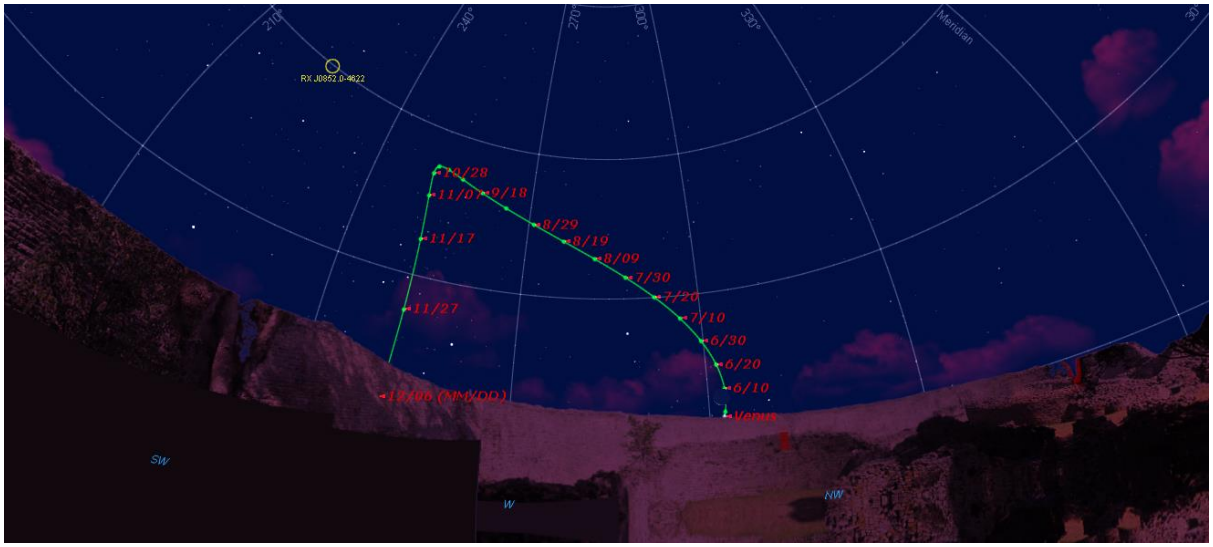


Figure 46 Evening Star after Pattern One - Simulation of Venus movement as Evening Star viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 1340 C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Disappears behind sun December 6th 1340 19h01 after being Evening Star for 247 Days (8 months, 3 days) No significant alignments with structures.
- Disappearance before Pattern Two for 10 days
- **TOTAL SYNODIC PERIOD** = 582 Days (271 + 54 + 247 + 10)

14.2 Pattern Two (Morning Star for 245 days – 8 months 2 days)

1st Appearance of Venus on horizon December 16th 1340 06h07. No significant alignment with structures.

1st appearance on wall December 29th 1340 06h07. (No significant alignment)

Moon rises as waning crescent (26.34 days old) on wall March 15th1341 with significant alignment of Small Conical Tower and monolith on wall. Significant conjunction with Venus at 30° altitude above same structures)

Venus disappears behind sun August 18th 1341 06h58 after being Morning star for 245 days (8 months, two days)

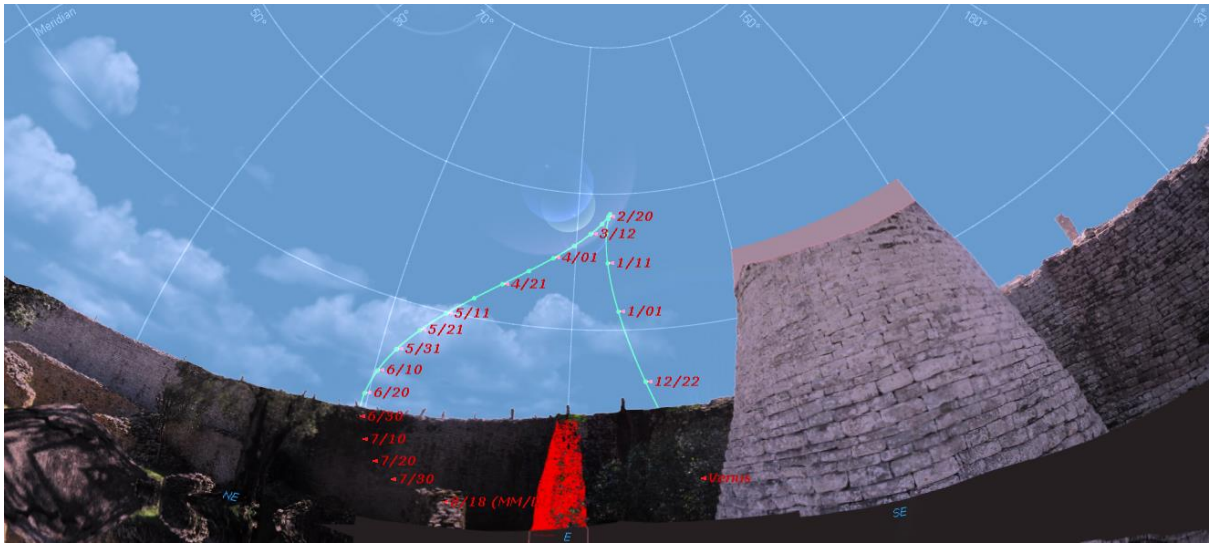


Figure 47 Pattern Two - Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1340 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Disappearance after Pattern Two for 60 days
- Evening Star after Pattern Two for 329 Days (10 months, 3 weeks, 4 days)

(Venus occults the 3.32 day old waxing crescent moon on the 10th March 1342 at 19h13)

(Venus disappears behind the western wall 29th June 1342 at 19h13 at an azimuth of 291° at an isolated monolith on the top of the wall.)

Venus disappears behind the sun on July 13th 1342 with no significant markers at 18h41.

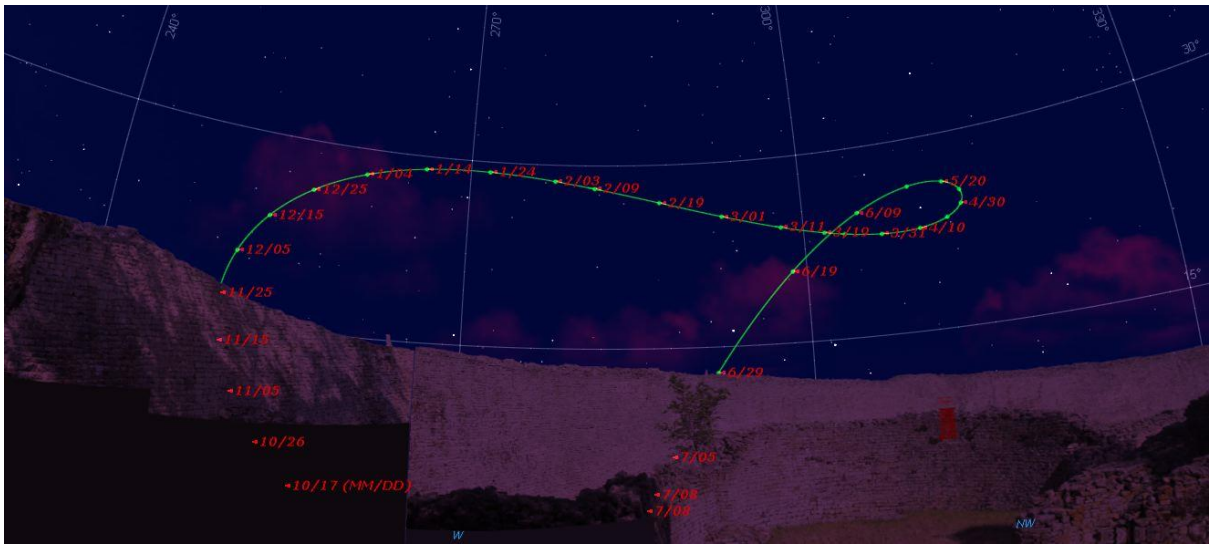


Figure 48 Evening Star after Pattern Two - Simulation of Venus movement as Evening Star viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 1342 C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009)

Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Disappearance before Pattern Three for 7 days
- **TOTAL SYNODIC PERIOD** = 641 Days (245 + 60 + 329 + 7)

14.3 Pattern Three (Morning Star for 266 days – 8 months, 3 weeks, 1 day)

1st Appearance of Venus on horizon July 20th 1342 07h15. No significant alignment with structures.

1st appearance on wall December 29th 1340 06h07. (No significant alignment)

Moon rises as waning crescent (28.18 days old) on wall February 24th1343 with significant alignment of Small Conical Tower and monolith on wall. Venus disappears behind the monolith on the wall and the small conical tower 12th March 1343 at 07h15 as a significant alignment. Disappears on the horizon 11th April 1343 at 06h56.

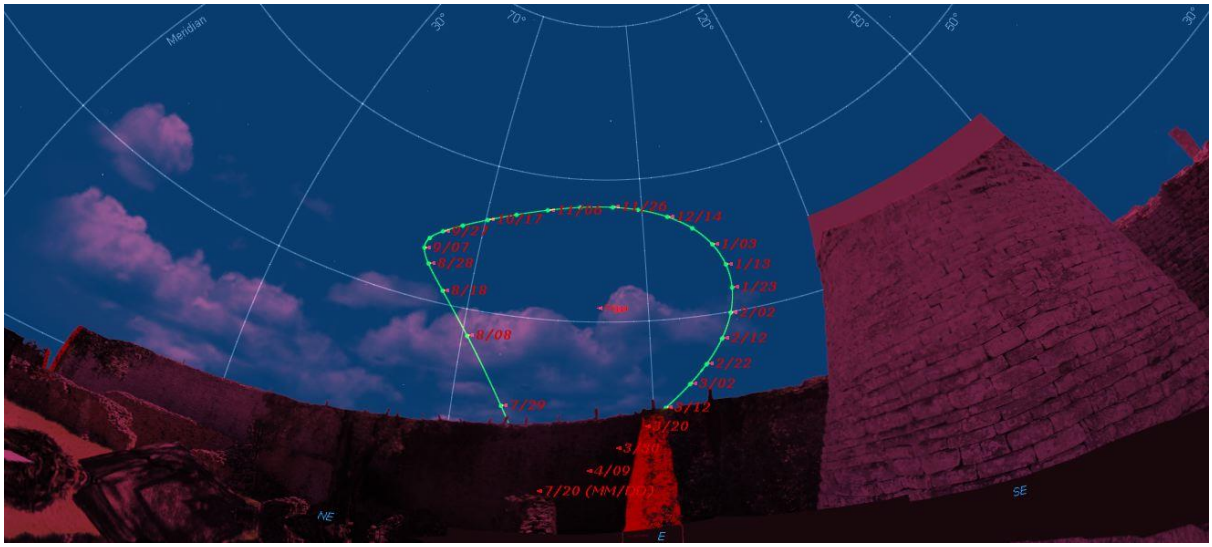


Figure 49 Pattern Three - Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1342 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Disappearance after Pattern Three for 52 days
- June 2nd 1343 reappears as evening star
- Evening Star after Pattern Three for 256 Days (8 months, 1 week, 4 days)

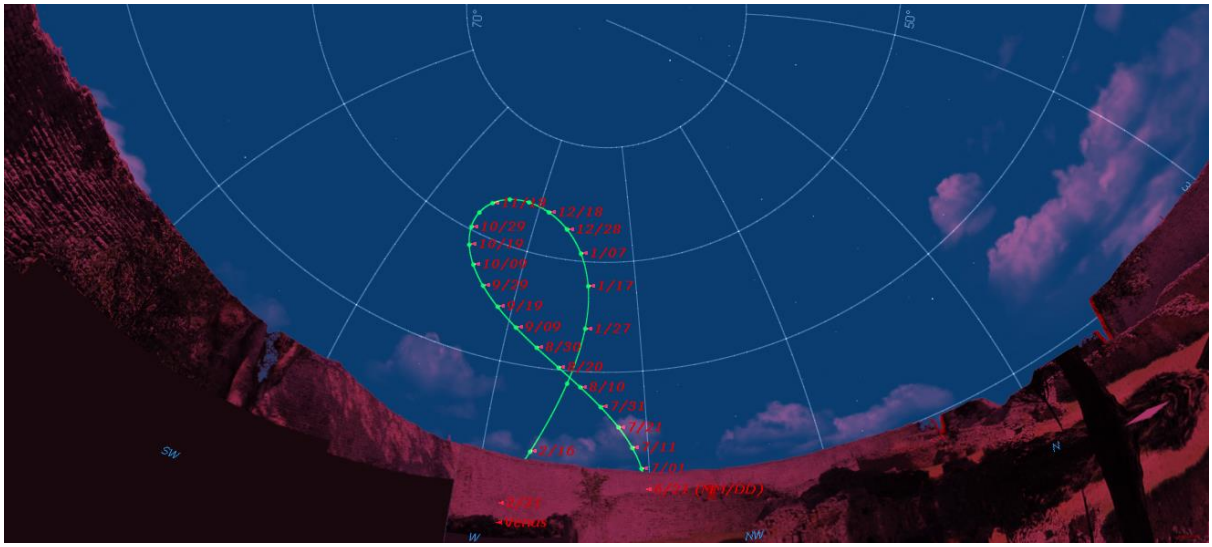


Figure 50 Evening Star after Pattern Three - Simulation of Venus movement as Evening Star viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 1342 C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Venus disappears behind the sun on February 13th 1344 with no significant markers
  at 19h38.

- Disappearance before Pattern Four for 14 days

- **TOTAL SYNODIC PERIOD** = 588 Days (266 + 52 + 256 + 14)

14.4 Pattern Four (Morning Star for 255 days – 8 months, 1 week, 6 days)

1st Appearance of Venus on horizon February 27th 1344 at 06h43. Very significant alignment with small conical tower.

1st appearance on wall March 10th 1344 06h38. (Significant alignment at small conical tower and monolith on wall). On March 13th 1344 at 06h38 the 27 day old waning crescent moon conjuncts with Venus above the small conical tower at 20° altitude. Venus disappears behind the wall at a monolith on August 6th 1344 06h38.

Venus disappears behind the sun 9th November 1344 at 05h59.

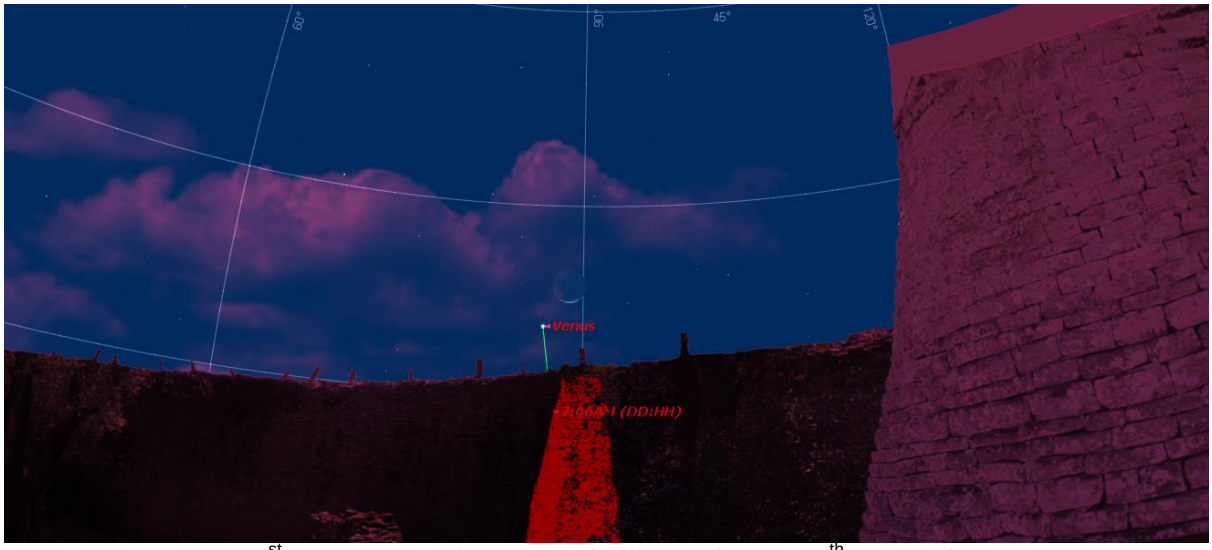


Figure 51 Pattern Four - 1st Appearance of Venus on horizon February 27th 1344 06h43. Very significant alignment with small conical tower and lunar crescent. Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1344 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

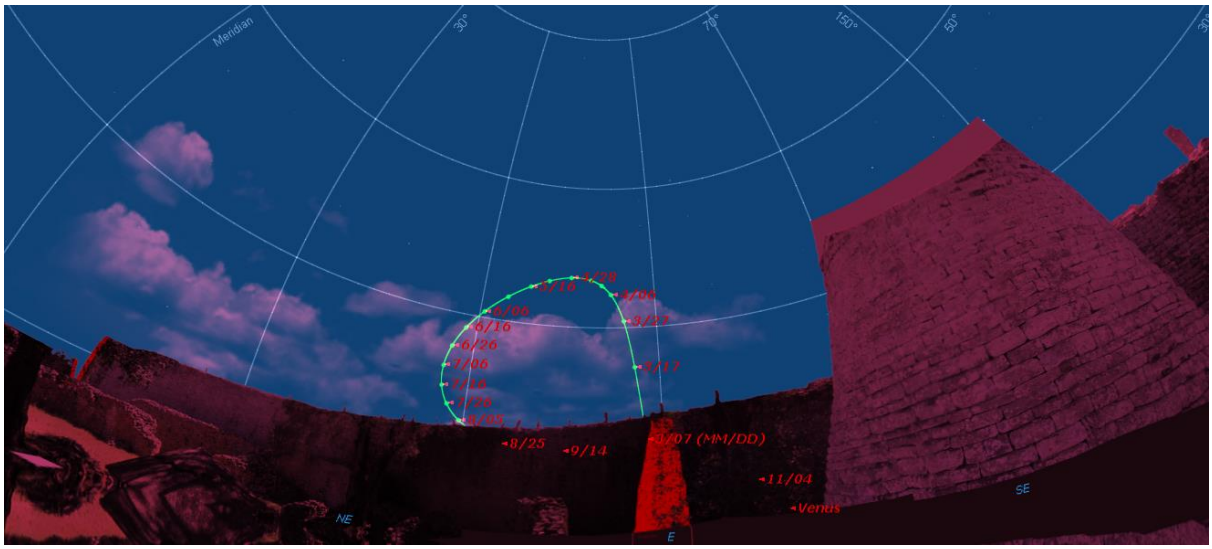


Figure 52 Pattern Four - Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1344 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Disappearance after Pattern Four for 50 days
- December 29th 1345 19h51 reappears as evening star. Significant conjunction with 1 day old waxing crescent moon at 2° above horizon at

azimuth 248° on 5th January 1345 19h57, including close conjunction with Jupiter and Saturn 9° away.

- Evening Star after Pattern Four for 267 Days (8 months, 3 weeks, 2 days)

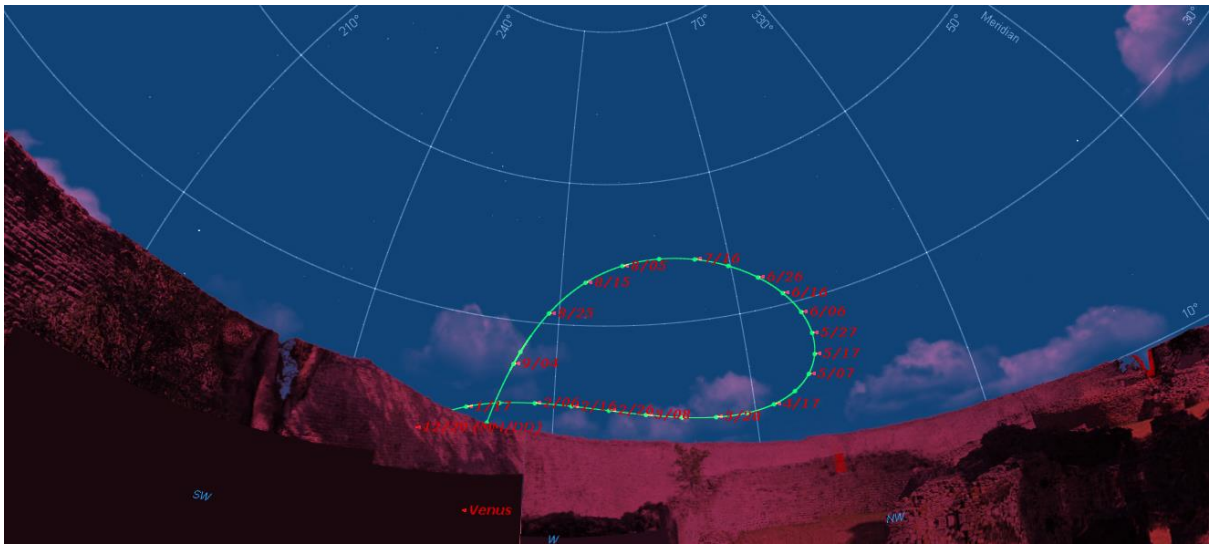


Figure 53 Evening Star after Pattern Four Simulation of Venus movement as Evening Star viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 1345 C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- 6th January 1345 19h40, 1.92 day old waxing crescent moon appears above the wall at 17° with very significant alignment of 1st solitary monolith on the wall at azimuth 263°.

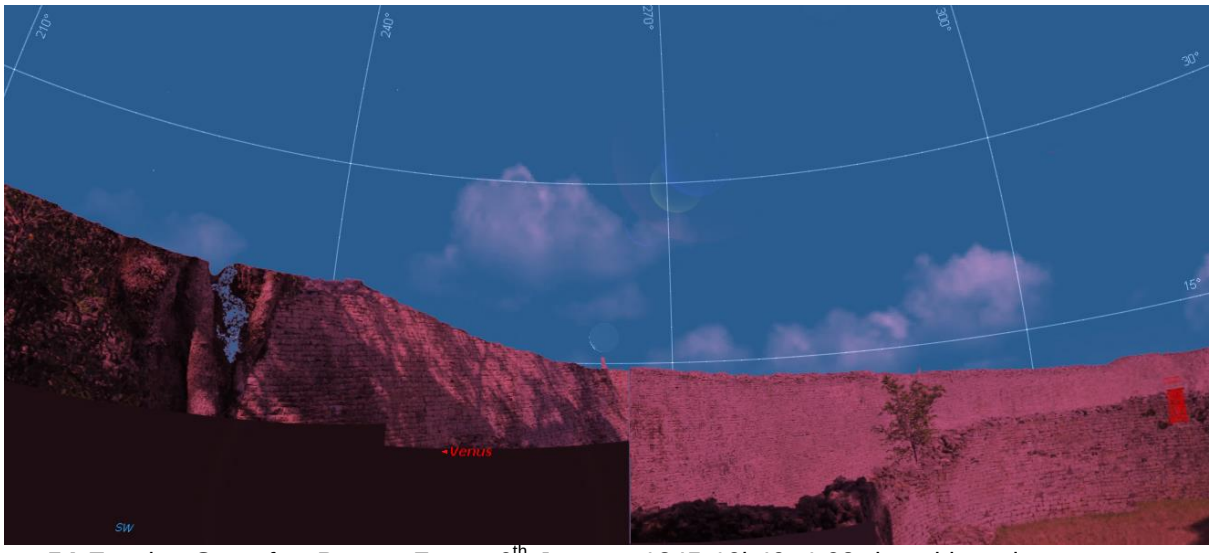


Figure 54 Evening Star after Pattern Four - 6th January 1345 19h40, 1.92 day old waxing crescent moon appears above the wall at 17° with very significant alignment of 1st solitary monolith on the wall at azimuth 263°. Simulation of Venus movement as Evening Star viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 1342 C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a

360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Venus appears on wall for first time as evening star 3rd February 1345 19h17 at azimuth 264°.

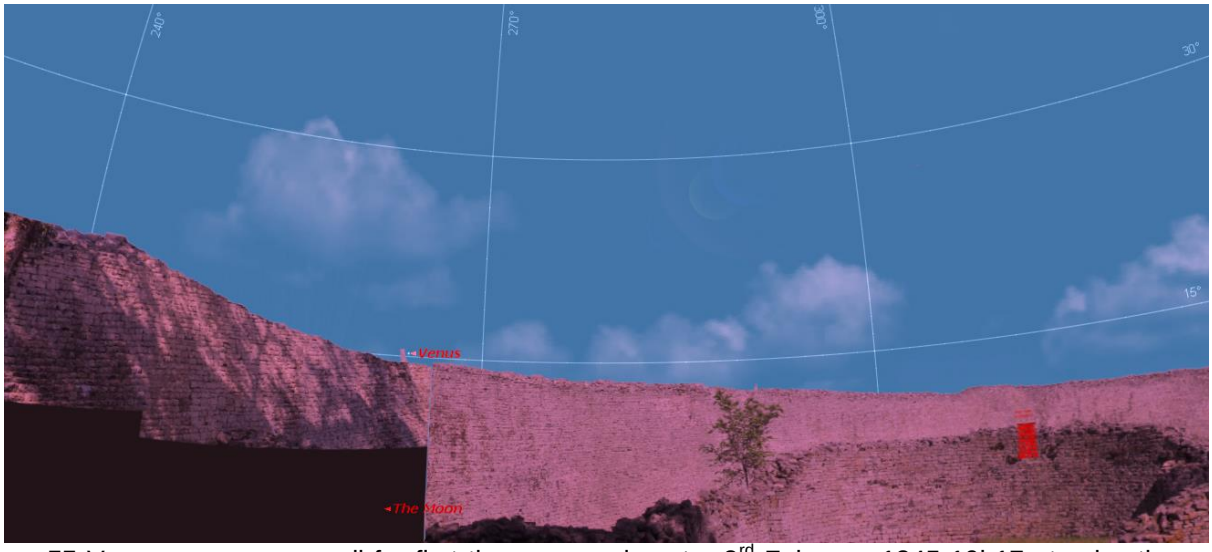


Figure 55 Venus appears on wall for first time as evening star 3rd February 1345 19h17 at azimuth 264°. Simulation of Venus movement as Evening Star viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 1342 C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S, 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Venus at 266° azimuth conjuncts with a 1.3 day old waxing crescent Moon in significant alignment with 1st solitary monolith on the wall.

- Venus travels along the height of the wall each evening from the 1st solitary monolith on the wall towards the western entrance and then conjuncts with the moon and a 3.81 day old waxing crescent moon in a significant conjunction at 29°altitude and azimuth 292° above 2nd solitary monolith near western entrance on 3rd July 1345 19h37.

- On 30th August 1345 19h37 Venus and 2.8 day old waxing crescent moon conjunct at 20° altitude as Venus in significant alignment with 1st solitary monolith near western entrance at 263° azimuth. 15th September 1345 is the vernal equinox.

- Venus disappears behind the sun on September 21st 1345 19h02 with significant alignment of 1st solitary monolith on wall near western entrance at azimuth 263°.

- NB: It could be an error in the 360° photo realistic horizon panorama as per Starry Night simulation software, that the '1st solitary' monolith which is one of the only monoliths on the western wall area, is actually at 270° and not 263°. This would therefore possibly be a marker from the viewpoint of the platform for the vernal equinox and autumnal equinox sunset!

- Disappearance before Pattern Five for 8 days
- **TOTAL SYNODIC PERIOD** = 580 Days (255 + 50 + 267 + 8)

14.5 Pattern Five (Morning Star for 263 days – 8 months, 3 weeks)

1st Appearance of Venus on horizon September 29th 1345 06h18.

No significant alignment with small conical tower. 1st appearance on wall October 10th 1345 06h22. (Very significant alignment at small conical tower and monolith on wall).

On October 23rd 1345 at 05h49 the 27 day old waning crescent moon conjuncts significantly with Venus above the small conical tower at 19° altitude.

On 21st November 1345 at 05h27 the 26 day old waning crescent moon conjuncts very significantly with the small conical tower at 22° altitude.

27 day old waning crescent Moon conjuncts with Venus 19th February 1346 06h13 with very significant alignment with monolith on wall at azimuth 98°.

Venus aligns significantly with monolith on the wall at azimuth 90° on 8th March 1346 06h12.

The 27 day old waning crescent Moon conjuncts with Venus 21st March 1346 06h57 as well as Jupiter and Saturn at same point. The Autumnal Equinox occurs on the 13th March 1346 at sunrise 06h54 and a major alignment of a conjunction of Jupiter, Saturn, Moon, Venus and the Sun takes place for a few days over the small conical tower from the 13th March 1346 till roughly 11th April 1346.

Orion aligns with the Small Conical Tower 19 June 2013 06h56. On the wall the alignment is not as significant as when Alnilam reaches 5° above the horizon, perhaps the rise in the horizon from this point makes it so.

Venus disappears behind the sun in conjunction with Mercury 19th June 1346 07h12 with no significant alignments.

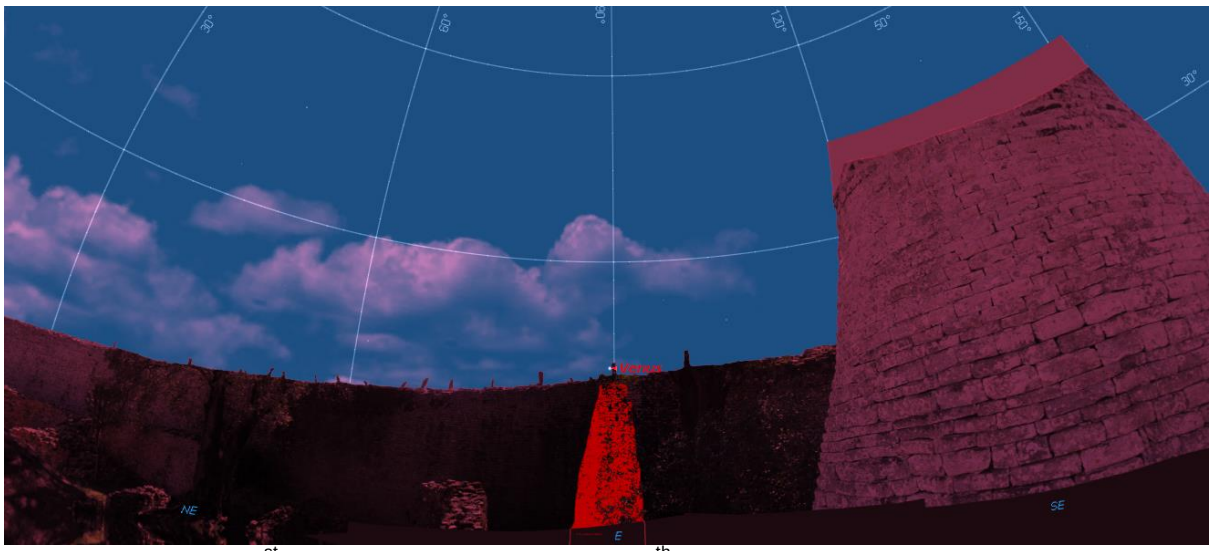


Figure 56 Pattern Five - 1st appearance on wall October 10th 1345 06h22. (Very significant alignment at small conical tower and monolith on wall). Simulation of Venus movement as Morning Star viewed

from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1344 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

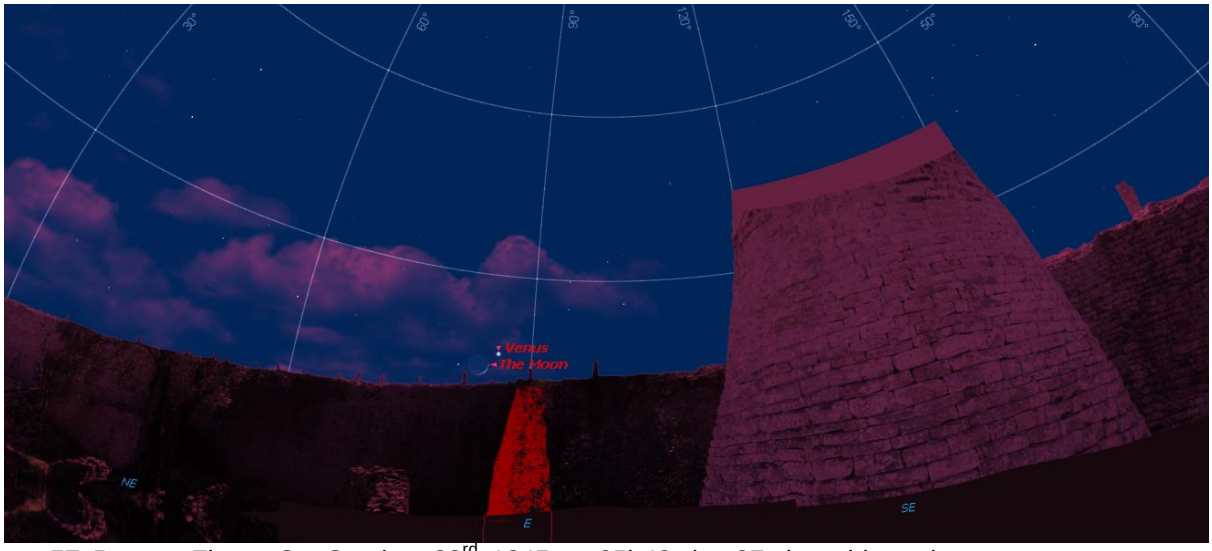


Figure 57 Pattern Five - On October 23rd 1345 at 05h49 the 27 day old waning crescent moon conjuncts significantly with Venus above the small conical tower at 19° altitude. Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1344 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Figure 58 Pattern Five - 27 day old waning crescent Moon conjuncts with Venus 19th February 1346 06h13 with very significant alignment with monolith on wall at azimuth 98°. Simulation of Venus

movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1344 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

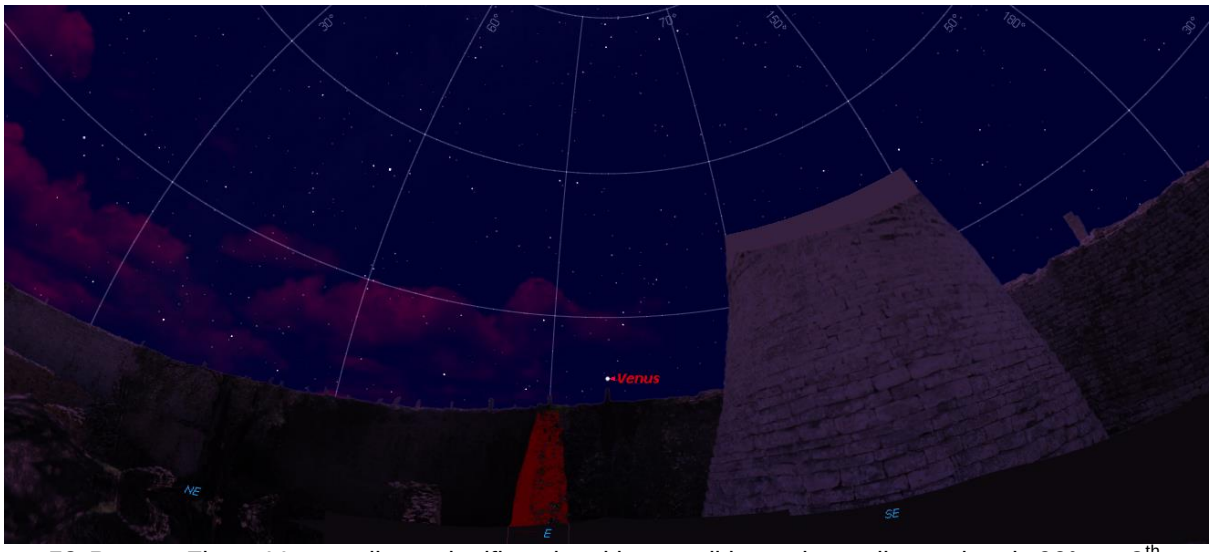


Figure 59 Pattern Five - Venus aligns significantly with monolith on the wall at azimuth 90° on 8th March 1346 06h12. Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1344 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

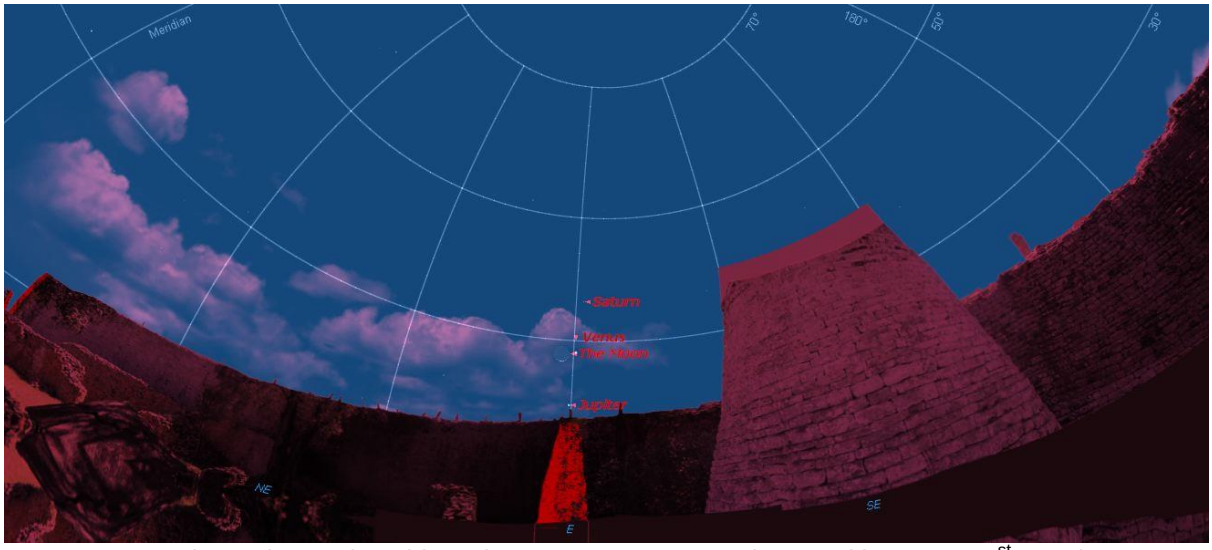


Figure 60 Pattern Five - The 27 day old waning crescent Moon conjuncts with Venus 21st March 1346 06h57 as well as Jupiter and Saturn at same point. The Autumnal Equinox occurs on the 13th March

1346 at sunrise 06h54 and a major alignment of a conjunction of Jupiter, Saturn, Moon, Venus and the Sun takes place for a few days over the small conical tower from the 13th March 1346 till roughly 11th April 1346. Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1344 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

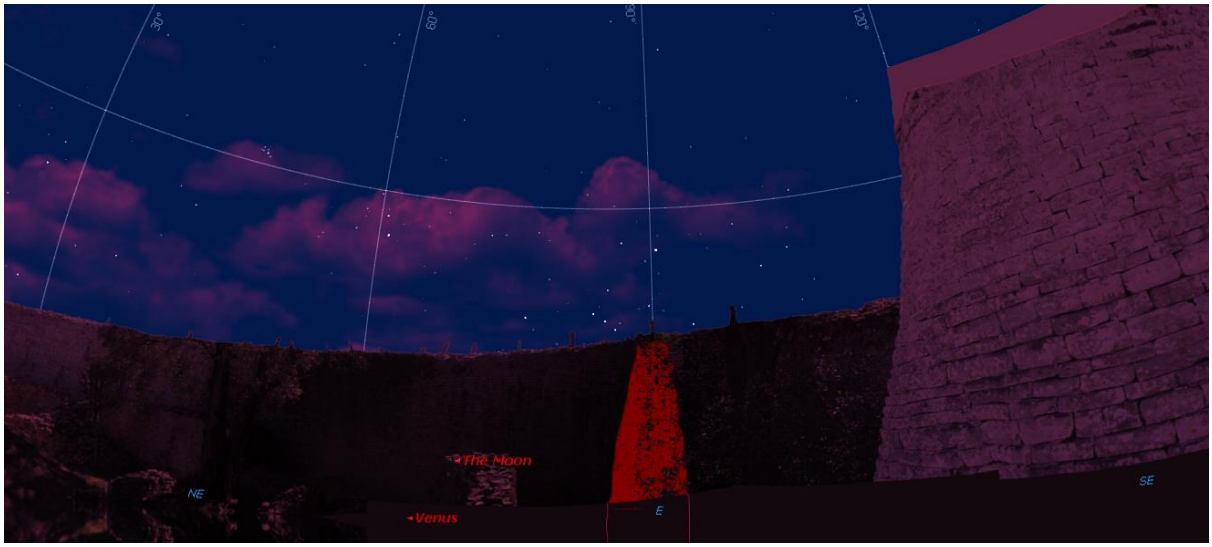


Figure 61 Pattern Five - Orion aligns with the Small Conical Tower 19 June 2013 06h56. On the wall the alignment is not as significant as when Alnilam reaches 5° above the horizon, perhaps the rise in the horizon from this point makes it so. Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1344 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Figure 62 Pattern Five Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1345 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Disappearance after Pattern Five for 44 days.
- 2nd August 1346 18h51 reappears as evening star.

- Evening Star after Pattern Five for 269 Days (8 months, 3 weeks, 5 days).
- 17th September 1346 18h59, 1.83 day old waxing crescent moon appears above the wall at 19° with no significant alignment of Venus which appears on wall for first time as evening star at azimuth 268°.
- Mars and Venus conjunct above the 1st solitary monolith on 27th September 1346 19h00.
- Summer solstice occurs 14th December 1346 and a fairly significant alignment occurs 30°over the 1st solitary monolith at 261° azimuth on the 16th December 1346 19h44.
- 13th March 1347 is autumnal equinox and on the 17th March 1347 19h15 a significant conjunction of Aldebaran, Pleiades star cluster, Venus and the 3.4 day old waxing crescent moon occurs 23-38° over the western entrance.
- Venus disappears behind the sun on April 28th 1347 18h40 with no significant alignments.

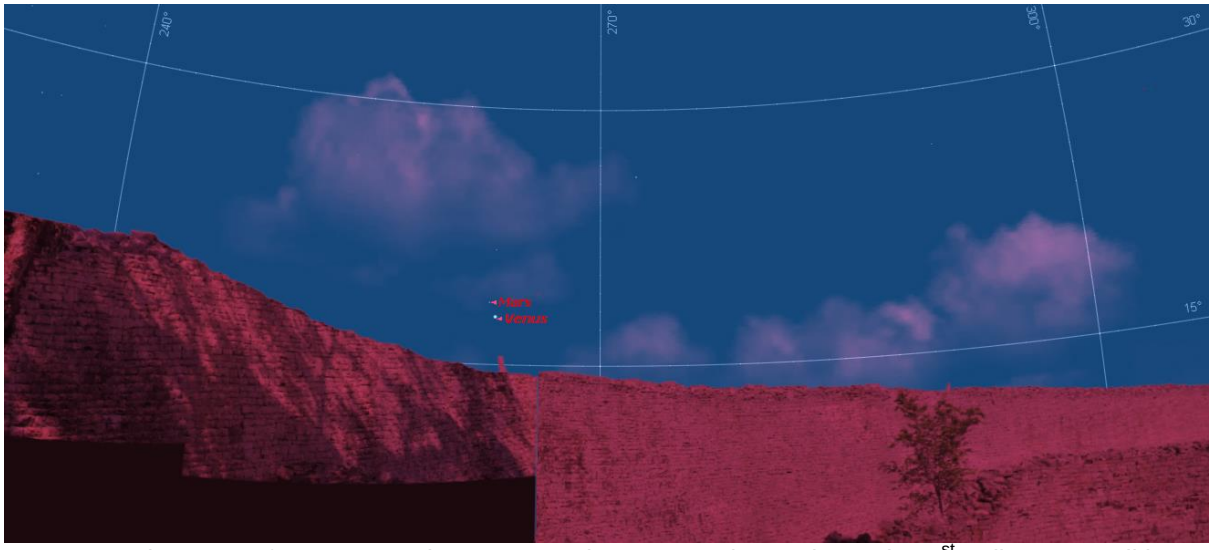


Figure 63 Evening Star after Pattern Five**.** Mars and Venus conjunct above the 1st solitary monolith on 27th September 1346 19h00. Simulation of Venus movement as Evening Star viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 1346 C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

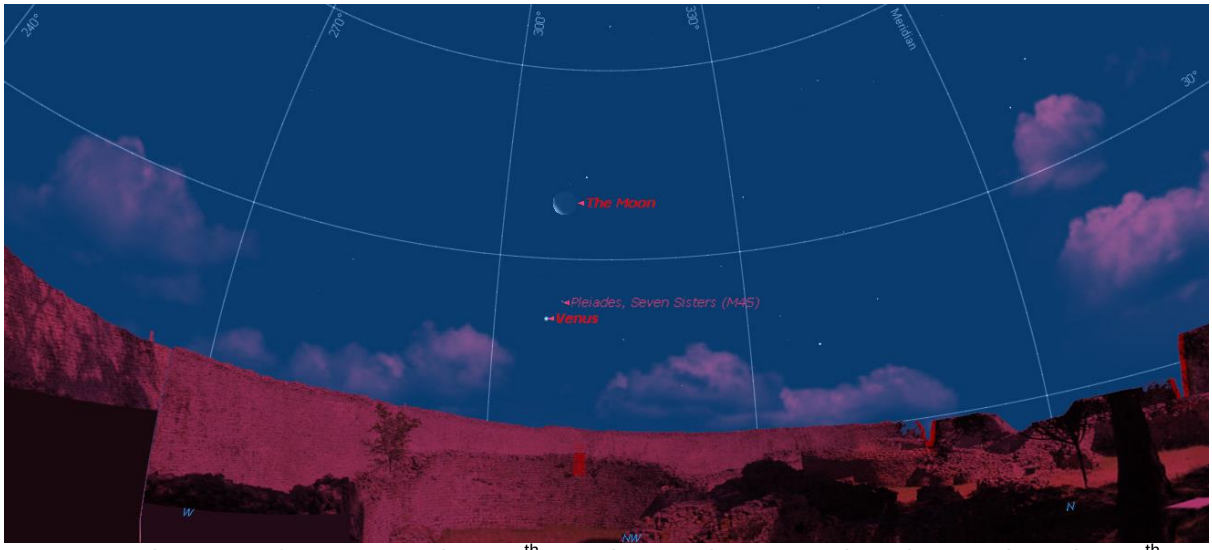


Figure 64 Evening Star after Pattern Five**.** 13th March 1347 is autumnal equinox and on the 17th March 1347 19h15 a significant conjunction of Aldebaran, Pleiades star cluster, Venus and the 3.4 day old waxing crescent moon occurs 23-38° over the western entrance. Simulation of Venus movement as Evening Star viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 134**5** C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

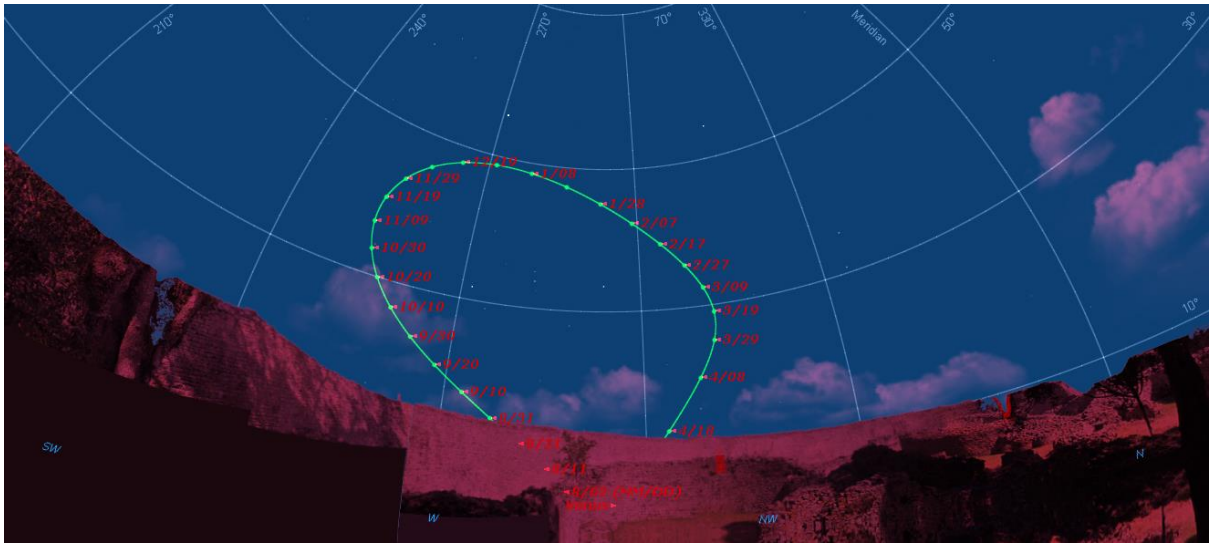


Figure 65 Evening Star after Pattern Five**.** Simulation of Venus movement as Evening Star viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 134**6** C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Disappearance before Pattern Six for 11 days
- **TOTAL SYNODIC PERIOD** = 587 Days (263 + 44 + 269 + 11)

14.6 Pattern Six (Morning Star for 266 days – 8 months, 3 weeks)

1st Appearance of Venus on horizon May 9th 1347 07h05.
Venus aligns very significantly with the Small Conical Tower on 2nd November 1347 06h13 and with the moon 39minutes later at 06h52!

Venus disappears behind the sun 30th January 1348 06h26.

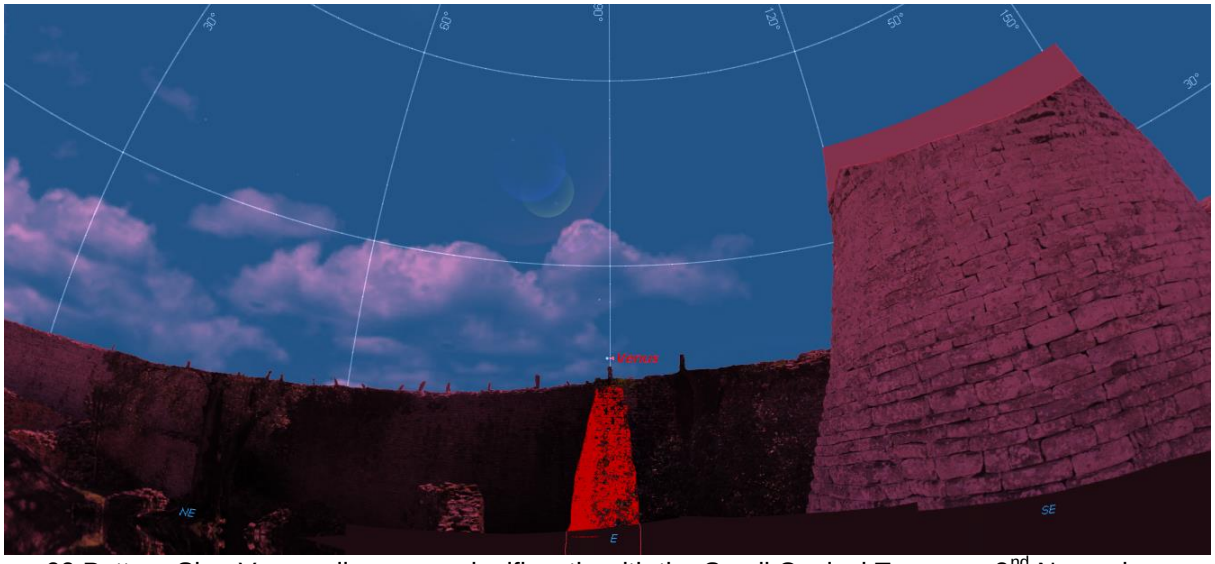


Figure 66 Pattern Six - Venus aligns very significantly with the Small Conical Tower on 2nd November 1347 06h13 and with the moon 39 minutes later at 06h52! Simulation of Venus movement as

Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1347 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

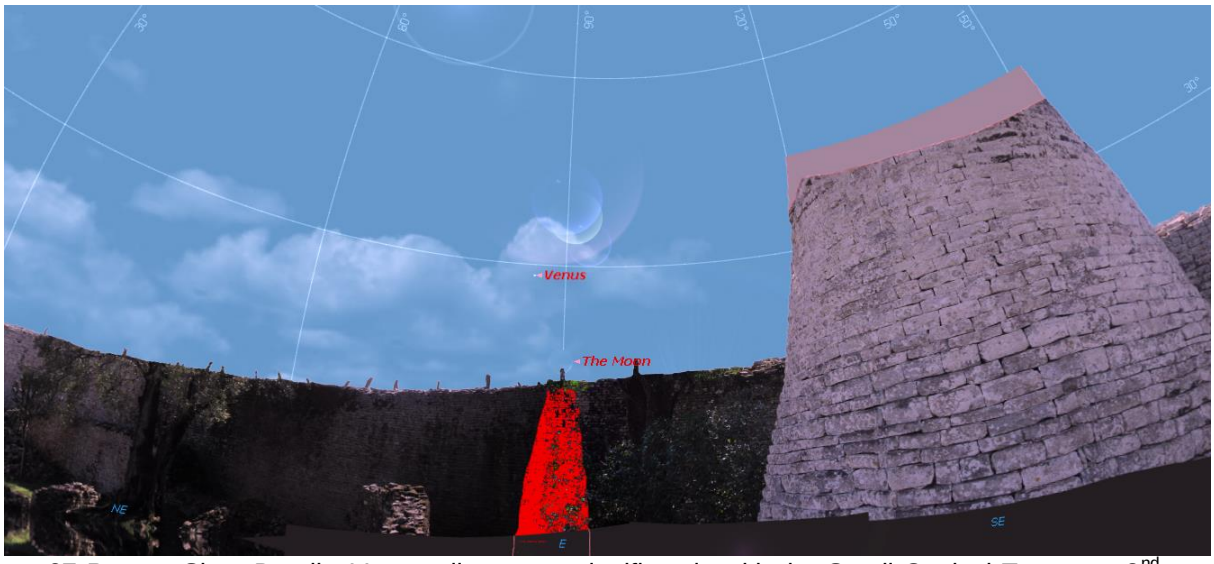


Figure 67 Pattern Six – Detail - Venus aligns very significantly with the Small Conical Tower on 2nd November 1347 06h13 and with the moon 39minutes later at 06h52! Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1347 C.E. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

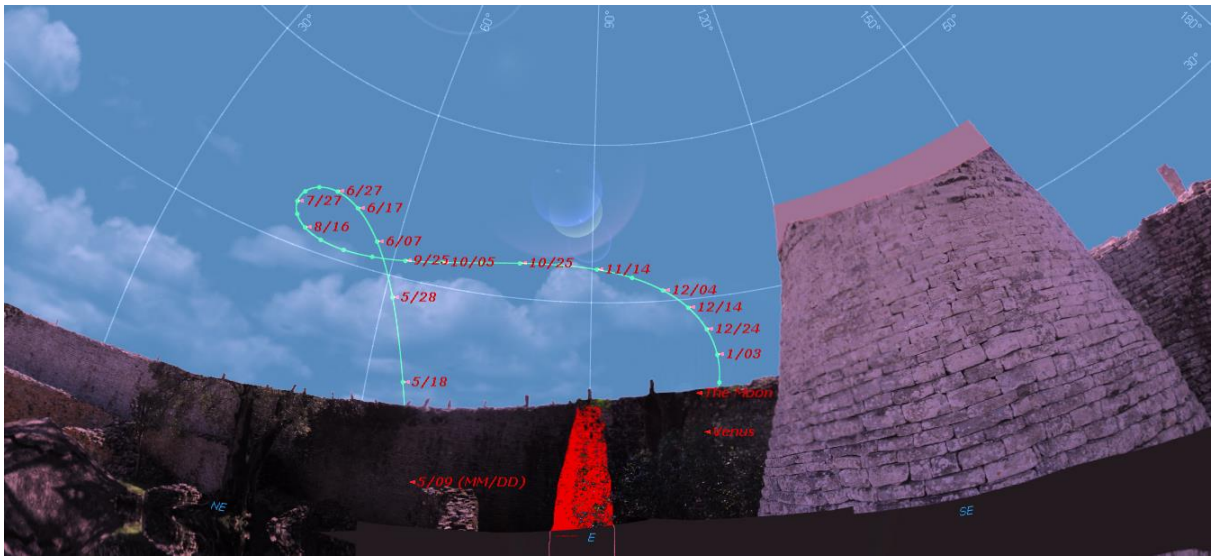


Figure 68 Pattern 'Six' (Repeat of Pattern One 8 years later) – Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 1347 C.E. Large Conical Tower is right of the Small Conical Tower (extended to

Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

- Disappearance after Pattern Six for 50 days
- 21st March 1348 19h10 reappears as evening star.
- Evening Star after Pattern Six for 259 Days (8 months, 2 weeks)
- Venus disappears behind the sun 5th December 1348 19h42. No significant alignments.
- Disappearance before Pattern Seven for 8 days
- **TOTAL SYNODIC PERIOD** = 583 Days (266 + 50 + 259 + 8)

15 ORIENTATION OF TSHIMEDZI MOON MARKER

Tshimedzi Moon is effectively the means to marking a year. The indigenous knowledge makes use of a sort of 'formula' to determine when the old year passes into a new year. Each moon through duration of a year would be associated with seasonal changes and the time of rain begins with the moon known as Tshimedzi (Rain).

It marks the change from a dry cloudless, cold period to a warm cloudy wet one. The changeover is associated relatively with the first lightning and thunder when food stores are usually depleted making the rain the most welcome event and this part of a year the most anticipated and revered as the entire environment continues a process of resuscitation, resurrection and procreation.

Hopes were likely impeded when 'formula' predictions failed into resultant droughts and famine. Libation, ritualization, ritual burning and sacrifice were a means to placate maligned ancestral providence to restore the rain and thereby the fertility of the land (Huffman 2009).

These 'formulas' were likely established over years of integration between agriculturists settlers, stock farmers, traders and hunter-gatherers at a time of formative Bantu-expansion into the southern hinterland as reconstructed through the ethnographic and archaeological record.

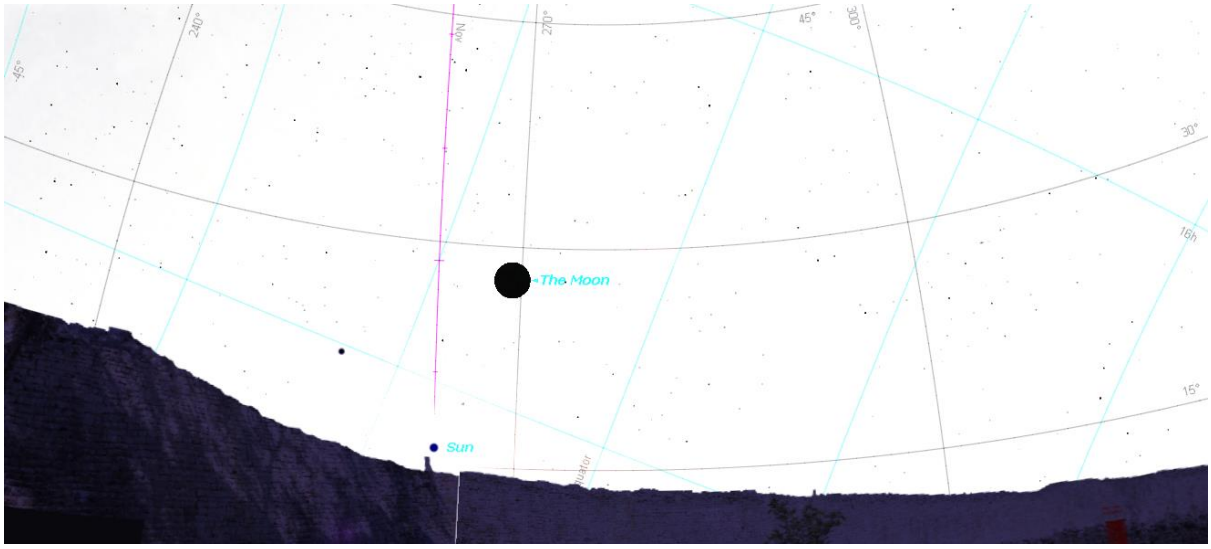
Stayt (1931) preserved as much information from the descendants of the Great Zimbabwe people as possible regarding the relationship that the first appearance of the waxing crescent new moon should have with the arrangement of the 'giraffe' or Tuda asterism to formulate a new year.

The solitary monolith on the western wall at azimuth 264° from the Platform in the Great Enclosure is the likeliest marker of the Sun's movement in the ecliptic for 13th October 1273 and has a very significant alignment with the Sun at 17h47 and a significant alignment with the 1.95 new waxing crescent Moon.

The solitary monolith on the western wall at azimuth 264° from the Platform in the Great Enclosure marks the Sun's movement in the ecliptic for 13th October 1273 and has a

significant alignment with the Sun at 17h47 followed 47 minutes later with another significant alignment with the 1.03 day old new waxing crescent Moon.

Figure 69 Tshimedzi Moon is marked by this alignment of the Sun with the monolith at azimuth 264° between 3rd October and 23rd October in general. Simulation of Sun viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 13th October 1273 C.E. 17h47. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.



Tshimedzi Moon is marked by this alignment of the Sun with the monolith at azimuth 264° between 3rd October and 23rd October in general. Simulation of Sun viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 13th October 1273 C.E. 17h47. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

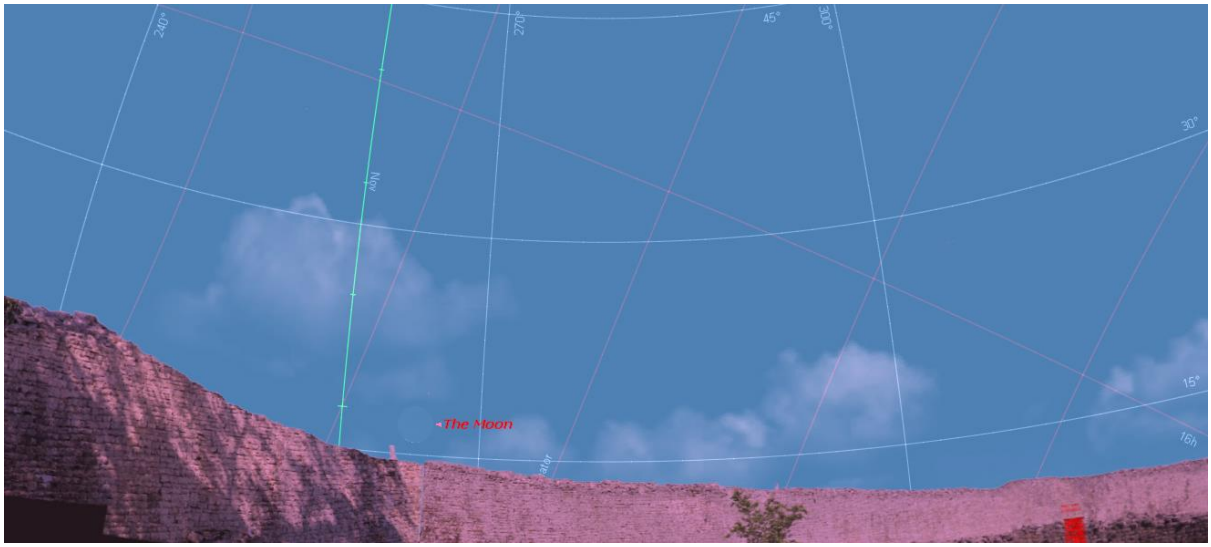
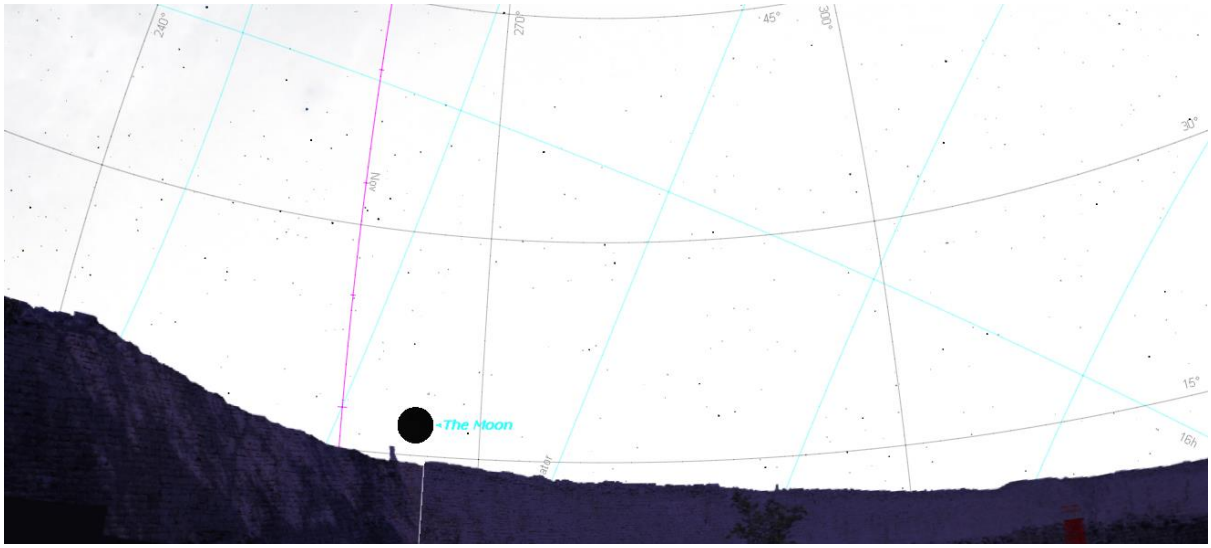


Figure 70 Tshimedzi Moon is marked by this alignment of the Moon. 1.03 day old waxing crescent moon appears above the wall at 17° altitude with significant alignment 47 minutes after Sun alignment of solitary monolith on the wall at azimuth 264°. Simulation of Moon viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 13th October 1273 C.E. 18h34. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.



Tshimedzi Moon is marked by this alignment of the Moon. 1.03 day old waxing crescent moon appears above the wall at 17° altitude with significant alignment 47 minutes after Sun alignment of solitary monolith on the wall at azimuth 264°. Simulation of Moon viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 13th October 1273 C.E. 18h34. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Tshimedzi Moon is marked by this alignment of the Sun with the monolith at azimuth 264° in subsequent and preceding years but not as significantly as on 13th October of most years.

Tshimedzi Moon is marked significantly by this solitary monolith on the western side of the enclosure when it occurs between 3rd October and 23rd October in general. Below are the days of Tshimedzi Moon every 8 years with a detail of its occurrence between 1273 – 1281:-

Tshimedzi Moon 13th October 1273 19h07 waxing crescent 1.01 days old

Tshimedzi Moon 2nd October 1274 19h07 waxing crescent 1.01 days old
Tshimedzi Moon 21st September 1275 19h07 waxing crescent 0.63 days old
Tshimedzi Moon 10th October 1276 19h07 waxing crescent 1.75 days old
Tshimedzi Moon 29th September 1277 19h07 waxing crescent 1.00 days old
Tshimedzi Moon 19th September 1278 19h07 waxing crescent 1.36 days old
Tshimedzi Moon 8th October 1279 19h07 waxing crescent 1.33 days old
Tshimedzi Moon 26th October 1280 19h07 waxing crescent 1.02 days old

Tshimedzi Moon 15th October 1281 19h07 waxing crescent 1.23 days old
Tshimedzi Moon 17th October 1289 19h07 waxing crescent 1.50 days old
Tshimedzi Moon 19th October 1297 19h07 waxing crescent 2.01 days old
Tshimedzi Moon 21st October 1305 19h07 waxing crescent 1.66 days old
Tshimedzi Moon 21st October 1313 19h07 waxing crescent 1.34 days old
Tshimedzi Moon 22nd October 1321 19h07 waxing crescent 1.00 days old
Tshimedzi Moon 24th October 1329 19h07 waxing crescent 1.71 days old
Tshimedzi Moon 26th September 1337 19h07 waxing crescent 1.74 days old
Tshimedzi Moon 27th October 1345 19h07 waxing crescent 1.18 days old
Tshimedzi Moon 29th October 1353 19h07 waxing crescent 1.48 days old
Tshimedzi Moon 1st October 1361 19h07 waxing crescent 1.65 days old
Tshimedzi Moon 2nd October 1369 19h07 waxing crescent 0.95 days old
Tshimedzi Moon 4th October 1377 19h07 waxing crescent 1.26 days old
Tshimedzi Moon 6th October 1385 19h07 waxing crescent 1.79 days old
Tshimedzi Moon 7th October 1393 19h07 waxing crescent 1.42 days old
Tshimedzi Moon 8th October 1401 19h07 waxing crescent 1.08 days old
Tshimedzi Moon 10th October 1409 19h07 waxing crescent 1.88 days old
Tshimedzi Moon 11th October 1417 19h07 waxing crescent 1.44 days old
Tshimedzi Moon 12th October 1425 19h07 waxing crescent 0.90 days old
Tshimedzi Moon 14th October 1433 19h07 waxing crescent 1.22 days old
Tshimedzi Moon 16th October 1441 19h07 waxing crescent 1.40 days old
Tshimedzi Moon 18th October 1449 19h07 waxing crescent 1.58 days old
Tshimedzi Moon 20th October 1457 19h07 waxing crescent 1.92 days old
Tshimedzi Moon 21st October 1465 19h07 waxing crescent 1.45 days old
Tshimedzi Moon 22nd October 1373 19h07 waxing crescent 1.07 days old
Tshimedzi Moon 24th October 1481 19h07 waxing crescent 1.90 days old
Tshimedzi Moon 25th October 1489 19h07 waxing crescent 1.55 days old
Tshimedzi Moon 27th September 1497 19h07 waxing crescent 1.63 days old
Tshimedzi Moon 28th September 1505 19h07 waxing crescent 1.15 days old
Tshimedzi Moon 30th September 1513 19h07 waxing crescent 1.58 days old
Tshimedzi Moon 1st October 1521 19h07 waxing crescent 0.91 days old
Tshimedzi Moon 3rd October 1529 19h07 waxing crescent 1.10 days old

It is therefore a possibility that the most notable references of structures at the Great Enclosure are those of the equinox sunrises, Venus with the small conical tower and the Tshimedzi Moon sunsets on the wall with a monolith at 264° azimuth as seen from the platform. The alignments of Venus and various monoliths from the autumnal equinox to the

winter solstice are highly unlikely to be coincidental and form a plausible argument that an astronomical function of the monoliths was intentional.

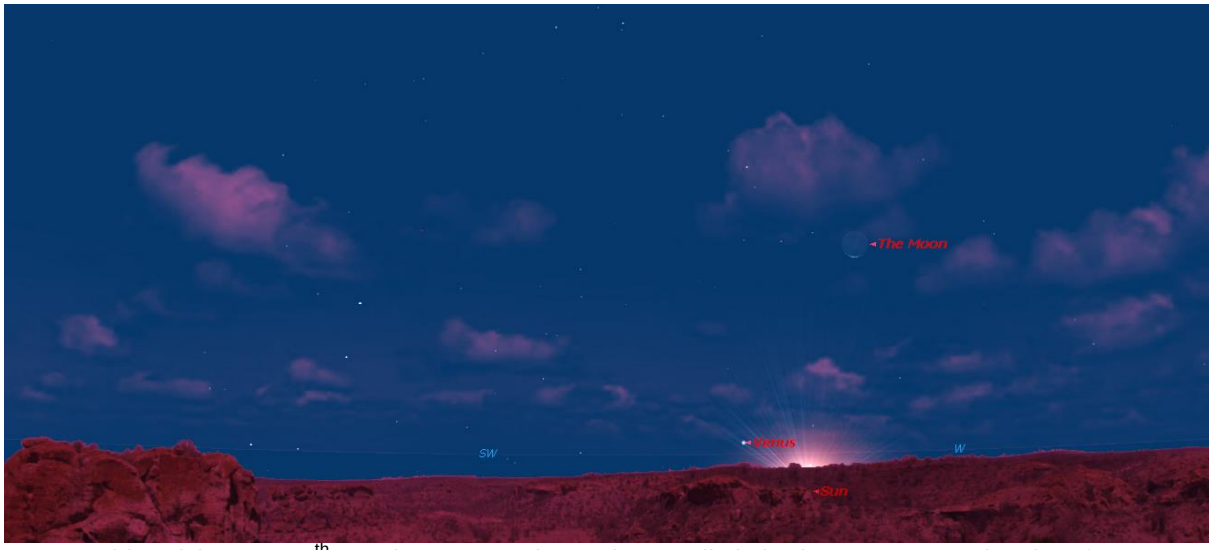
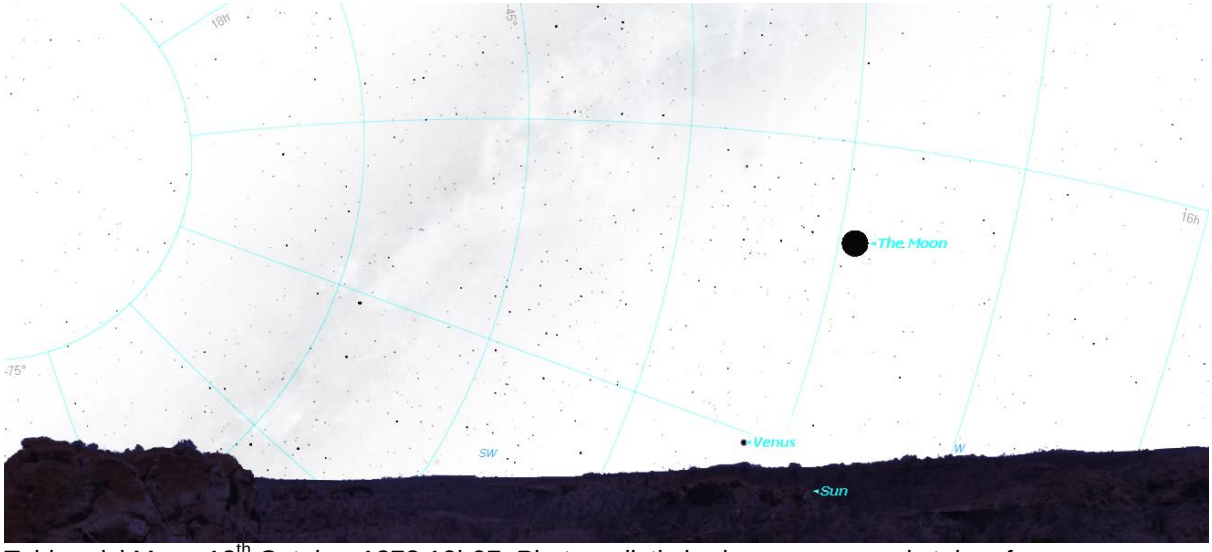


Figure 71 Tshimedzi Moon 13th October 1273 19h07. Photorealistic horizon panorama is taken from Mapungubwe hilltop. General horizon view of 'Tuda' asterism making characteristic 'L'-shape and new crescent waxing crescent 1.01 day old moon. Venus is visible shortly after sunset. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° .



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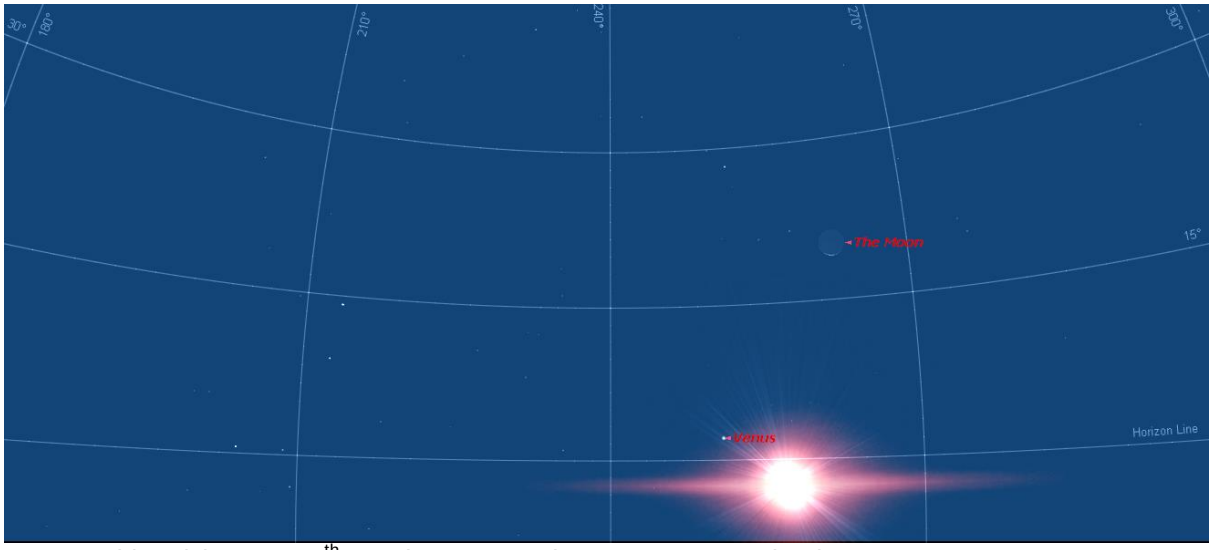
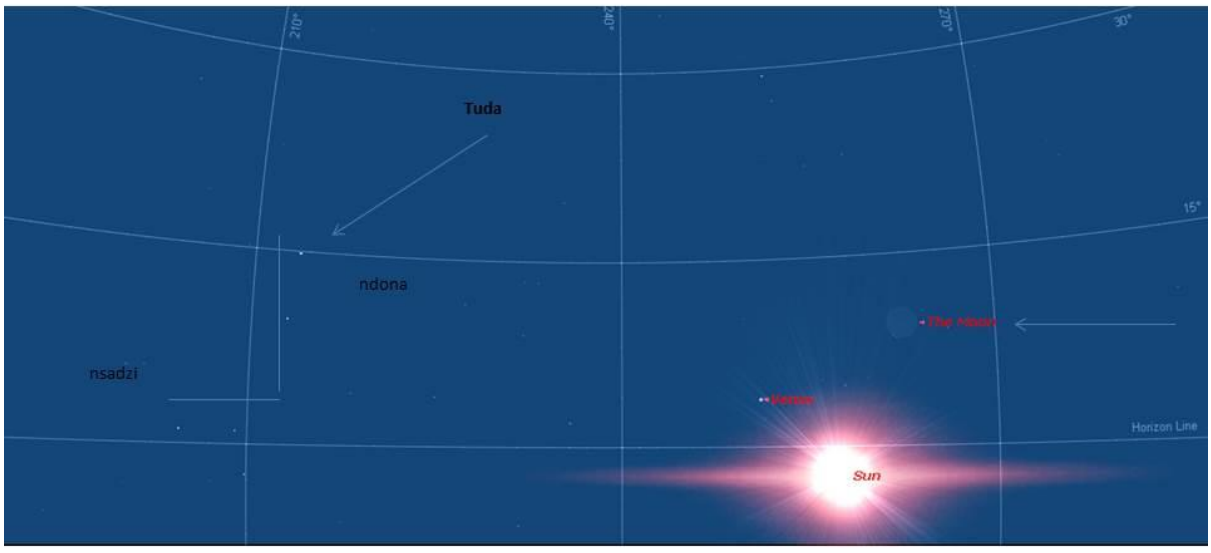


Figure 72 Tshimedzi Moon 13th October 1273 19h07. A New Year begins as a new crescent moon appears when the two lower stars of the constellation Tuda are just below the horizon and the two upper stars just visible. This is the Tshimedzi moon. Enlargement without structures of azimuth and altitude lines. General horizon view of 'Tuda' asterism making characteristic 'L'-shape and new crescent waxing crescent 1.01 day old moon. Venus is visible shortly after sunset. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E.

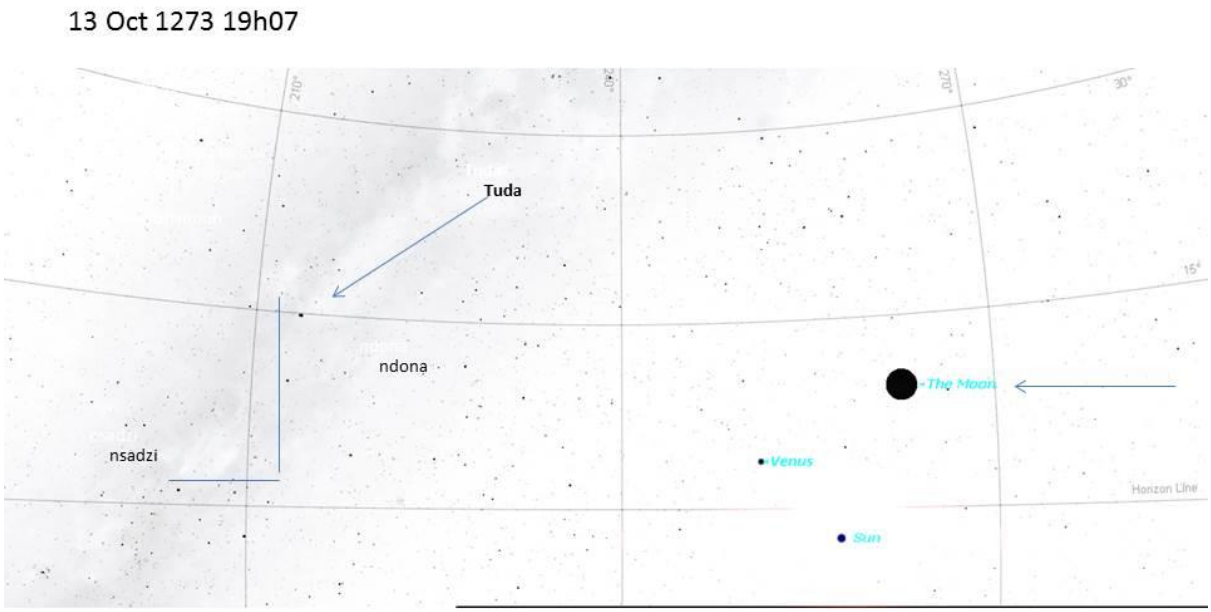
13 Oct 1273 19h07



Tshimedzi Moon as seen from Great Zimbabwe Great Enclosure
Vernal Equinox. 1.06 day old waxing crescent Moon.

Tshimedzi Moon 13th October 1273 19h07. A New Year begins as a new crescent moon appears when the two lower stars of the constellation Tuda (Nsadzi) are just below the horizon and the two upper stars (Ndona) just visible. This is the Tshimedzi moon. Enlargement without structures of

azimuth and altitude lines. General horizon view of 'Tuda' asterism making characteristic 'L'-shape and new crescent waxing crescent 1.06 day old moon. Venus is visible shortly after sunset. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E.



Tshimedzi Moon as seen from Great Zimbabwe Great Enclosure
Vernal Equinox. 1.06 day old waxing crescent Moon.

Tshimedzi Moon 13th October 1273 19h07. A New Year begins as a new crescent moon appears when the two lower stars of the constellation Tuda (Nsadzi) are just below the horizon and the two upper stars (Ndona) just visible. This is the Tshimedzi moon. Enlargement without structures of azimuth and altitude lines. General horizon view of 'Tuda' asterism making characteristic 'L'-shape and new crescent waxing crescent 1.06 day old moon. Venus is visible shortly after sunset. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E.

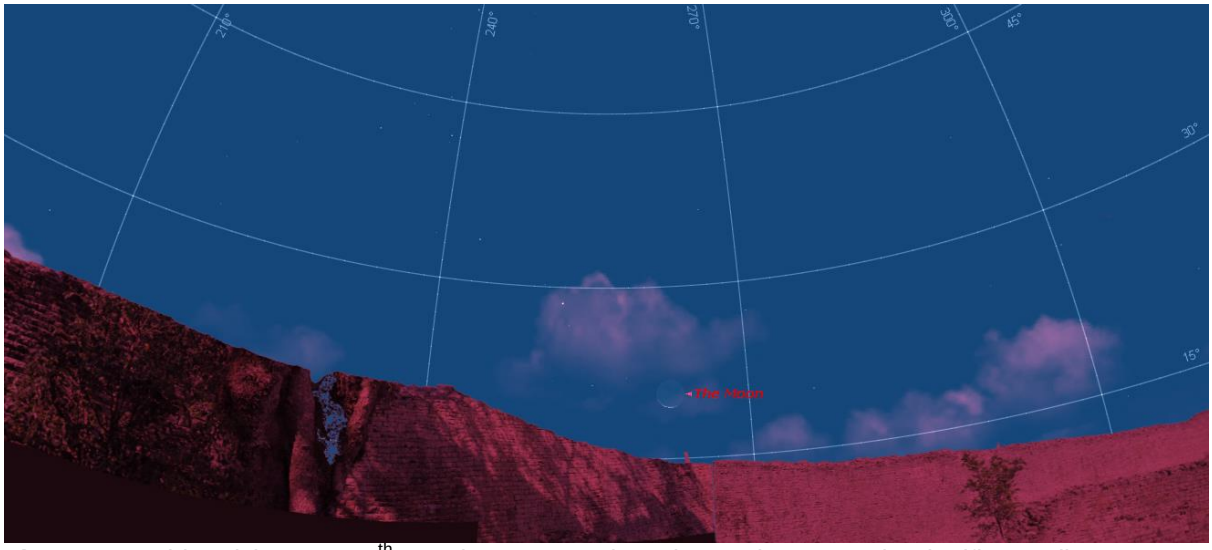
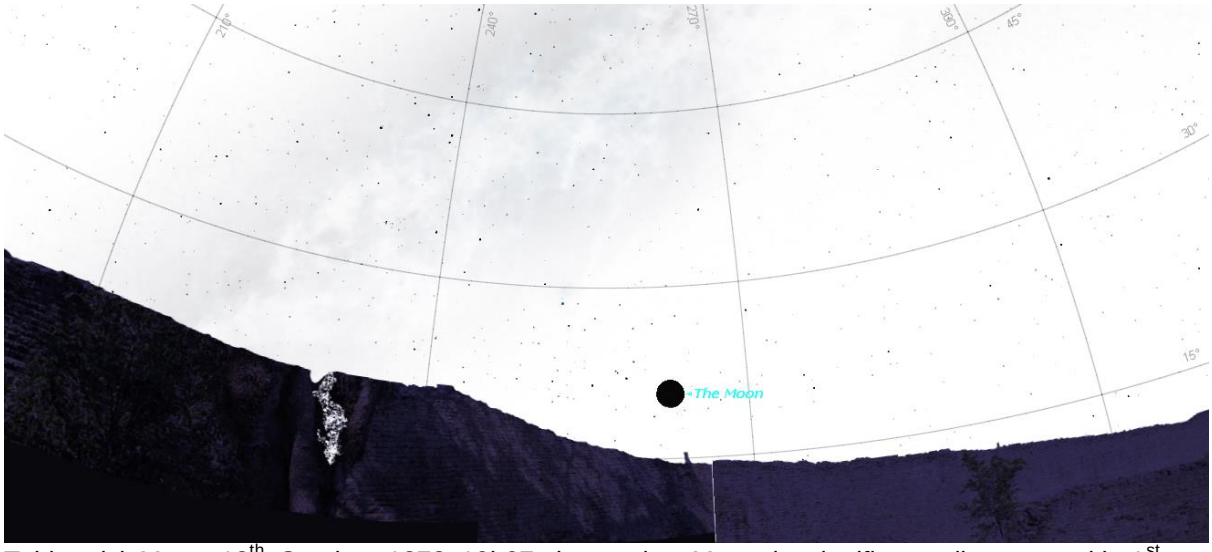


Figure 73 Tshimedzi Moon 13th October 1273 19h07 the setting Moon in significant alignment with 1st solitary monolith at azimuth 264°. Simulation of Moon viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 1273 C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.



Tshimedzi Moon 13th October 1273 19h07 the setting Moon in significant alignment with 1st solitary monolith at azimuth 264°. Simulation of Moon viewed from the Platform Area looking west over the Outer Wall of the Great Enclosure of Great Zimbabwe 1273 C.E. Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

16 Sequence of the Alignments of Venus as a Morning Star (Massassi) with the Monoliths between azimuth 98° - 58° on the Eastern Wall when viewed from the Platform in the Great Enclosure September 1273 – June 1274 (Vernal Equinox – Winter Solstice)

From the Platform of the Great Enclosure of Great Zimbabwe Venus progressively aligns with monoliths on the wall from the Autumnal Equinox to the Winter Solstice. The monoliths appear to mark the first appearance of Venus to the disappearance of Venus on the wall over 93 days (3 months, 1 day). The random hypothetical dating for these heliacal risings of Venus against the back drop of the Main Wall has been selected from 13th March 1274 to 14th June 1274

Pattern 5 Oct 1273 – July 1274 (Morning Star for 268 days 8 months, 3 weeks, 4 days) i.e. V Eq[1] to S Sol[2] to A Eq[3] to W Sol[4]

[1]Vernal Equinox 15th September 1273 (no significant references)
[2]Summer Solstice 14th December 1273 (note Venus at 90°azimuth at sunrise)
[3]Autumnal Equinox 13th March 1274 (note Venus and Jupiter at 92° azimuth at sunrise)
[4]Winter Solstice 14th June 1274 (note Venus at 60°azimuth at sunrise)

The movement of Venus through the morning sky is marked by the small conical tower and the monolith on the wall at azimuth 90° at its start and ending of the Pattern 5. That is the pattern that Venus makes as a morning star from October to July, starting close to the vernal equinox and moving through the summer solstice and autumnal equinox to the winter solstice.

The example chosen provides the Pattern 5 that Venus makes when it appears from behind the Sun for first time on 19th October 1273 06h07 until it disappears on the 14th July 1274 07h21 when Venus is a morning star for 268 days (8 months, 3 weeks, 4 days). Pattern 5 happens every 8 years. The vernal equinox at this time occurs on the 15th September 1273 and the Winter Solstice occurs on the 14th June 1274.

Venus makes a first appearance as a morning star above the wall at the start of Pattern 5 in conjunction with the 27 day old waning crescent moon in alignment with the small conical tower by 20° altitude on 8th November 1273 06h01.

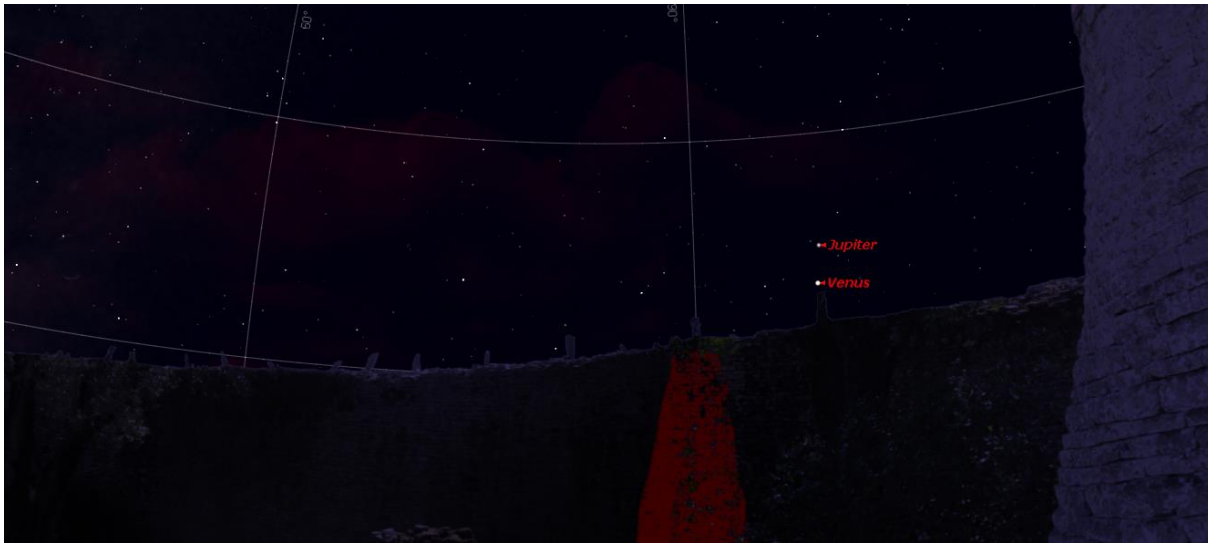
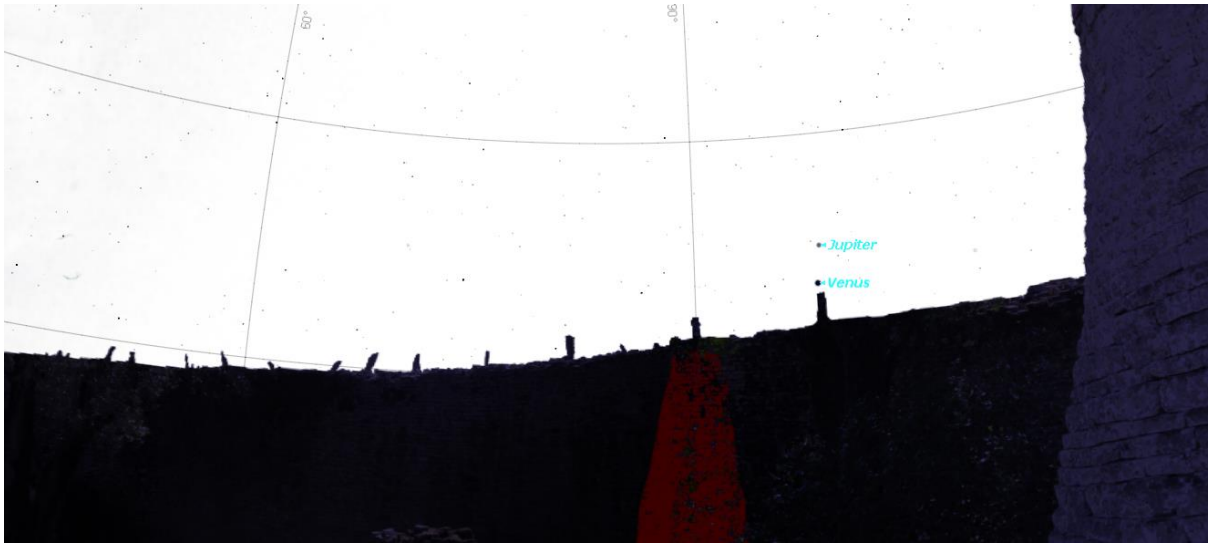


Figure 74 Autumnal Equinox. Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 13 March 1274 C.E. 05h55 Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.



Autumnal Equinox. Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 13 March 1274 C.E. 05h55 Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

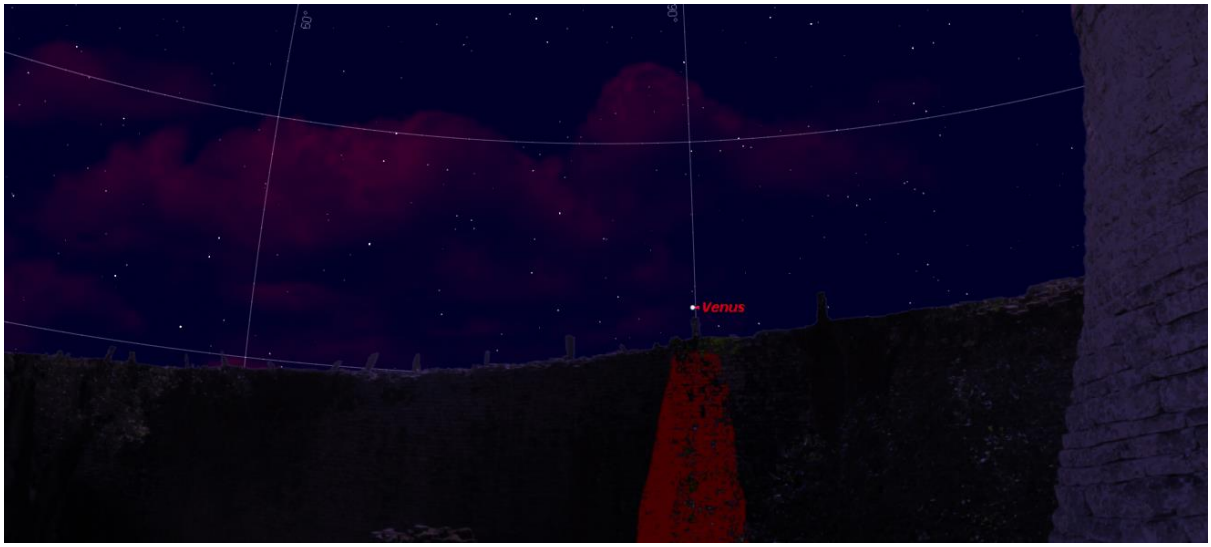
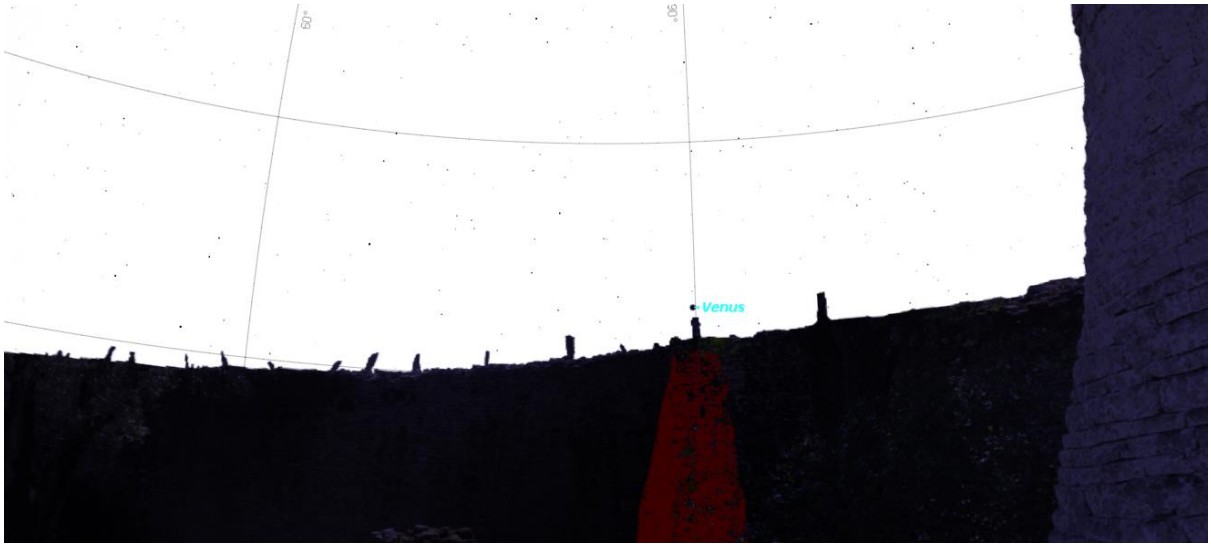
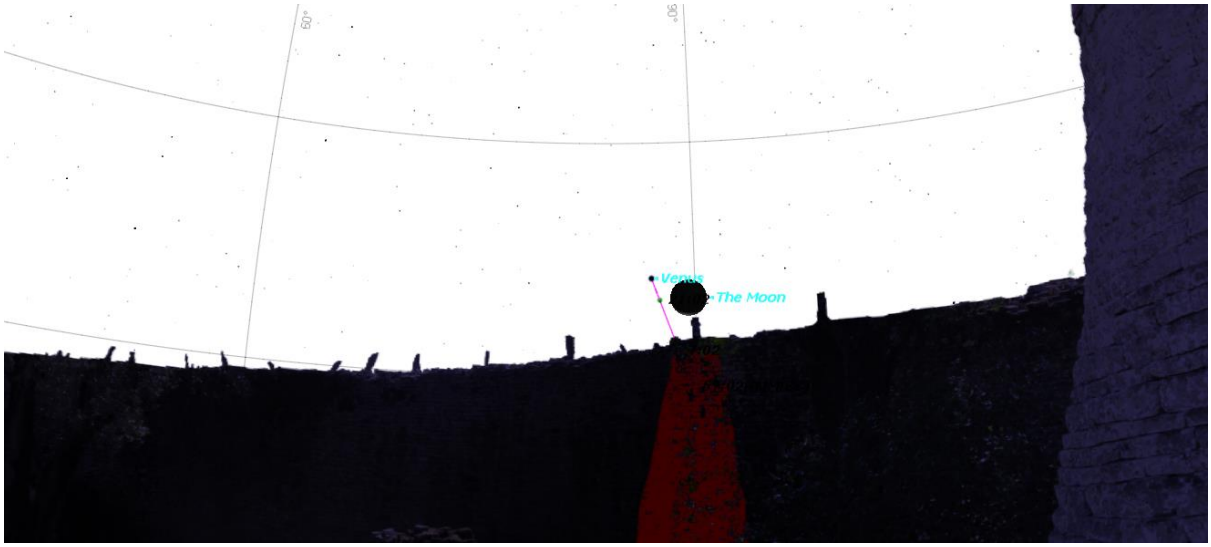


Figure 75 Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 2 April 1274 C.E. 06h15 Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.



Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 2 April 1274 C.E. 06h15 Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Figure 76 Simulation of Venus movement as Morning Star and Moon at Small Conical Tower and Monolith on wall viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 6th April 1274 C.E. 06h27. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.



Simulation of Venus movement as Morning Star and Moon at Small Conical Tower and Monolith on wall viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 6th April 1274 C.E. 06h27. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

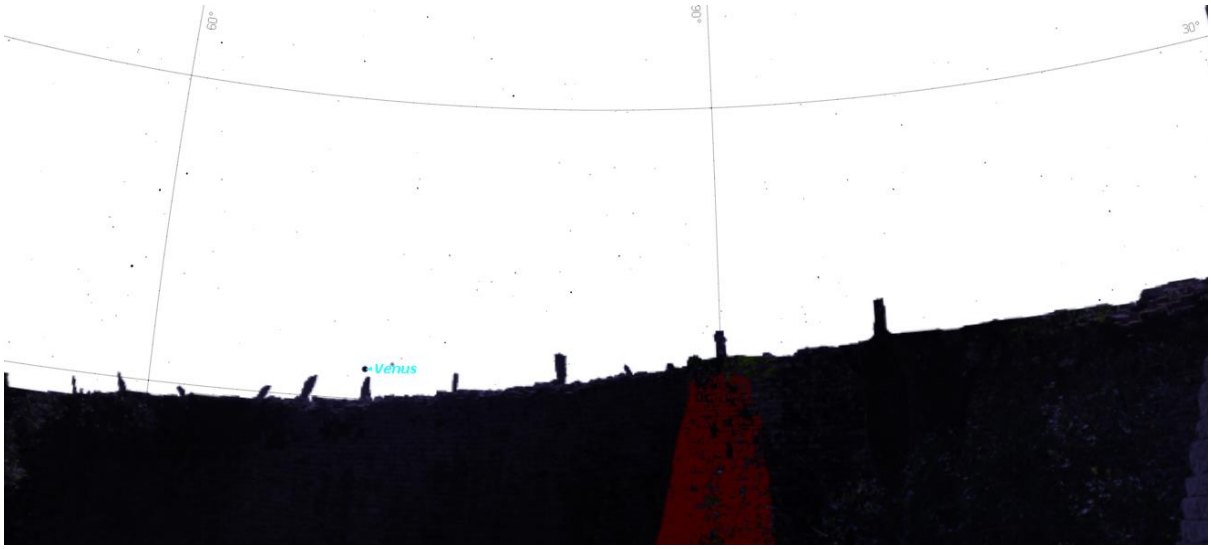
Figure 77 Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 19th April 1274 C.E. 06h31. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 19th April 1274 C.E. 06h31. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Figure 78 Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 30th April 1274 C.E. 06h40. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

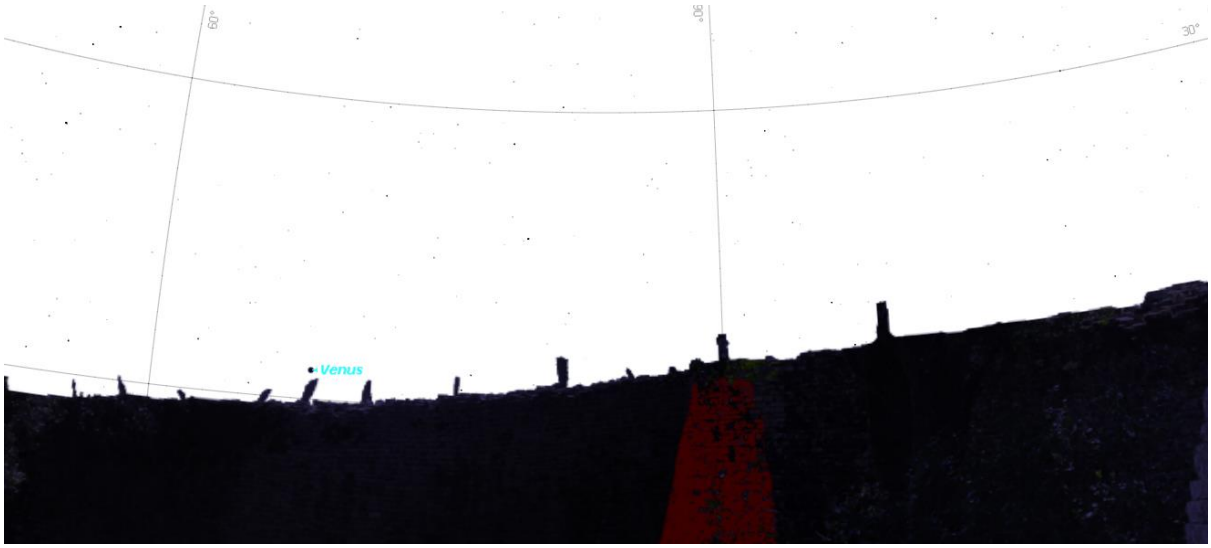
Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 30th April 1274 C.E. 06h40. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Figure 79 Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 10th May 1274 C.E. 06h51. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.



Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 10th May 1274 C.E. 06h51. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Figure 80 Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 16th May 1274 C.E. 07h00. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

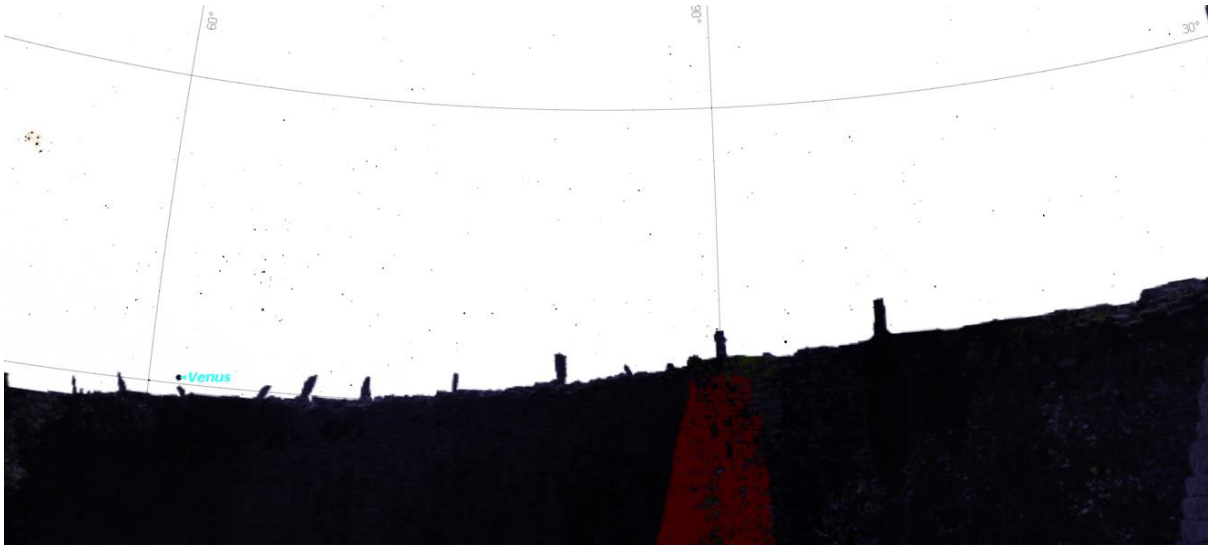


Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 16th May 1274 C.E. 07h00. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Figure 81 Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 22nd May 1274 C.E. 07h06. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

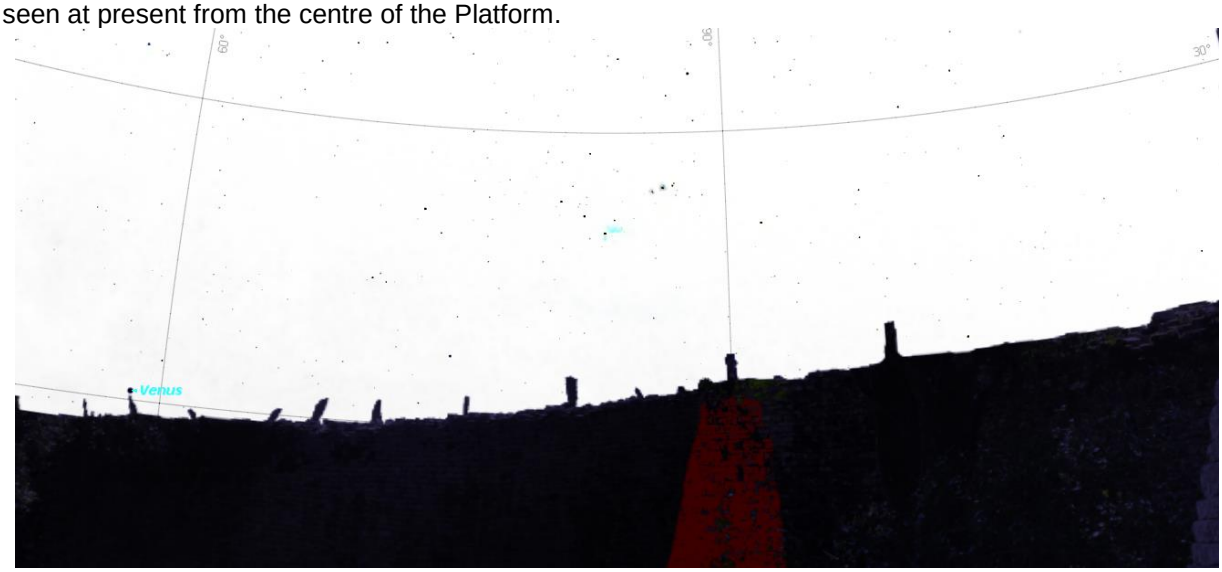
Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 22nd May 1274 C.E. 07h06. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Figure 82 Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 3rd June1274 C.E. 07h25. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.



Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 3rd June1274 C.E. 07h25. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

Figure 83 Winter Solstice. Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 14th June 1274 C.E. 07h45. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.



Winter Solstice. Simulation of Venus movement as Morning Star viewed from the Platform Area looking east over the Outer Wall of the Great Enclosure of Great Zimbabwe 14th June 1274 C.E. 07h45. Large Conical Tower is right of the Small Conical Tower (extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

17 LARGE CONICAL TOWER

The Large Conical Tower appears to be a reference to a supernova remnant. The reconstructed 11m conical tower in the Great Enclosure aligns with the supernova remnant RX J0852.0-4622 in Vela (Aschenbach 1998a; 1998b; Aschenbach, Iyudin & Schonfelder 1999; Aschenbach, Egger & Trümper, 1995; Iyudin et al 1998; Chen & Gehrels 1999), as

seen from the Platform Area; and may be a preserved structural edifice related to the Lemba legend of a star guiding them to their present homeland.

The supernova remnant aligns with the Conical Tower and a monolith on the wall as viewed from the Platform Area, at an azimuth of 130° 50′ 30′′ when rising and with a monolith on the wall at an azimuth of 193° 09′ 36′′ when setting.

Figure 84 Supernova remnant RX J0852.0-4622 rising behind the large Conical Tower during the time of Great Zimbabwe's flourish as a culture. Computer Simulation by RP Wade of the alignment in relation to the wall and Conical Tower of the Great Enclosure when viewed from the Platform Area 14th September 1281 AD at 18h50. Large Conical Tower is right of the Small Conical Tower (centre of picture - extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

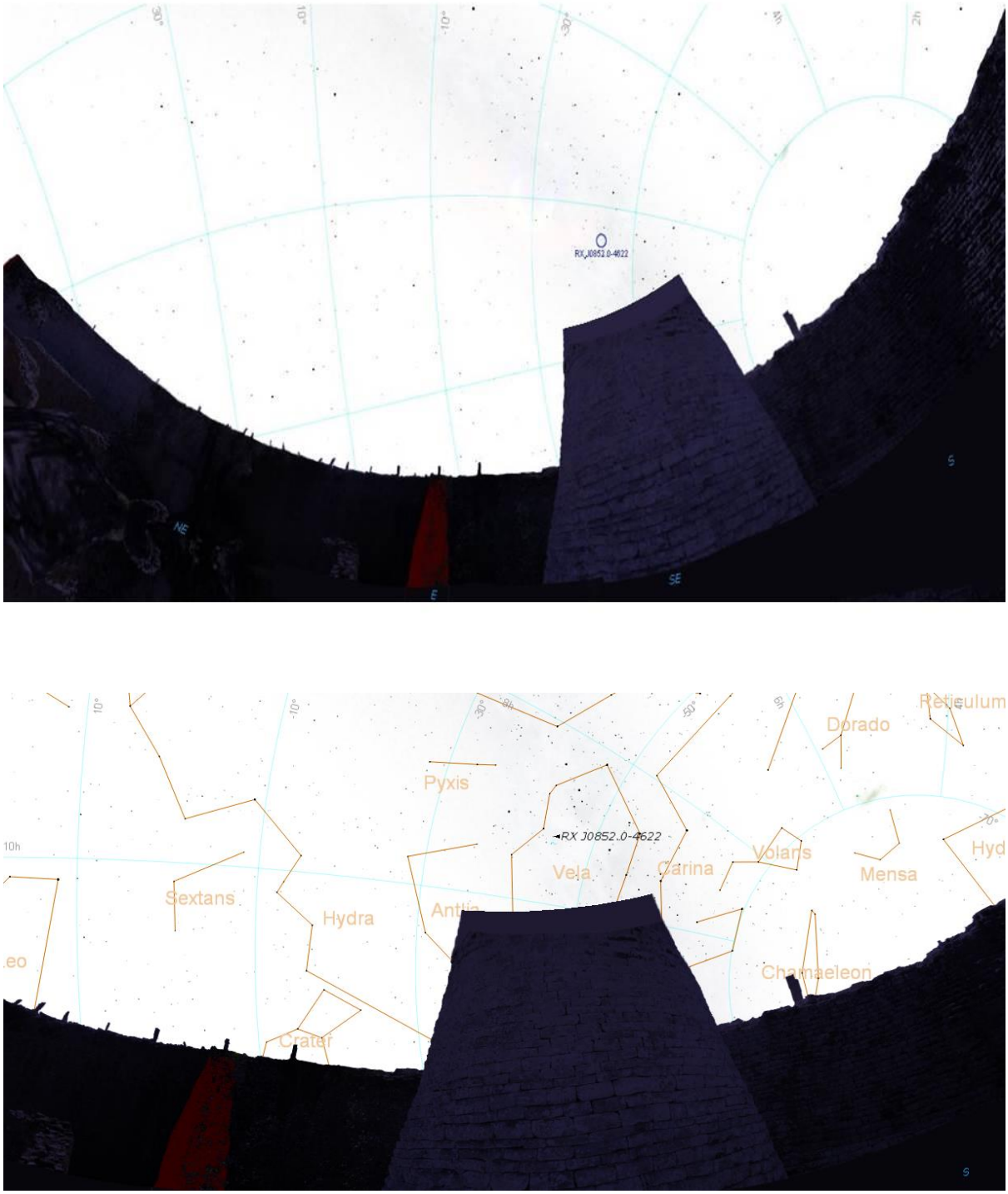


Figure 85 Supernova remnant RX J0852.0-4622 rising behind the large Conical Tower during the time of Great Zimbabwe's flourish as a culture. Computer Simulation by RP Wade of the alignment in relation to the wall and Conical Tower of the Great Enclosure when viewed from the Platform Area 14th September 1281 AD at 18h50. Large Conical Tower is right of the Small Conical Tower (centre of picture - extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

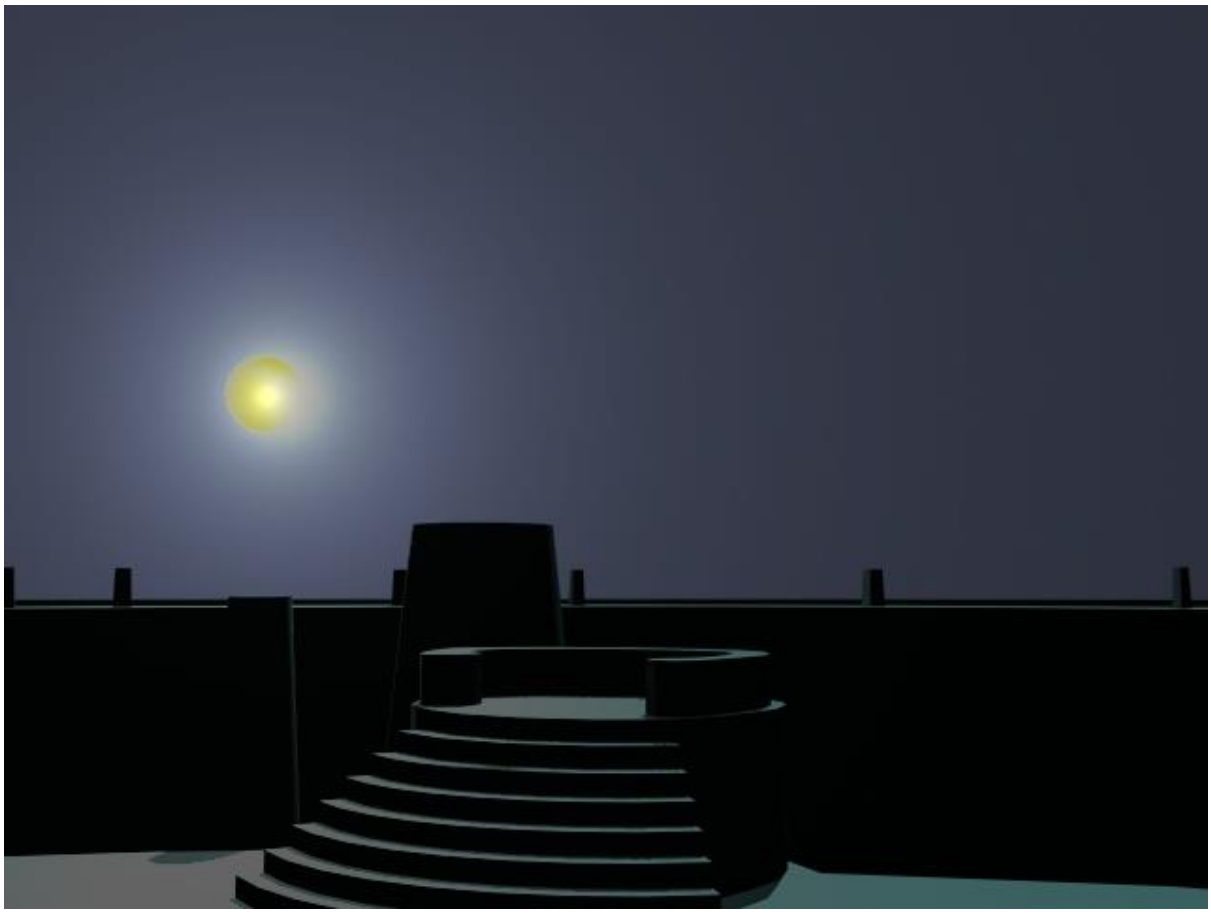


Figure 86 Reconstruction of Supernova rising above Conical Tower at Great Enclosure at Great Zimbabwe by Jan-Willem Van Bergen and RP Wade

18 CHEVRON PATTERN OF THE GREAT ENCLOSURE AT GREAT ZIMBABWE

Another possible astronomical aspect that may apply to Great Zimbabwe is the 'chevron' on the main wall of the Great Enclosure as another case in point where the chevron may represent a Venusian Synodic Period, which bears a close relationship with other natural periodicities such as the Human gestation period and could provide an explanation of the use of the chevron as a fertility symbol (Huffman 1981). A ritual amongst the Karanga involving use of a python skin belt and worn from conception to birth period, is symbolically related to 'Nehanda' or 'Mukaranga' (Venus) (von Sicard 1966), is never seen by anyone and is 'eased' by a notch nine times during the pregnancy period.

The Venus cycle was also used in recording the periodicity of lunar and solar eclipse cycles in various cultures throughout the world and there exists the likelihood that eclipse prediction exists amongst the past and present Zimbabwe Cultural Complex.

Predicting the advent of the rain at the vernal equinox was possibly the prime objective of structural references to mark the Sun, Moon and Venus's movements in the sky. Amongst the descendants of the Great Zimbabwe people the practice was found to exist in predicting the rain by means of the 'stars':-

> "*The fifth suburb was the Mhani suburb which was under the leadership of Gumbu chena Mhani. This suburb was good in the observation of the stars and other heavenly bodies. Members of this suburbs could foretell what the stars meant by certain positions. They led the other suburbs in the observation of the phases of the moon and to determine the seasons*". (Mathivha 1992:12)

> "*The Lembas had a certain powdered substance which they used to pour on to water and then enable them to observe the heavenly bodies. The knowledge of the heavenly bodies made the Lembas to divide the year into twelve months. They have the names of the different phases of the moon. Each phase of the moon lasted for about 10 days. They observed the stars and their positions in the sky. They could read the message of the stars and they could forecast the weather of the following day or month or year.*" (Mathivha 1992:53)

The domba which involves the renowned python dance is part of the 'Vhusha' or 'Vhukomba' initiation ceremony amongst the Lemba/Venda people:-

> "*Both the girls and the boys who have gone through their initiations get to the Domba. Here the adult life is taught. Sex education is taught by experienced teachers. The girls and the young men are taught how to conduct themselves in adult life. The Balemba regard the Domba as a rounding off of the Lemba adult. After grounding by the Domba the young people may now think of marriage*". (Mathivha 1992:48)

The concepts of fertility, conception, gestation and birth are associated with the movements of Venus, the Moon and structural frames of references formed by the monoliths and the wall of the Great Enclosure. Examples of oral tradition selected in chapter 2 describe the term 'Massassi' (Frobenius & Fox 1938: 237-242; 261-265).

The 'Vhusha' or 'Vhukomba' initiation ceremony and the domba are all part of the practice relating to ideals of conceiving (becoming pregnant) that takes place at the advent of the rain at Tshimedzi Moon or closest to the vernal equinox.

Gestation is likely measured by releasing the notch 9 times in synchronisation with the alignments of Venus and the monoliths on the 'Massassi' wall. Birth takes place at the winter solstice roughly 260 days after Venus appears and disappears behind the sun. (Wade 2009: 76 – 88).

> "*The ritual amongst the Karanga /Shona involving use of a python skin belt and worn from conception to birth period, is symbolically related to 'Nehanda' or 'Mukaranga' –Venus (Von Sicard 1966) is never seen by anyone and is 'eased' by a notch nine times during the pregnancy period (Huffman1981). The 'Domba' dance amongst the Venda specifically invokes Venus and the songs all revere Venus and in some cases Jupiter as the 'light that brings the supper' and fertility. During the evening dance of the second or third day, they may begin to learn one of the recreational songs of domba, and also Tshilalelo. This 'song of dismissal', in which the girls 'ask for their supper' (ri yo humbela tshilalelo) and Khumbela-tshilalelo is also a name for Venus as the evening star (Blacking 1988; Wade 2009:79)"* (Wade 2009:79).

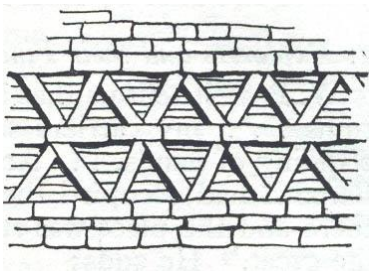


Figure 87 Chevron Pattern on the Main Wall at the Great Enclosure at Great Zimbabwe in Caton-Thompson, G. 1931. The Zimbabwe Culture: Ruins and Reactions. Oxford: Clarendon Press. Page 232.

Figure 88 The Chevron Pattern Decoration on the East-facing wall of Great Enclosure at Great Zimbabwe. Maricopa Photograph prepared by Richard Effland of the slide by Dave Turkon. http://www.mc.maricopa.edu/academic/cult_sci/anthro/lost_tribes/zimbabwe/

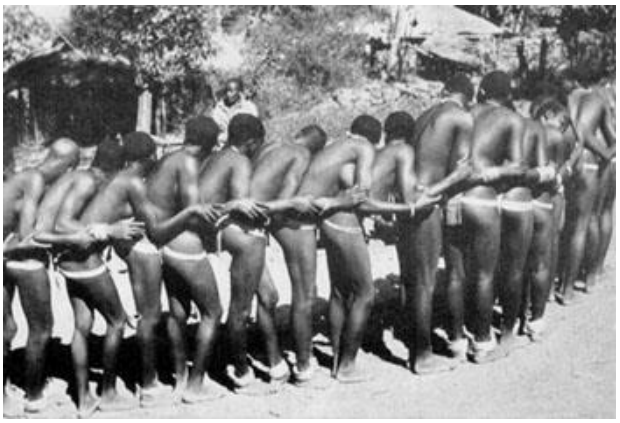


Figure 89 Venda Girls' Initiation Schools. Department of Social Anthropology. University of Belfast (Blacking March 1998) http://sapir.ukc.ac.uk/QUB/Introduction/TitlePage.html

The idea that bowls are used to reflect the sky are mentioned in chapters 1 and 2 but this concept is radical until considered with the possible uses of Bronze Age Aegean ceramic “frying pans” (Tsikritsis et al 2015; Coleman 1985; Papathanassoglou & Georgouli 2009; Varoucha 1925-26; Rambach 2000).

And, that the 'frying pans" may have been associated with a similar use to the 'divination bowls' of the Venda or Zimbabwean cultural complex – for correlation of the biological pregnancy cycle with that of the Venus movement through the sky (Tsikritsis et al 2015).

Figure 90 Clay frying-pan vessel with incised decoration of a ship. Found at Chalandriani on Syros island. Early cycladic II period (Keros-Syros culture, 2800-2300 BC) Cycladic pan, National Archaeological Museum Athens, inventory # 4974 (Tsountas 1899)

In 1 of the 5 synodic periods of a Venus Year (8 years), Venus disappears behind the Sun for 8 days after being an evening star and reappears as a morning star for 268 days. Venus then disappears for 50 days before becoming an evening star again, 268 days is equivalent to the human gestation period (Scotland 1956).

The stelae that mark the passage of Venus from the vantage of the Platform Area are erected above the Chevron pattern. The amount of chevrons on the main wall total 216.

19 CONCLUSION

The rain period mostly begins with the conjunction of the new moon with the Southern Cross stars – Tshimedzi Moon. A New Year begins as a new crescent moon appears when the two lower stars of the constellation Tuda are just below the horizon and the two upper stars just visible. This is the Tshimedzi moon.

Venus disappears behind the sun with significant alignment of the solitary monolith on the wall near the western entrance at azimuth 264° (September 21st 1345 19h02).

Solitary monolith at azimuth 264° marks Venus, Sun, various planets and ecliptic specifically closest to the vernal equinox.

It is therefore a possibility that the most notable references of structures at the Great Enclosure are those of the equinox sunrises, Venus with the small conical tower and the

Tshimedzi Moon sunsets on the wall with a monolith at 264° azimuth as seen from the platform.

The alignments of Venus and various monoliths from the autumnal equinox to the winter solstice are highly unlikely to be coincidental and form a plausible argument that an astronomical function of the monoliths was intentional.

In computer simulations, RX J0852.0-4622 would have risen directly over the conical tower in about the mid-13th century and then proceeded in line with the tower, on its vertical journey for most of the late evening and set at dawn, in alignment with another monolith on the western side of the main wall, for a few months in a year.

The platform area is suggestive of being a sort of 'stage' that would effectively have placed viewers in the secluded gathering place, to see the 'bright star' reach the tip of the conical tower each night and perhaps during the day while visible. If the remnant was sub-luminous this 'alignment' would be an extraordinary coincidence, specifically in light of the structures and oral tradition record.

In accordance with the oral traditions concerning Great Zimbabwe and in light of the new information presented here, the suggestion is that conceptions on the vernal equinox followed by birth at the winter solstice were a preference in selecting royal wives.

20 REFERENCES

Aschenbach, Bernd. 1998. Discovery of a Young Nearby Supernova Remnant. In Nature, Vol. 396 : 6707. November 12th 1998 pages 141 -142. see also http://antwrp.gsfc.nasa.gov/apod/ap990413.html

Aschenbach et al. 1999. Constraints of Age, Distance and Progenitor of the Supernova Remnant RX J0852.0-4622/ GROJ0852-4642 in Astronomy & Astrophysics. Volume 350, Issue 3 - 1999. Pp 997-1006.

Aschenbach, B. 1998. Jahresbericht 1998 / Annual Report 1998 ROSAT – Max Plank Extraterrestrial Physics (MPE) Garching 1999-07-29 http://www.gamma.mpe-garching.mpg.de/~hcs/hcs.html

Aschenbach, B. 1998b. Jahresbericht 1998 / Annual Report 1998 ROSAT – Max Plank Extraterrestrial Physics (MPE) Garching 1999-07-29 http://www.gamma.mpe-garching.mpg.de/~hcs/hcs.html

Aschenbach, B. 1998c. Personal Communication Dec 16th 1998. Max Planck Institute for Extraterrestrial Physics, Garching/Germany

Aschenbach, B., Egger, R. and Trümper, J. 1995. The Vela Supernova Remnant: Discovery of explosion fragments outside of the Vela supernova remnant shock-wave boundary (ROSAT All-Sky Survey). Nature 373, 587-590, December 1995

Aschenbach B, Iyudin A. F and Schonfelder V. 1999. Constraints of age, distance and progenitor of the supernova remnant RXJ0852.0- 4622/GROJ0852-4642. ASTRONOMY AND ASTROPHYSICS . Astron. Astrophys. 350, 997–1006 (1999) Max-Planck-Institut fur Extraterrestrische Physik, 85740 Garching, Germany.

Blacking, John. March 1998. Venda Girls' Initiation Schools. Department of Social Anthropology. University of Belfast. http://sapir.ukc.ac.uk/QUB/Introduction/TitlePage.html
http://www.qub.ac.uk/VendaGirls/GrDombaSong/GDS_Music_Text03.html

Chen, W. and Gehrels, N. 1999.The progenitor of the new COMPTEL/ROSAT supernova remnant in Vela, Astrophysical Journal Letters v. 514, p. L103 (1999), (astroph/9812154 v2).

Coleman, John E. 1985. Frying Pans of the Early Bronze Age Aegean, American Journal of Archaeology, vol. 89, pp. 191-219.

Frobenius Leo & Fox Douglas C. 1938. African Genesis: Folk Tales and Myths of Africa. Faber & Faber Ltd UK. pages 237-242.

Frobenius Leo & Fox Douglas C. 1938. African Genesis: Folk Tales and Myths of Africa. Faber & Faber Ltd UK. pages 261-265.

Huffman, T.N. 1981. Snakes and Birds: Expressive Space at Great Zimbabwe. In African Studies. Vol. 40, no. 2 1981.

Huffman, T.N. 1996. Snakes and Crocodiles: power and symbolism in ancient Zimbabwe. Johannesburg: Witwatersrand University Press.

Iyudin, A.F., Schönfelder,V., Bennett, K, Bloemen, H., Diehl, R., Hermsen, W., Lichti, G.G., Van Der Meulen, R.D., Ryan, J. & Winkler, C. 1998 Emission from 44Ti associated with a previously unknown Galactic supernova. Nature 396 (6707): 142 -144.

Papathanassoglou, D. A. , Georgouli, CH. A. 2009. The 'frying pans' of the Early Bronze Age Aegean: an experimental approach to their possible use as liquid mirrors, Archaeometry, vol. 51, no. 4 (August 2009), pp.658–671.

Rambach, Jörg. 2000. Kykladen I. Die frühe Bronzezeit – Grab- und Siedlungsbefunde. Habelt, Bonn 2000, ISBN 3-7749-2831-2, p. 144 Tbl. 80.

Tsikritsis, M, Moussas, X, Tsikritsis, D. 2015. Astronomical and Mathematical Knowledge and Calendars During the Early Helladic Era in Aegean "Frying Pan" Vessels. Mediterranean. Archaeology and Archaeometry. Pp xx - xx (In Press MAA). As well as Proceedings of the 21st SEAC Conference

Tsountas, CH., 1898, Cycladic I, ArchEph, 137-212.

Tsountas, Ch., 1899 Cycladic II, ArchEph, 73-134.

Varoucha Irini. 1925-26. "Kykladikoi taphoi tēs Parou (Κυκλαδικοί τάφοι της Πάρου)" Ephēmeris archaiologikē 1925-1926, pp. 98–114 (Digitised: p. 99, 107 Ill. 9).

von Sicard, Harald. 1966. Karanga Stars. In N.A.D.A. - The Southern Rhodesia Native Affairs Department Annual, Volume 9, No. 3, 1966.

Wade, R.P. 2009. A Systematics For Interpreting Past Structures With Possible Cosmic References In Sub-Saharan Africa. M.Sc. Thesis. University of Pretoria http://upetd.up.ac.za/thesis/available/etd-05052009-174557/

CHAPTER FOUR

Cosmogenic Geomythology of Great Zimbabwe: A Southern African Postulate of the Vela Junior Supernova Remnant

Abstract

Within the relatively unknown cosmology of indigenous knowledge systematics of southern Africa, archaeological information, oral traditions, rituals and rock-art have provided a deeper perspective of specific astronomical data. In an attempt to ascertain geomythology in the African sub-Saharan continent various aspects were found to exist in structures such as at Great Zimbabwe and Mapungubwe together with a rich collection of evidence of how these expressions integrate amongst others.

A relevant cosmic reference of an event in the Vela region, most likely a supernova, has been identified within fourteenth century configured structures at Great Zimbabwe - further substantiated by certain artefacts and oral traditions - that revitalized social ideologies of the Zimbabwe origins mythology. These data relate to evidence of a similar period in suggested histories and archaeological data of southern hemisphere cultures in Australasia, South and Central America where the absence of historical records in these predominantly pre-literate societies implied the event may have not been visible in those regions.

Ice-core data reveal that nitrate peaking appears at depths corresponding to known supernovae with two different abundance spikes dated to be within the range of 1070 ± 10 AD and 1320 ± 20 AD.

There are insurmountable problems associated with absolute dating with the ethnographic records of non-literate cultures of the southern hemisphere which offer little of relevance or contribution to applied historical astronomy; however, the Maori traditions document a possible supernova dating to the period 1000 – 1770 AD and amongst the Great Zimbabwe cultural complex chronological exactitudes are present in a cosmogenic mythology and in arranged and stratified structural references. Apart from the ice-core results, an historically unrecorded supernova remnant in the Vela Region - RX J0852.0-4622 (Vela Jr.) that has been detected by radio, x-rays, and the ^{44}Ti γ-ray line is the likeliest remnant in the region for the time period, which may have been portrayed as a pinpoint of light with a concentric ring in the southern African rock art and other artefacts.

Keywords: Geomythology, RX J0852.0-4622, G 266.2-1.2, Great Zimbabwe, astronomy, archaeology, archaeoastronomy, Little Ice-Age, Limpopo, Lemba, Indigenous knowledge systems, Oral Tradition, Supernova, Supernova remnant, Ice-cores, Great Enclosure, Hill-top Complex, Tsisulwe, Mahutonga, Tatsunokuchi, Nichiren.

21 INTRODUCTION

Astronomical research in historical and prehistorical periods with emphasis on supernovae investigations has covered a wide spectrum of cultures (e.g., Krupp 1978; 1997; 1983; 1988; 1997; 2011a; 2011b; Aveni 1981; 1993; 1997; Ruggles 1987; 2000; 1999; 1993; 2005; Schaefer 1993; 1995; 1996; 1999; Stephenson & Green 2002). Southern hemisphere cultures evidenced in the archaeological records in other parts of the world are also being assessed for any geomythology in regard to supernovae. Geomythology encompasses the study of geological phenomena (including astronomical events like comets, eclipses and supernovae) which may have inspired aspects of oral traditions (e.g., Vitaliano 1968; 1973; Hamacher & Norris 2009:6-8). The astrophysical information is generally tenuous and depends at times on substantiation of eyewitness accounts; written records are subjective and depend on peer confirmation (Mayor 2000; 2005; Piccardi & Masse 2007; Masse & Masse 2007; Masse et al 2007; Vitaliano1973).

This paper explores the postulate that astronomical phenomena may have been witnessed in sub-Saharan Africa in the distant past, partially based on celestial references of geoinformatic indigenous knowledge (Doyle & Frank 1997; Mathivha 1992; Lewicki 1974; Wade 2007a; 2007b; 2009; Swan 1897; 1896; 1892 a-g; 1893a-d). A specific hypothesis discussed here, and one analysed within cultural contexts, is that Mapungubwe and Great Zimbabwe within southern Africa, may have had various structures that determined seasons, trade, rituals and cosmology amongst other aspects; these can be expanded into systematics for identification of past cosmic references. The focus will be on the Great Zimbabwe ruin called the Great Enclosure, radiocarbon dated to have been built between the 11th and 15th centuries, as well as the Hilltop Ruins (Huffman & Vogel 1991), which may have been associated with alignments of planets, specific stars, constellations, solstices, and/or lunar sightings within the Zimbabwe Complex. Various ethnic groups, possibly descendant from the Zimbabwe Cultural Complex (Huffman 1996), such as the people now referred to as the Venda, Shona, Sotho, Lemba, Lovedu, Karanga and Tsonga-Shangaan, demonstrate a legacy of knowledge of certain stars as agricultural markers and calendars (Aveni 1993; Chaplin 1967; Dornan 1927; Doyle and Wilcox 1986; Frobenius 1931; Holbrook 1998; Krige and Krige 1965; McCosh 1979; Ruggles 1987; Snedegar 1995; Stayt 1968; von Sicard 1966; Wade 2009; Swan 1892; 1893; 1896; 1897).

Preliminary archaeoastronomical surveys completed at Mapungubwe and Great Zimbabwe Great Enclosure and Hill-top Ruins (Wade 2009: 94-111; 24-26, 44, 48, and 227; Wade & Broodryk 2010) provide a basis for the research. Systematic analysis of the geomythology of Great Zimbabwe in this paper is compatible with supernova remnant RX J0852.0-4622 / G 266.2-1.2 as an historical event at the turn of the 14th century (cf., Doyle & Frank 1997; Mathivha 1992; Lewicki 1974).

22 GREAT ZIMBABWE - ARCHAEOASTRONOMICAL ASPECTS

Stellar alignments found in ancient structures are often problematic in that the precise date of the structure is unknown; this has been addressed to a certain extent at Great Zimbabwe as the archaeologically established chronology is identified (Summers et al. 1961; Huffman & Vogel 1991; Chirikure & Pikirayi 2008: 976-988; Krupp 2011a and b). In addition, alignments are not usually linked tightly to a convincing interpretive framework, and it is necessary to know the function of the configuration, the way it is incorporated into the architecture or landscape and cultural value (cf., Krupp 2011a and b). In the preliminary

findings from some of the surveys carried out at Great Zimbabwe, these aspects were dealt with and the data have been uniquely linked, to a convincing interpretive framework (Stenger 2002; Clark & Carrington 2002; Wade 2009).

Such an interpretive framework is likely inherent to the agricultural facet of the Great Zimbabwe people. As a formative state marked by gender discrimination and class distinctions with the wealth of the trader agriculturists (Huffman 2005 & 2008; Chirikure & Pikirayi 2008), these people faced a sporadic climate and changing environment coincident with the Mediaeval Warm period (Hughes & Diaz. 1994; Huffman 2008). To them, fertility of the land was measured according to metal production, rain, cattle, crops and a shifting social stratification of nascent kingship, concepts that relied on external trader contact, environmental and celestial phenomena.

Specific movements of Venus associated with the sun at the advent of rain coincide at the vernal equinox, in relation to the ethnography of descendants in the area. Nehanda or 'Venus personified' through the living oracles on earth, guide ancestral 'demands' still to this day and possibly progressed as a cultural facet (Mhondoro) since the agriculturist/trader naissance of the Great Zimbabwe/Mapungubwe state formation (Lan 1987; Wade 2009:76-79: 256-269; Keen & Tyson 1973; Scotland 1956; Chirikure & Pikirayi 2008; Huffman 1981; von Sicard 1966).

The introduction and origins of the earliest grains and crops in the Great Zimbabwe culture have been related to the east African trade route which links the pre-Islamic anwã system and the use of agricultural marker stars and therefore accounts for an observed similarity in astronomical names and practices (Varisco 1985; 1987; 1989; Wade 2009:85). This likely developed by the 13th century into an intricate integration of social systems that reached an ideological crescendo together with a wealth and power associated with trade, a complete upheaval in socio-political structures that led to extravagance, military might, excesses and art.

Legends and cosmogenic myths were created at this time and the sciences were expressed in the structures (Huffman 1981), their spatial arrangement and use of space – specifically astronomy. The interpretive framework for the Great Zimbabwe stellar alignments presented here, also links with a need for timing to plant approximately 27 species of rare sorghum seeds in only '10 selected days' in a roughly 30 day period, within a very harsh environment, and most especially to use the stars to 'predict' the rain (Varisco 1985:61; Wade 2009:86).

22.1 Great Zimbabwe – Great Enclosure

An archaeoastronomical examination from the platform area suggests that the Great Enclosure's Main Wall was used to define the backdrop of stars, Moon and Venus with monoliths marking specific ascending stars and the vernal and autumnal equinox, amongst other aspects. By postulating that the Great Enclosure functioned as a kind of observatory supports the astronomical oral traditions of the BaSena people or people of 'Sayuna' (Arabic for 'Zion') (Lewicki 1974; Mathivha 1992; Doyle & Frank 1997; Stenger 2002; Clark & Carrington 2002; Wade 2009).

This postulate is not a new idea (although the computer simulations of celestial alignments presented here provide new supportive findings) and was mooted in 1893 already, when a survey of the ruins led to an interpretation that they provided the elements of a celestial calendar and the ability to measure the passage of the seasons (Swan in Bent 1893:147; Lockyer & Penrose, 1901; see also, Wade 2009:25).

Analogously, Hall (1909:344-345; see Wade 2009:25) following a study of the Great Enclosure's preserved architecture inferred that it provided the means, albeit crude, of

determining times, seasons and concomitant feasts. However, several later researchers, following their own surveys have disputed the ideas first espoused by Swan (as expressed in Bent 1893: Chapter V) as incommensurable with the data while accepting that more research was required for finality to be reached (e.g., Doyle & Frank 1997).

Figure 91 Great Zimbabwe Great Enclosure viewed from Hill-Top Complex. (Rüther, et al 2008). ALUKA University of Cape Town, Geomatics.
http://www.aluka.org/action/showMetadata?doi=10.5555/AL.CH.DOCUMENT.UCTZIM0000762

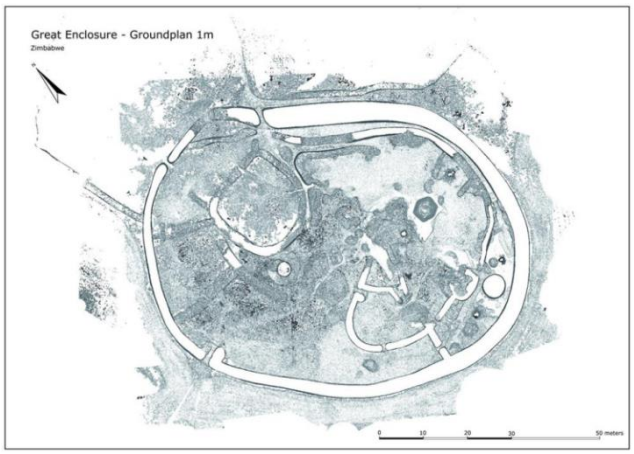


Figure 92 Ground plan of Great Enclosure at Great Zimbabwe. (Rüther, et al 2008). ALUKA University of Cape Town, Geomatics.
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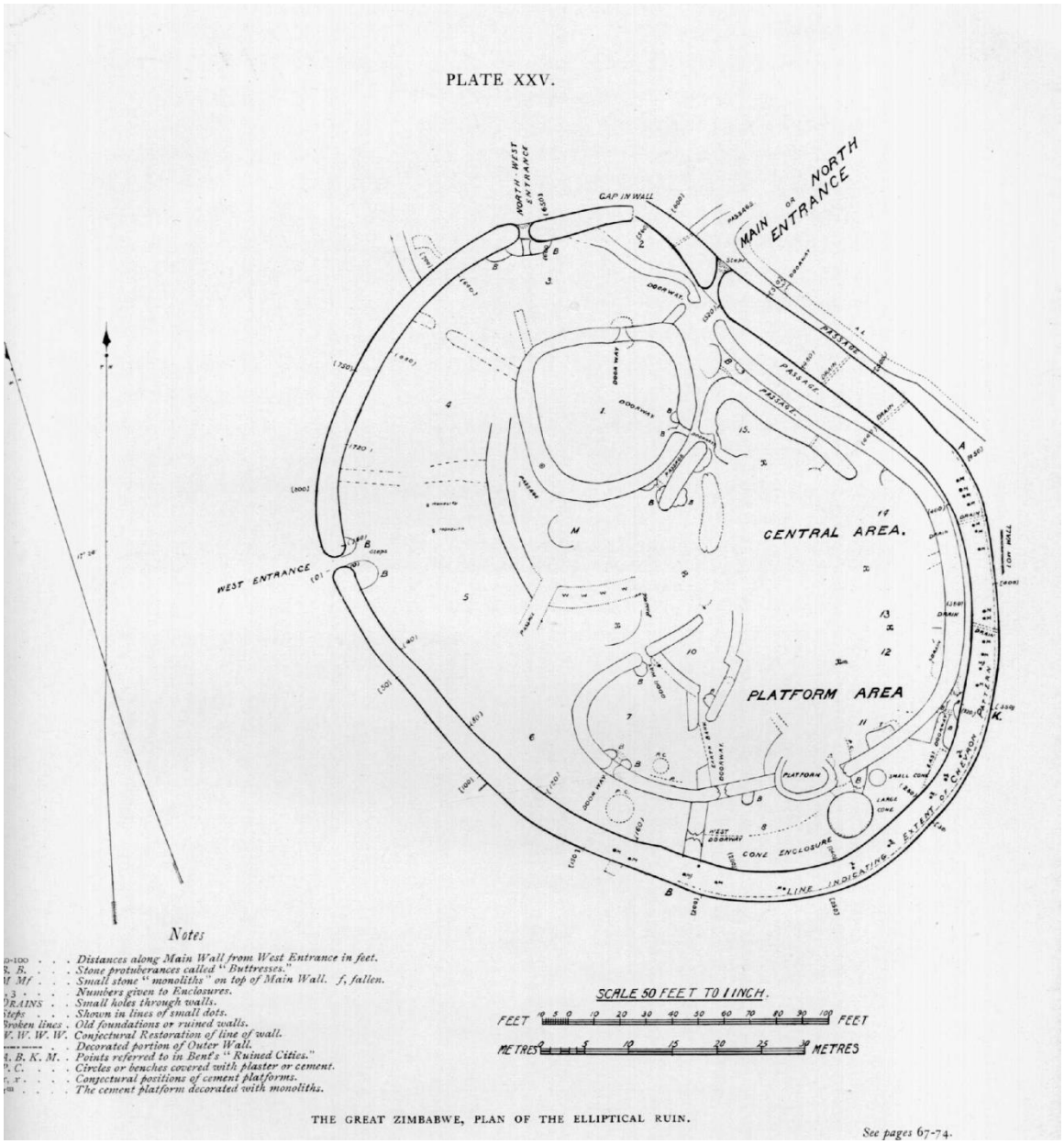

Figure 93 Plan of Great Enclosure surveyed and draughtsmanship by Franklin White (MacIver, 1906:74 plate XXV).

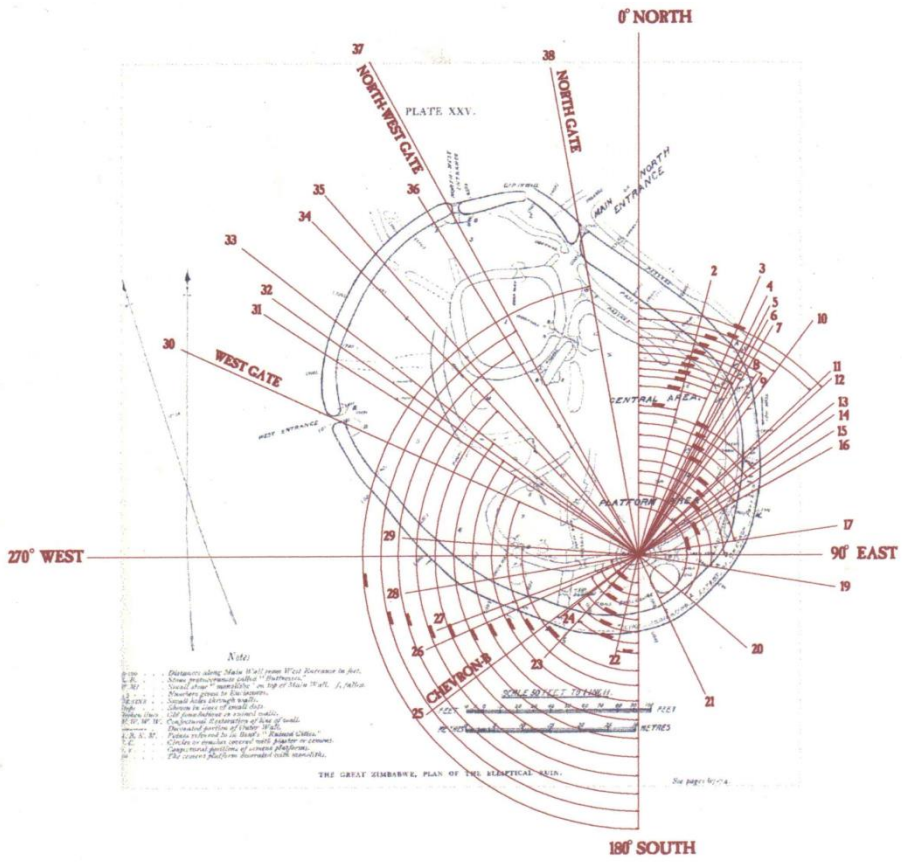

Figure 94 Plan of Great Enclosure surveyed and draughtsmanship by Franklin White (MacIver, 1906:74 plate XXV). Reconstruction of alignments – RP Wade (Wade 2009)

The functions of the Large Conical Tower at Great Zimbabwe have been the subject of much speculation: as being a minaret, symbolic ant-hill, phallus, grave, look-out tower, gnomon, grain-bin, status symbol and initiation pillar built after initiation; it may have had an alignment function as is found with some stelae in an African context. Alignments could have been made with planets and any number of celestial phenomena such as comets, meteor shower/storm radiants and even novae/supernovae events.

At the Great Enclosure a particular arrangement of stelae, for instance, aligns with three stars of Orion, namely: Saiph, Alnilam and Bellatrix at Orion's heliacal rising on the winter solstice. There are several alignments that coincide with a specially erected platform, at the easternmost part of the oval wall. This platform is built sufficiently high to allow the observer to see over the wall to the horizon with the monoliths placed in the wall to mark the rising stars, moon, planets or sun.

From the vantage point of the platform of the Great Enclosure at Great Zimbabwe it is possible to see the exact risings and settings of Makhali (Orion) which is well marked by three monoliths, which align with Saiph, Alnilam and Bellatrix. The central monolith together with the smaller Conical Tower not only marks Alnilam but the Vernal/Autumnal Equinox rising sun.

However, it would appear in a preliminary chronological/stratigraphical analysis that the platform and small conical tower were built at the same time as the inner wall, and only thereafter, the main wall. The Large Conical Tower was constructed after all the walls were completed (Chirikure & Pikirayi 2008:976-989). This implies that the platform once existed in a pre-outer walling phase with the small conical tower marking solstitial directions and the

Venus starting point on the horizon and its departure from the horizon when it disappears behind the sun during the synodic period (Wade 2009: 76)

Figure 95 Pre-walling phase of Ground plan of Great Enclosure at Great Zimbabwe. (Rüther, et al) 2008. ALUKA University of Cape Town, Geomatics. Annotated R.P Wade

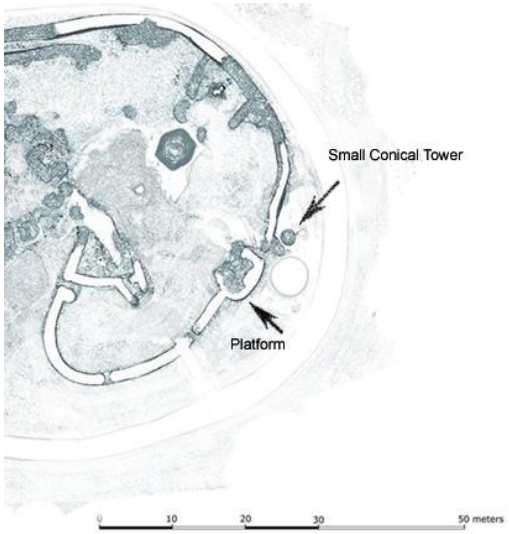

Figure 96 Pre- walling phase of Ground plan of Great Enclosure at Great Zimbabwe. (Rüther, et al 2008). ALUKA University of Cape Town, Geomatics. Annotated R.P Wade – detail indicating Small Conical Tower and Platform.

Initiation schools are still held by traditional communities throughout southern Africa and they are known to reoccur every 2 years and in some cases 4 years. This is because Venus is used as the timing device; when Venus changes over to being a morning or evening star, basically every 2 years, depending on whether the community has chosen Venus as a Morning star or evening star as preference.

Important rituals and gatherings also occur at the times when Venus conjuncts with the new crescent moon. The most powerful ancestral spirit that can 'occupy' a rain-maker or Mhondoro spirit-medium (Svikuru) is 'Venus' or Nehanda (Frobenius & Douglas 1938:261-265 and 237-242; Von Sicard 1966; Beach 1980; Beach 1983a; Lan 1987; Wade 2009:

256). Most notably, the smaller tower and monolith on the Main Wall both mark the Venus rising and setting point as a morning star during the Venus Synodic period.

Figure 97 Small Conical Tower at Great Enclosure of Great Zimbabwe. . (Nadine Broodryk van De Wetering for scale – Photographed by R Wade).

22.2 Great Zimbabwe – Hill Complex

The Western Enclosure of the Hill Complex at Great Zimbabwe has one vantage platform at its highest point that acts as a central viewing point from which several 'alignments' would have been visible before the turrets on the wall were destroyed. The height of these turrets from that particular vantage possibly coincided with the first appearance of each thin crescent moon in the late afternoon throughout a year. There were 14 turrets but very little evidence can be extrapolated from the various reconstructions and plan drawings that have been made (e.g., Swan 1891; White 1905; Hall 1905; Schofield 1926; Whitty 1958; Summers in 1961; 1971; Summers and Witty 1961; Doyle & Frank 1997).

23 A POSSIBLE SUPERNOVA RELATED TO GREAT ZIMBABWE: PRELIMINARY EVIDENCE IN RELATION TO ASTROPHYSICAL AND ICE-CORE DATA

In addition to alignments of stars, Sun and Moon discussed in the previous section, the preliminary surveys also provide sufficient cosmic references at Great Zimbabwe in the archaeological record, supported also by the ethnography as well as in artifacts, for alignments tightly linked to a convincing interpretive framework including an ancestral geomythology of a possible supernova event in the Vela constellation region.

Supernovae are more energetic than the general novae that occur in distant galaxies and there are relatively few that occur in our known galaxy. A supernova is usually a luminous burst of radiation that briefly surpasses the luminosity of an entire galaxy before fading over several weeks or months, as determined from very distant observations. The explosion expels most of the star's material at almost 10% the speed of light, radiating as much energy as the sun in an entire human life span. The shock wave sweeps up an expanding shell of gas and dust called a supernova remnant (Giacobbe 2005; Schawinski 2008).

Over the past decade there has been an intense search for any evidence relating to an historically unrecorded supernova event that occurred in the Vela region. The object has been identified as the supernova remnant RX J0852.0-4622 (Vela Jr.) that has been detected by radio, x-rays, and as observed by the Imaging Compton Telescope (COMPTEL) through gamma ray emissions from the decay of the ^{44}Ti γ-ray line (Iyudin et al. 1998; Iyudin et al. 2010). The detection of the radioactive decay line of ^{44}Ti provides unique evidence that the γ-ray source is a young (<1000 yr) supernova remnant because of the short ^{44}Ti lifetime of ~90 yr. Only two Galactic remnants, Cassiopeia A and RX J0852.0-4622, have hitherto been reported as ^{44}Ti line emitters.

The distance to this supernova remnant is controversial (Katsuda, Tsunemi & Mori 2008), but it may be only 650-700 light years away, perhaps within the last 800 years. It is designated as supernova remnant RX J0852.0-4622 (also known as G266.2−1.2.) and is located in the southern sky in the constellation Vela ("sail") and sits (in projection) inside the much larger and older Vela Supernova Remnant and is often referred to as 'Vela Junior'.

This possible astrophysically determined cosmic event may have been the nearest, brightest and most recent supernova to Earth (Aschenbach 1998a; 1998b; Aschenbach et al. 1995; Aschenbach et al. 1999; Iyudin et al 1998; Chen & Gehrels 1999).

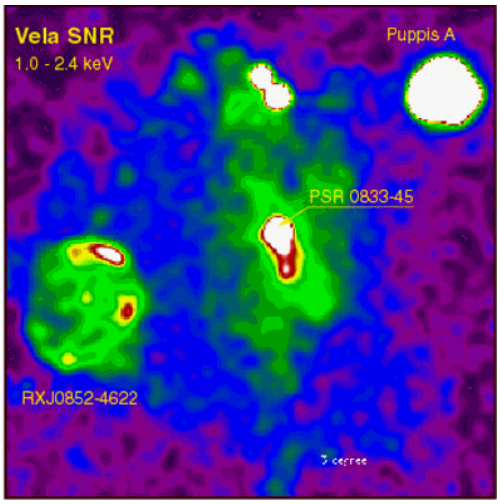

Figure 98 Vela and friends: The two supernova remnants Puppis-A and RX J0852.0-4622 are both located at the edge of the Vela supernova remnant. Emission from the neutron star CXOU J085201.4-461753 is clearly visible in the ROSAT all-sky survey image near to the centre of RX J0852.0-4622. (Iyudin, et al. 2005 and 2010)

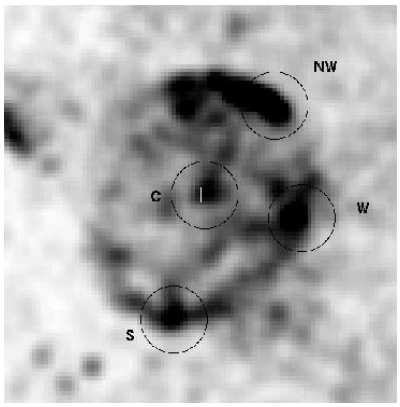

Figure 99 ROSAT grey scale image of RX J0852.0-4622 for E_x > 1.3 keV; black circles show the XMM-Newton GTO fields in the northwest (NW), the west (W), the south (S) and the center (C) of the remnant. North is up and east is to the left. The white cross marks the position of the point source CXOU J085201.4-461753. (Iyudin, et al. 2005 and 2010). May have been seen as a dot with a circle when the shell was illuminated.

Despite the fact that the production yield of titanium-44 in 'RX J0852.0-4622' is not known - it is being produced in every type of supernova but at different rates - the γ-ray measurements could be used to further constrain the age and distance of 'RX J0852.0-4622' making use of the 'life-time' of Ti ^{44}. It is concluded that the supernova occurred in the 13th century at a distance of about 700 light years from Earth. This is the first time that a previously unknown supernova remnant has been found by means of the Ti^{44} γ-ray line (Koppeschaar 1998).

If previous estimates prove correct it should have been visible from the earth in about the year 1250 and yet there are no known contemporary eyewitness accounts or literature available regarding the event which appears to have occurred in the mediaeval era at the turn of the 13th to the 14th century (Iyudin et al. 2010; Aschenbach 1998b). It is unclear why it went unrecorded historically (Iyudin et al. 1998).

In 2009, elevated levels of nitrate ions were found in Antarctic ice, which coincided with the 1006 and 1054 supernovae. Gamma rays from these supernovae could have boosted levels of nitrogen oxides, which became trapped in the ice. Ice-core data in Antarctica have established a possible date of circa 1320 AD +\- 20 years for the supernova RX J0852.0 - 4622 (Watanabe et al. 1997; 1999). If these enhanced nitrate ion levels were indeed linked to this supernova, then the age given would be more accurate than that determined by astrophysical techniques (Burgess & Zuber 2000).

As a possible near-Earth supernova RX J0852.0-4622 may have had noticeable effects on the biosphere. Depending on the type and the energy, a near-Earth supernova between 3000 to 100 light years away can change the upper atmospheric chemical reactions to convert nitrogen into nitrogen oxides which deplete the ozone layer and expose the biosphere below to harmful cosmic and solar radiation (Gehrels et. al. 2003). Recent estimates predict that generally a supernova would have to be closer than eight parsecs (26 light-years) to destroy half of the Earth's ozone layer; further research thus appears to be needed in this regard.

Northern hemisphere cultures which were predominantly literate have no known records of such a supernova event and southern hemisphere non-literate cultures to date have revealed no known cosmic references (Orchiston 2002). Without historical evidence however and given the lack of any known reference to a bright southern supernova in this time interval in written records from Asia, Europe or North Africa (Aschenbach 1998b), it is natural

to suppose that perhaps the age estimates are wrong, that it was too low on the horizon at an unfavourable time of year, that there are gaps in the historical record, or that the supernova was sub-luminous. If the progenitor was a Wolf-Rayet star, the supernova might not have been very spectacular at all. But it remains very important to establish whether the closest supernova in known recent history actually exploded unnoticed.

New ethno-astronomical evidence may assist in establishing whether or not this event was seen and recorded, especially in regions where it would have appeared well above the horizon. Despite the apparent lack of well-preserved astronomical traditions or records in most of sub-Saharan Africa, aspects of the Great Zimbabwe complex, associated rock art and indigenous knowledge systematics may provide circumstantial evidence that the 'missing' supernova was indeed seen in the southern hemisphere.

If the supernova that produced the remnant RX J0852.0-4622 was at a distance commensurate with affecting the biosphere of the Earth then evidence should exist of effects on life and in global ecological change. The ice-core data reflect nitrate abundance possibly due to RX J0852.0-4622, which implies a relationship between the atmosphere and its ionization due to influx radiation. Tree-ring data or dendrochronology has indicated that there was a change in the climate at the proposed time of the supernova event (Villalba 1990; 1994); however, this climatic change may also have been related to the intense volcanism of the time (Miller et al. 2012).

While possible effects on Earth and global climate from the supernova within the time frame is speculative, severe climatic aberrations caused crop failures and famines in Europe in A.D. 1315 and 1316, while extreme droughts were experienced from A.D. 1120 – 1300 (destroying amongst others, Anasazi society) in the American Southwest, with widespread warming trends throughout the American West (Fagan 2000a; 200b). These global scale climatic changes were mirrored also in Mapungubwe, an early capital of the Zimbabwe Cultural Complex, which appears to have experienced a sudden change around 1290 AD +/- 20 years at the same time as Great Zimbabwe (Meyer 1988; 2000; Huffman 2005: 2008).

Elsewhere notable climatic fluctuations occurred such as the freezing of the Thames River in England, the abrupt collapse of the Greenland Viking colonization, the rise of the Inca, the Anasazi Pueblo Culture Great Drought 1276-1299, and the arrival of the Maori in New Zealand at the advent of the so-called 'Little Ice Age' (Villalba 1994; Hughes & Diaz 1994; Houghton et. al. 1995; Keigwin 1996; Holdaway 1996; Svensmark 1998; Anderson 2000; Magnuson et al. 2000; Tyson et al. 2000; Huffman 2005: 2008; Mann, et.al.2008; Wilmshurst et al. 2008; Pearce 2010).

The palaeolimnological stratigraphical record of Lake Naivasha corroborates the east African oral traditions of the 'Wamara', 'Nyarubanga' and 'Lapanarat-Mahlatule' drought periods and signifies that the Mediaeval Warm Period came to a distinct and sudden end with high rainfall at the advent of the Vela Junior supernova event. This suggests a speculative correlation of supernovae and climate, specifically between the RX J0852.0-4622 and the Spörer Minimum, the 1572 Tycho Brahe / Kepler 1604 supernovae and the Maunder Minimum, and possibly one or all of the SNe1006 / 1054/1181 and the Mediaeval Maximum (Burgess & Zuber 2000; Verschuren & Cumming 2000; Kiage & Liu 2006).

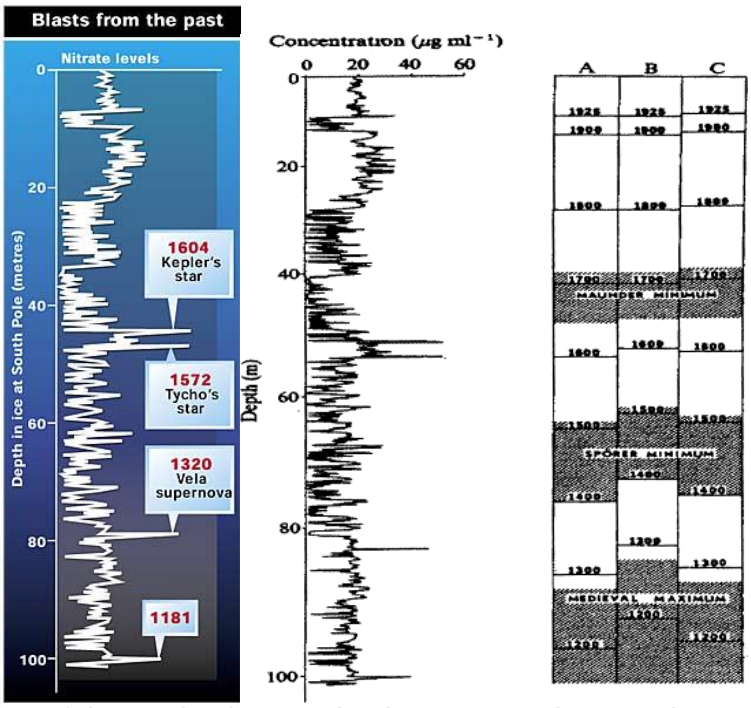

Figure 100 Footprints of the Newly-Discovered Vela Supernova in Antarctic Ice Cores? (Burgess & Zuber 2000:1-6) Nitrate abundance in South Pole ice cores. The two spikes at ~50 m correspond to the dates around 1600, the spikes at ~85 m and ~100 m to 1300 and 1150, respectively. The increases in Nitrate abundance have been associated with Supernovae observed in 1604 (Kepler's supernova), 1572 (Tycho's supernova), and in 1181. The 700 year old Vela Junior supernova might have caused the fourth spike at ~85 m. (Rood, et al 1979; Burgess and Zuber, 2000)

24 ASTRONOMICAL DATA IN THE ARCHAEOLOGICAL RECORD IN SPECIFIC RELATION TO SUPERNOVA RXJ0852.0-4622

The reconstructed 11m Conical Tower in the Great Enclosure aligns with the supernova known to have exploded in Vela; 700 to 800 years ago the supernova remnant certainly falls well within the parameters of being aligned with the Conical Tower as seen from the Platform Area and would have been a spectacular addition to the sky, brighter than the brightest star and moon today (-5th to -8.5th magnitude, visible between 3 months if sub-luminous and 1,5 years if luminous; Aschenbach 1998c). As a very unusual star, which is postulated to have been a point of light surrounded by one ring and possibly more with atmospheric aberration, it may have contributed to the Lemba legend of a star guiding them to their present homeland (Mathivha 1992).

The supernova remnant aligns with the Conical Tower as viewed from the Platform Area, at an azimuth of 130° 50´ 30´´ when rising and with a monolith on the wall at an azimuth of 193° 09´ 36´´ when setting. Upon entering these co-ordinates of the supernova into computer simulations of the site and its attendant sky it is apparent that it would have risen directly over the Conical Tower in about the mid-13th century. It would have proceeded in line with the tower, on its vertical journey for most of the late evening and set at dawn, in alignment with another monolith on the western side of the main wall, for a few months in a year.

The platform area is suggestive of being a sort of ‘stage’ that would effectively place viewers in the secluded gathering place, to see the ‘bright star’ reach the tip of the conical tower each night and perhaps day also, while visible. The simulations also show that as the object faded in magnitude it would have risen before dawn in the east and traversed the sky unnoticed during the day before suddenly appearing again in the evening before sunset in

the west. The Supernova remnant continues to make this alignment but is no longer visible to the naked eye.

Figure 101 Supernova remnant RX J0852.0-4622 rising behind the large Conical Tower during the time of Great Zimbabwe's flourish as a culture. Computer Simulation by RP Wade of the alignment in relation to the wall and Conical Tower of the Great Enclosure when viewed from the Platform Area 14th September 1281 AD at 18h50. Large Conical Tower is right of the Small Conical Tower (centre of picture - extended to Outer Wall height hypothetically at 90° azimuth). Courtesy Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009) Planetarium software for simulation of the skies at Great Zimbabwe Great Enclosure Platform Area 20° 16' S , 30° 56' E and a 360° Photorealistic horizon panorama of the entire walling as seen at present from the centre of the Platform.

From the Platform Area several other arrangements can be seen in the computer simulations, such as the winter solstice sunset, which sets over the western entrance, and the vernal and autumnal equinox sunrise and Venus over the small conical tower. Venus conjuncts with the waning crescent moon at this point at the start and ending of being a 'morning star'. Such accuracy is postulated here to not be coincidental and to require a rich tradition of astronomical knowledge to so precisely allow one conical tower to have several cosmic references.

As a caveat, the assumption here that the supernova was well visible at Great Zimbabwe is an uncertainty best left to astrophysicists; additionally unless corroboration of the supernova can be achieved in more worldwide references, the only achievement of the postulate of Great Zimbabwe as an astronomical observation centre is to link the observed alignments to historical traditions (Krupp 2011a and b). Traditional symbols and oral traditions which are compatible with the supernova postulate discussed in this paper are detailed below

24.1 Ndoro – Mhondoro

The 'Ndoro' symbol, fashioned within the last millennium or more, is usually a spiral whorl of seashell associated with cowry currency ('ndarama'), relatively common as a symbol in Zimbabwe and the Limpopo Province of South Africa and which became incorporated as a stellar symbol at a particular time (cf., Stayt 1931:26; Jeffreys 1952; Von Sicard 1953), possibly as a result of the supernova.

The 'Ndarama' is a much older concept and symbol that has represented money for a much longer period and wider area. The Ndoro is a kind of Jungian archetypal 'mandala'- looking symbol (Gold 1994; Brauen 1997). The symbol exists in the rock art but becomes part of the stylistic expression within the Great Zimbabwe Cultural Complex at a specific time. Amongst the 13th century ruins of the emergent farming and metalworking capital at Great Zimbabwe and elsewhere in the apparently contemporaneous rock art of southern Africa, are found peculiar symbols, rather like a child's drawing of the sun, but not aligned or positioned in a way that suggests a solar connection, but which could be records of a supernova.

The concept that the 'Ndoro' is a celestial symbol - in this case as a moon - is emphasized in an oral tradition recorded by Reverend Samuel Muhlanga (Muhlanga 1926; Chigwedere 1996). The ornament is usually a white disc made from the flattened whorl of a gastropod shell cut off from the convolutions which house the body of the animal, made from heavy, pure white calcium carbonate and marine in origin. Some are made from porcelain and represent a spiral rather than the later stellar stylistic incorporation which became rings within rings around a dot (Frobenius1931:166-168; Von Sicard 1951:17).

During the Monomotapa Period an Mbire leader 'Torwa' appears to have adopted the Ndoro as a symbol of the moon (Frobenius1931:15). However, the etymology of the word Ndoro in the Karanga vocabulary encompasses an earlier round and shining object, and later reflected a star or blaze (Von Sicard 1951:17; Latham 1986).

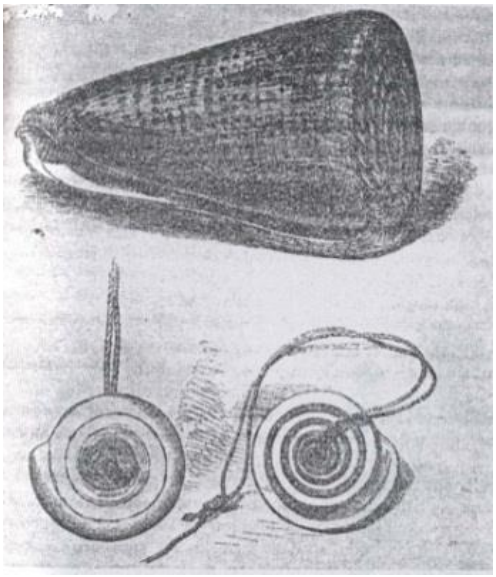

Figure 102 Ndoro amulets and Conus shell. (Chigwedere, 1996:72).

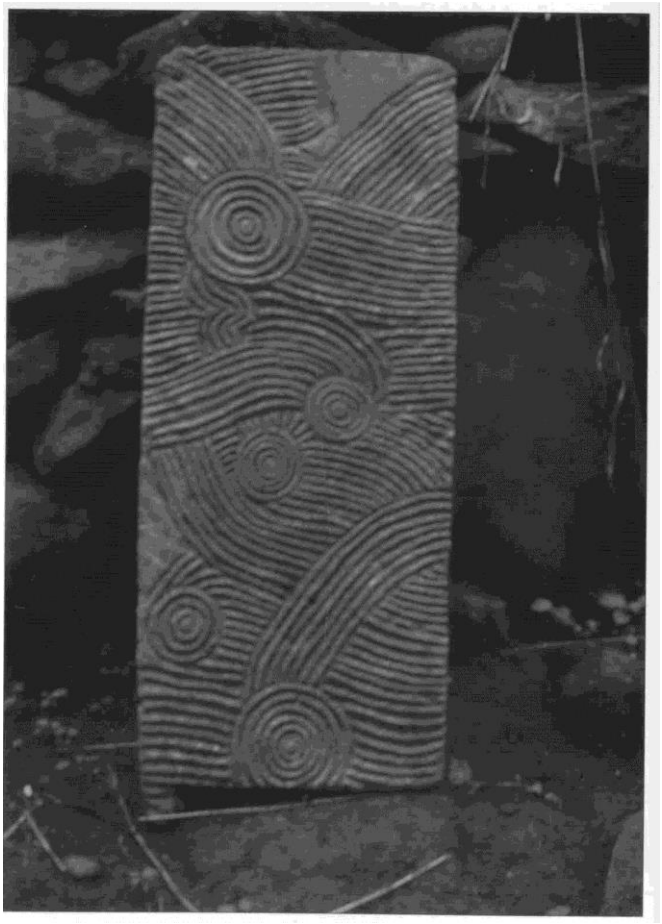

Figure 103 Door of a Venda homestead showing the Ndoro symbol in (Stayt, 1968: 153)

24.2 East African Oral Traditions: Tsisulwe and the Star of Destiny

Amongst the Pare- and Hehe-speaking peoples of Tanzania Miss B Millroth preserved a most important oral tradition concerning a strange star, which became part of the legends and oral traditions that emerged from near Mt Kilimanjaro (Millroth 1965: 31; Von Sicard 1966: 51). Millroth (op. cit.) records that 'Tsisulwe' refers to two large stars, an eastern one which shines before dawn and a western one which shines after sunset. Von Sicard (1966: 51) discusses the etymology of the Tsisulwe, that they possibly represent Venus as a morning and evening star, that they might be connected with one of the Hehe peoples' names for God, and that a further connection with Nguluve, Nguruve, Kuruvi, etc,, names among the Karanga people of Orion's belt. A combination of cultural strata and repeated migrations might account for such a confusing plethora of star names (Von Sicard 1966: 51).

The reference to Nguruve is vital to understanding many other astronomical aspects in southern Africa dealing with 'naming of stars', rain-making and possibly an anwã method of determining the seasons by stars. Tuda (Crux / Centaurus) and Nguruve (Orion's Belt) are mentioned as being similar to a naw' in the anwã (plural) system in the discussion of the Mademba Ndikuteme conjunction with relevance to Nehanda (Venus as Cosmological Reference) (Von Sicard 1966: 43; Stayt 1968; Wade 2009: 77-88).

Tsisulwe (a plural name for the two stars concerned in the oral tradition) is indeed similar to Venus in that it shines in the east before dawn and in the west after sunset, but only after the amount of days it takes in its synodic period to change over from a Morning Star to an Evening Star. But, Tsisulwe is seen as the same star as implied in its naming, which appears

in the east and west on the same day; furthermore it has become invisible. These aspects place some doubt on a Venus interpretation. The chronology of this Pare and Hehe oral tradition is vital to confirming whether Tsisulwe is RX J0852.0-4622 but there are no other likely candidates observed to date that would fit the latitude and time of day. This oral tradition thus provides corroborative argument in favour of a definite record of a star that once existed within the past and was unique.

Another oral tradition from East Africa, stems from Pâté Island which is located in the Indian Ocean close to the northern coast of Kenya. The island was an early site of Arabic colonisation that gained prominence around the 14th century and although archaeology reveals a more recent date (de Vere Allen 1996), the Pâté chronicle records Omani Arab colonisation from the 8th century and then again by the Nabahani family in 1204 (Tolmacheva & Dagmar 2005). O

Oral traditions and an early document refer to a 13th/14th century star, called the ‘star of destiny’, also called the ‘star of the night of the divine decree’ (the night when the Prophet ascended to heaven), seen in visions accorded only to holy people (Stigand 1913: 29; Freeman-Grenville 1962: 241 and 266).

24.3 Southern African Oral Traditions: ‘Following a Star’

A study of the Indigenous Knowledge has led to an in-depth investigation of the legends and myths that deal with how the ancestors of the BaLemba/BaSena/VaMwenye people came to establish the Zimbabwe 'civilization' (Great Zimbabwe Cultural Complex) and how the earliest metalworking farmers and traders were led to build Great Zimbabwe by following a star (Mathivha 1992; Müller 2000; Arenstein & Hamese 2000; Van Warmelo 1944).

This topic has been the subject of a separate paper (Wade et al. 2014) and will only be dealt with briefly here. The myths also deal with another version of how the ancestors of these people came to establish the Zimbabwe ‘civilization’. This research portrays the relationship of the Shona-Lemba-Venda and how their ancestry relates to possible external influences on the east African coastline of many centuries ago and how Great Zimbabwe may have been designed in terms of cosmic reference or had as one of its many functions, through time, the aspects of an observatory.

This star-lore with conflicting chronological aspects that has yet to be demythologized, reveals in all probability that a celestial phenomenon is embedded in the oral traditions handed down by early Zimbabweans. It is still remembered in legend, and symbols of the ‘Ndoro’ suggest very bright objects are depicted and found in renderings on monoliths, wooden carvings, rocks facing the declinational direction of the supernova remnant RX J0852.0-4622 risings and settings i.e., the route 'followed' by the BaLemba/BaSena in their migration points toward the direction where the supernova would have set, with stop-over sites inhabited for short periods during the Supernova’s lifespan and superimposed on the vague history by descendants as ‘cities’ (Mathivha, 1992; Arenstein & Hamese 2000;).

25 DISCUSSION

This chapter has attempted to investigate whether the ancient people who built Great Zimbabwe and created its civilization possessed any astronomical capabilities. Southern African astronomy is discernible within a framework of social contexts relating to cosmology, agriculture, rain and religion. The inferred general astronomical indigenous knowledge is present within the oral traditions of the Great Zimbabwe – Mapungubwe area, as well as with later descendant revitalizations of the myths.

Surveys carried out at Great Zimbabwe over a long period (e.g., Swan in Bent 1893:147; Lockyer & Penrose, 1901; Hall 1909:344-345; Wade 2009: 24-6; 44; 48; 94-111; 227; Wade & Broodryk 2010) are compatible with the postulate that this architectural complex, at least partially, functioned as an astronomical observatory. As a caveat, it should be noted that there are also surveys which are not interpreted in this way.

Despite these opposing views, there is a statistically substantial alignment aspect adherent within the stratigraphical geoinformatics of the Great Enclosure as well as with other structural arrangements, artifacts, symbols and petroglyphs. The observed alignments suggest that Great Zimbabwe also served the function of allowing astronomically-based calendrical deductions to be made, relevant to predicting season accurately, and more importantly, rainy seasons and concomitant most suitable planting periods.

In addition to architectural evidence and recorded alignments at Great Zimbabwe supporting use of Sun, Moon and specific stars and groups of stars (Venus, Orion etc.) for these calendrical purposes, further alignments can be interpreted as reflecting an actual celestial event, most likely a supernova. There is astrophysical evidence of supernova remnant RX J0852.0-4622, located in the southern sky in the constellation Vela (Iyudin et al. 1998; 2010).

This cosmic event, dated approximately to the 13th -14th centuries, may have been the most recent supernova to Earth (Aschenbach 1998a; 1998b; Aschenbach et al. 1995; Aschenbach et al. 1999; Iyudin et al. 2010; Chen & Gehrels 1999), and would theoretically have been well visible in sub-Saharan Africa, specifically including southern and eastern Africa.

A further postulate made here is that such a celestial event would have had a significant geomythological impact, as is indeed recorded in various aspects of oral traditions from both eastern and southern Africa, and in the widespread Ndoro symbol. There is a significant association of the alignment aspect at Great Zimbabwe, the oral tradition of a star trek, the astrophysical and ice-core data as well as temporal constraints to form an adequate cosmic reference.

The preliminary Great Zimbabwe data discussed here need to be related to similar multi-disciplinary global studies to analyze such data in a final conclusion, specifically, through comparing symbols, such as are found in other examples of geomythology and data emanating from Peñasco Blanco (Pankenier 2006; Green & Stephenson 2003; Krupp 1997; Than 2006), Bolivia - Lakha Manta petroglyphs (Sullivan 1974), an Honduran Mayan Glyph at Copan (Michanowsky 1977; Tierney 1983) and most specifically, the Australian (Norris & Hamacher 2010) and New Zealand oral traditions of Mahutonga (Orchiston 2000; Orchiston 2002; Sutton 1992; Best 1922; Green & Orchiston 2004).

Figure 104 Hypothetical reconstruction by David Aguilar of a supernova within 20 light years distance from a planet.

Figure 105 Petroglyphs found at Coral Island 17km off the south coast of Santa Catarina http://www.bradshawfoundation.com/santa_catarina/coral_island/index.php

A proper survey of the archaeological records of South America, Australasia, Indonesia, Oceania, southern Africa, Mesoamerica including the Indian Ocean islands should be made to reach finalization on the question of what is often circumstantial evidence. Any cosmic reference therefore of any possible relationship to the vague stellar region of Vela/Carina, Puppis, Crux and Antlia should be examined. The absolute dating of the recent past of the ice-cores is subject to C^{14} calibrations and the astrophysical data together with the comparative corroboration of several other techniques such as dendrochronology should be attempted. All known supernovae and related events can then only be assessed in a final chronological analysis for spatial zones.

The southern African cosmogenic geomythology of ‘following a star’ cannot be ignored and when compared with similar cosmogenic indigenous knowledge systems elsewhere in the world, a plausible argument presents itself that an event was witnessed in a particular section of the sky, that at this stage is known to have a supernova that should have been visible in 1320 +/-30 C.E.

An exciting aspect arises from such studies as at Great Zimbabwe, namely the possibility of potential causal relationships between human movements or culture changes and the surge in gamma-ray flux at the time of the inferred supernova event. To extrapolate any reasonable association or global relationship between climatic changes and supernovae in general is thus implied (Green & Stephenson 2004; Burgess & Zuber 2000; Iyudin 2002).

It would be pertinent to not ignore any data pertaining to universal changes in the environment and in human populations that could have occurred when various significant patterns emerge that indicate a possible correlation between the 'sudden' cultural transformations and the environment within the temporal context of the supernova. This cosmic reference requires to be tested against comparative climatic data elsewhere in the world and assessed for any prevalent potential global effects and culture change.

26 BIBLIOGRAPHY

Allen, James de Vere. 1996. Lamu, with an appendix on Archaeological finds from the region of Lamu by H Neville Chittick: Kenya National Museums.

Anderson, A. 2000. Differential reliability of 14C AMS ages of Rattus exulans bone gelatin in south Pacific prehistory. Journal of the Royal Society of New Zealand, 30 (3)

Arenstein, J & Hamese, Chuene. 2000. SA's Black Jews Search for Ancient Lost Cities in The Sunday Independent Newspaper - Article in the Reconstruct section of Sunday 17 September 2000, page 4. Issue 262. Johannesburg - South Africa African Eye News Service See Addendum

Aschenbach, Bernd. 1998a. Discovery of a Young Nearby Supernova Remnant. In Nature, Vol. 396 : 6707. November 12th 1998 pages 141 -142. see also http://antwrp.gsfc.nasa.gov/apod/ap990413.html

Aschenbach et al. 1999. Constraints of Age, Distance and Progenitor of the Supernova Remnant RX J0852.0-4622/ GROJ0852-4642 in Astronomy & Astrophysics. Volume 350, Issue 3 - 1999. Pp 997-1006.

Aschenbach, B. 1998b. Jahresbericht 1998 / Annual Report 1998 ROSAT – Max Plank Extraterrestrial Physics (MPE) Garching 1999-07-29 http://www.gamma.mpe-garching.mpg.de/~hcs/hcs.html

Aschenbach, B. 1998c. Personal Communication Dec 16th 1998. Max Planck Institute for Extraterrestrial Physics, Garching/Germany

Aschenbach, B., Egger, R. and Trümper, J. 1995. The Vela Supernova Remnant: Discovery of explosion fragments outside of the Vela supernova remnant shock-wave boundary (ROSAT All-Sky Survey). Nature 373, 587-590, December 1995

Aschenbach B, Iyudin A. F and Schonfelder V. 1999. Constraints of age, distance and progenitor of the supernova remnant RXJ0852.0- 4622/GROJ0852-4642. ASTRONOMY AND ASTROPHYSICS . Astron. Astrophys. 350, 997–1006 (1999) Max-Planck-Institut fur Extraterrestrische Physik, 85740 Garching, Germany.

Aveni, A. 1997. Stairways to the Stars – Skywatching in Three Great Ancient Cultures. John Wiley & Sons, Inc. Astronomy in the Maya Codices.

Aveni, A. 1993. 'Africa's Socialized Astronomy', in Ancient Astronomers, Montreal: St. Remy Press

Aveni, Anthony F. 1981. "Archaeoastronomy". In Advances in Archaeological method and Theory.". Vol 4. Princeton, N.J.: Academic Press, 1981, pp.1 –77

Aveni. A.F. 2003. Archaeoastronomy in the Ancient Americas. Journal of Archaeological Research 11 (2): 149–91. doi:10.1023/A:1022971730558

Beach, D.N.1980. The Shona and Zimbabwe 900-1850: An Outline of Shona History. Gweru, Mambo Press. & London : Heinemann New York : Putnam, 1980.

Beach, D.N.1983a 'Oral history and archaeology in Zimbabwe', Zimbabwean Prehistory, 19, 8-11.

Best, Eldson 1955 Astronomical Knowledge of the Maori. Dominion Museum Monograph No. 3. Reprinted. Government Printer, Wellington. Originally published 1922.
http://www.nzetc.org/tm/scholarly/tei-BesAstro-t1-body-d1-d3.html

Brody, Thomas A. 1993. The Philosophy Behind Physics. Springer Verlag, ISBN 0-387-55914-0 .

Burgess, C.P. & Zuber, K. 2000. Footprints of the Newly-Discovered Vela Supernova in Antarctic Ice Cores? Journal of Astrophysics. McGill University

Chaplin, J.H. 1967. Vernacular month names from Zambia. African Studies 26: Issue 3, pages 145 – 169.

Chen, W. and Gehrels, N. 1999.The progenitor of the new COMPTEL/ROSAT supernova remnant in Vela, Astrophysical Journal Letters v. 514, p. L103 (1999), (astroph/9812154 v2).

Chigwedere, Aeneas. 1996. The Karanga Empire. Books for Africa, Harare

Chirikure, Shadreck & Pikirayi, Innocent. 2008. Inside and Outside the Dry Stone Walls: revisiting the material culture of Great Zimbabwe. Antiquity 82 (2008): 976-993.

Clark, Stuart and Carrington, Damian. 12:53 04 December 2002. Eclipse Brings Claim of Medieval African Observatory. © Copyright Reed Business Information Ltd.
NewScientist.com. http://www.newscientist.com/news/print.jsp?id=ns99993137.

Chen, Wan & Gehrels, Neil. 1999. The Progenitor of the New COMPTEL/ROSAT Supernova Remnant in Vela. In The Astrophysical Journal 514: 1000 - L000 April 1st 1999.

Dornan, S.S.1927. Moon Lore amongst the Bantu. Native Affairs Department Annual No.5: 29-35.

Doyle, L., Frank, E. 1997. "Astronomy in Africa". Encyclopedia of the History of Science, Technology, and Medicine in Non-Western Cultures, Helaine Selin, Dordrecht: Kluwer

Doyle, L.R. & Wilcox, T.J. 1986. Statistical Analysis of Namoratunga: An Archaeoastronomical Site in Sub-Saharan Africa? Azania 21: 125-129.

Fagan, B. 2000a. The Little Ice Age, Perseus Book Group.

Fagan, Brian. 2000b. When the Rains Stopped - Constant Shifts in Climate Molded Much of Human History. In Scientific American Discovering Archaeology - Focus July/August 2000 Issue 9

Freeman-Grenville G.S.P. 1962. The East-African coast: select documents from the first to the earlier nineteenth century. London: Oxford University Press

Frobenius, L. 1931. Erythräa: Lander und Zeiten des heiligen Königsmordes. Berlin: Atlantis Verlag.

Frobenius Leo & Fox Douglas C. 1938. African Genesis: Folk Tales and Myths of Africa. Faber & Faber Ltd UK.

Gehrels Neil, Laird Claude M, Jackman Charles H, Cannizzo John K, Mattson Barbara J , Chen Wan. 2003. Ozone Depletion from Nearby Supernovae. Astrophys.J. 585 (2003) 1169-1176

Giacobbe, F. W. 2005. How a Type II Supernova Explodes. Electronic Journal of Theoretical Physics 2 (6): 30–38. Bibcode 2005EJTP....2f..30G

Gold, Peter 1994. Navajo & Tibetan sacred wisdom: the circle of the spirit. ISBN 0-89281-411-X. Rochester, Vermont: Inner Traditions International.

Green, D.A. and Orchiston, W., 2004. In Search of Mahutonga: A Possible Supernova Recorded in Maori Astronomical Traditions? Archaeoastronomy, 18, 110-113.

Green, David A., and F. Richard Stephenson 2003 Historical Supernovae. In Supernovae and Gamma-Ray Bursters, edited by K. W. Weiler, pp. 7–19. Lecture Notes in Physics, Vol. 598. Springer, Berlin.

Hall, R.N. 1909. Prehistoric Rhodesia. London: Maskew & Miller.

Hamacher, D.W. and Norris, R.P., 2009. Australian Aboriginal Geomythology: eyewitness accounts of cosmic impacts? Archaeoastronomy, 22, pp 60 -93.. E-print: arXiv:1009.4251 Accepted in the 'Journal for Astronomical History & Heritage', 13(3): (November 2010) 19.Australian Aboriginal Geomythology: eyewitness accounts of cosmic impacts?

Holbrook, Jarita. 1998. African Astronomy. Essays from Archaeoastronomy & Ethnoastronomy News, The Quarterly Bulletin Of The Center For Archaeoastronomy and ISAAC. Number 28 June Solstice 1998.

Holdaway, R. 1996. Arrival of rats in New Zealand. Nature, 384 (6606), 225-226 DOI:10.1038/

Houghton, J. et al. 1995. "Climate Change 1995: The Science of Climate Change", Cambridge Univ. Press, UK, 1995

Huffman, T.N. 2008. Mapungubwe and Great Zimbabwe: The origin and spread of social complexity in southern Africa Journal of Anthropological Archaeology. Volume 28, Issue 1, March 2009, Pages 37-5

Huffman, T.N. 1981. Snakes and Birds: Expressive Space at Great Zimbabwe. In African Studies. Vol. 40, no. 2 1981.

Huffman, Thomas N. 2008. "Climate change during the Iron Age in the Shashe-Limpopo Basin, southern Africa". Journal of Archaeological Science 35: 2032–2047.doi:10.1016/j.jas.2008.01.005.

Huffman, T.N. 1996. Snakes and Crocodiles: power and symbolism in ancient Zimbabwe. Johannesburg: Witwatersrand University Press.

Huffman, T.N. & Vogel, J.C. 1991. The Chronology of Great Zimbabwe. The South African Archaeological Bulletin 46 (154): 61-70.

Huffman, T.N. 2005. Mapungubwe: ancient African civilisation on the Limpopo. Johannesburg : Wits University Press.

Hughes, M.K. and H. Diaz. 1994. The Medieval Warm Period, Kluwer Academic Press, 1994.

(IGC 2004 Proceedings International Geological Conference - http://www.32igc.org/stampa/32igc%20informs6%20.pdf accessed 12 May 2011),

Iyudin, A. F., Yu. V., Pakhomov, N. N., Chugai, J., Greiner, M., Axelsson, S., Larsson & Ryabchikova,T. A.2010. Search for broad absorption lines in spectra of stars in the field of supernova remnant RX J0852.0-4622 (Vela Jr.)

Iyudin, A., Aschenbach, B., Becker, W., Dennerl, K and Haberl, F. 2010. XMM-Newton observations of the supernova remnant RX J0852.0-4622/GRO J0852-4642. Astronomy & Astrophysics.

Iyudin, A.F., Schönfelder,V., Bennett, K, Bloemen, H., Diehl, R., Hermsen, W., Lichti, G.G., Van Der Meulen, R.D., Ryan, J. & Winkler, C. 1998 Emission from 44Ti associated with a previously unknown Galactic supernova. Nature 396 (6707): 142 -144.

Jeffreys, M.D.W. 1952. Cowry: Ndoro. In N.A.D.A. pg. 35 - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Katsuda, S.; Tsunemi, H.; Mori, K. 2008. The Slow X-Ray Expansion of the Northwestern Rim of the Supernova Remnant RX J0852.0-4622. The Astrophysical Journal, Volume 678, Issue 1, Pp. L35-L38.

Keen, Cecil S and Tyson, Peter D. 1973. Seasonality of South African rainfall: a note on its regional delimitation using spectral analysis. Volume 21, Numbers 2-3/June 1973. in Theoretical and Applied Climatology. Springer. Wien.

Keigwin L.D. 1996. "The Little Ice Age and Medieval Warm Period in the Sargasso Sea", Science, v.274 pp.1504-1508.

Kiage, Lawrence M & Liu, Kam-biu. 2006. Late Quaternary paleoenvironmental changes in East Africa: a review of multiproxy evidence from palynology, lake sediments, and associated records. Progress in Physical Geography 30, 5 (2006) pp. 633–658

Koppeschaar, Carl. November 13, 1998. Discovery of a Young Near-By Supernova Remnant. ASTRONET. http://carlkop.home.xs4all.nl/youngsup.html Accessed 12 May 2011

Krige, E.J. and Krige J.D. 1965. The Realm of the Rain-Queen – A study of the Pattern of Lovedu Society. Oxford University Press

Krupp, E. C., ed. 1978. In Search of Ancient Astronomies. Garden City, N.Y.: Doubleday & Company, 1978 (and New York: McGraw-Hill Book Company, 1979 paperback reprint).

Krupp, E.C. 1997, Skywatchers, Shamans and Kings, John Wiley and Sons, 196-9, ISBN 0471329754

Krupp, E. C., ed. 1983. Archaeoastronomy and the Roots of Science. Washington, DC: American Association for the Advancement of Science.

Krupp, E.C. 1988. Light in the Temples, Records in Stone: Papers in Memory of Alexander Thom. 473-499, ISBN 0521333814

Krupp, E.C. 2011a. Personal Communication Thursday 16th June 2011 00h55. Dr. E.C. Krupp eckrupp@earthlink.net

Krupp, E.C. 2011b. Personal Communication Wednesday 1st June 2011 22h49 and Thursday 16th June 2011 00h55. Dr. E.C. Krupp eckrupp@earthlink.net

Lan, David. 1987. Guns & Rain : Guerrillas & Spirit Mediums in Zimbabwe. James Currey London and University of California Press Berkeley and Los Angeles.

Latham, C.K.J. 1986. Mwari and the divine heroes : guardians of the Shona : pan Shona religion as an inspiration for nationality. C.J.K. Latham. Grahamstown : Rhodes University, 1986. Thesis (M.A.)-Rhodes University, 1986.

Lewicki,T.1974. Arabic External Sources For The History of Africa To The South Of Sahara. Polska Akademia Nauk - Oddzial W Krakowie. Prace Komisji Orientalistycznej Nr 9. London - Curzon Press, Lagos - Pilgrim Books (1974)

Lockyer, J.N. and Penrose, F.C. 1901. An attempt to ascertain the date of the original construction of Stonehenge. Proceedings of the Royal Society of London, 69, 1901, pp. 137-147

MacIver, R.D. 1906. Medieval Rhodesia. London, Macmillan, pp. 74 plate XXV, Plan drawn and surveyed by Franklin White.

Magnuson J. et al.2000. "Historical Trends in Lake and River Ice Cover in the Northern Hemisphere", Science, v.289, p.1743, 8 Sept 2000

Millroth B. 1965. Lyuba. Uppsala. P 128

Muhlanga, Samuel. (Contributed by Elaine M. Lloyd). 1926. Mbava and Others. In N.A.D.A. pg. 91 - 92 - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. Edited by Guy A. Taylor. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Müller, Karl. 2000. The Great Zimbabwe Supernova in The Sunday Independent Newspaper - 3rd September 2000. Issue 260. Full-page leader headline of

Mann, M.E.; Zhang, Z., Hughes, M.K., Bradley, R.S., Miller, S.K., Rutherford, S. and Ni, F. 2008. "Proxy-based reconstructions of hemispheric and global surface temperature variations over the past two millennia". Proc. Natl. Acad. Sci. U.S.A. 105 (36): 13252–7. Bibcode2008PNAS..10513252M.doi:10.1073/pnas.0805721105. PMC 2527990.PMID 18765811.

Mathivha, M.E.R. 1992. The Basena / Vamwenye / Balemba. Morenster. Published by Prof. M E R Mathivha Copyright © 1992 First Edition/ First impression 1992 Morester Printers (01521) 931831 South Africa.

McCosh, F.W.J. 1979. The African Sky. NADA 12: 30-44. The Southern Rhodesia Native Affairs Department Annual, See page 34. Edited by A. B. D. Spicer. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Masse, W. Bruce and Michael J. Masse. 2007. Myth and catastrophic reality: using myth to identify cosmic impacts and massive Plinian eruptions in Holocene South America. In Myth and Geology, edited by L. Piccardi and W.B. Masse, Geological Society, London, Special Publications, 273

Masse, W. Bruce, Elizabeth Wayland Barber, Luigi Piccardi and Paul T. Barber. 2007. Exploring the nature of myth and its role in science. In Myth and Geology, edited by L. Piccardi and W.B. Masse, Geological Society, London, Special Publications 273

Mayor, A., 2000. The First Fossil Hunters: Paleontology in Greek and Roman Times. Princeton University Press.

Mayor, A. 2005. Fossil Legends of the First Americans. Princeton University Press.

Meyer, A. 1998. The Archaeological Sites of Greefswald: Stratigraphy and Chronology of the Sites and a History of Investigations. Pretoria: University of Pretoria.

Meyer, A. 2000. K2 and Mapungubwe. The South African Goodwin Series 8: 4-13.

Michanowsky, George. 1977. The Once and Future Star. Hawthorn Books Inc, New York.

Miller, G. H., et al. 2012. Abrupt onset of the Little Ice Age triggered by volcanism and sustained by sea-ice/ocean feedbacks. Geophys. Res. Lett., doi:10.1029/2011GL050168.

Norris, R.P. & Hamacher, D.W. 2011. Astronomical symbolism in Australian Aboriginal rock art. Rock Art Research 28(1): 99-106. [PR, A]

Orchiston, Wayne. 2002. Southern Hemisphere Observations. In Highlights of Astronomy, Vol. 12, edited by H. Rickman, pp. 322–325. Astronomical Society of the Pacific, San Francisco.

Orchiston, Wayne 2000. A Polynesian Astronomical Perspective: The Maori of New Zealand. In Astronomy Across Cultures: A History of Non-Western Astronomy, edited by Helaine Selin, pp. 161–196. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Pankenier, D. 2006. Notes on translations of the East Asian records relating to the Supernova of AD 1054. Journal of Astronomical History and Heritage 9.1 (2006): 77-82.
Pearce, Fred. 2010. The Climate Files: The Battle for the Truth About Global Warming, Random House UK, ISBN 0-85265-229-1

Ruggles, C. 1987. The Borana Calendar: Some Observations. Archeaoastronomy Supplement II, pg 35, 1987

Ruggles, C.L.N. 2005. Ancient Astronomy. ABC-Clio. ISBN 1-85109-477-6.

Ruggles, Clive. 2000. The General and the Specific: Dealing with Cultural Diversity. In Archaeoastronomy. Vol 15, 151-177(Texas Press).

Ruggles, C.L.N. 1999. Astronomy in Prehistoric Britain and Ireland. Yale University Press. ISBN 0-300-07814-5.

Ruggles. C.L.N. 2000. "Ancient Astronomies - Ancient Worlds". Archaeoastronomy:Supplement to the Journal for the History of Astronomy 25 (31): S65–S76.

Ruggles, C.L.N. & Saunders, N.J. 1993. "The Study of Cultural Astronomy", in Ruggles, Clive L.N. and Saunders, Nicholas J.: Astronomies and Cultures. University Press of Colorado, 1-31.

Ruther, Heinz ; Held, Christoph ; Schroeder, Ralph ; Bhurtha, Roshan ; Wessels, Stephen ; Neeser, Rudolph. 2008. ALUKA. Great Zimbabwe, Great Enclosure, University of Cape Town, Geomatics Department Position Latitude: 20 dg 16' 8" South Longitude: 30 dg 56' 17" East (WGS84)
http://www.aluka.org/action/showMetadata?doi=10.5555/AL.CH.DOCUMENT.UCTZIM0001486

Schaefer, B.E. 1999. Astronomy in Historical Studies in Archaeoastronomy: The Journal of Astronomy in Culture. Edited by J. B. Carlson. XIV,I University of Texas Press (Spring/Summer 1999).

Schaefer, B.E., 1993. Astronomy and the limits of vision. Vistas in Astronomy, 36(4), 311-361.

Schaefer, B.E., 1995. 'Supernova' 185 is really a Nova plus Comet P/Swift-Tuttle. Astronomical Journal, 110, 1793-1795.

Schaefer, B.E., 1996. The Peak Brightness of SN 1937C in IC 4182 and the Hubble Constant: Comments on Pierce & Jacoby [AJ, 110, 2885 (1995)]. Astronomical Journal, 111, 1668-1674.

Schawinski, K.; et al. 2008. Supernova Shock Breakout from a Red Supergiant. Science 321 (5886): 223–226. Bibcode 2008Sci...321..223S.

Schofield, J.E 1926. Zimbabwe: a critical examination of the building styles employed. South African Journal of Science 23:971-86.

Scotland, W.H.D. February 1956. Length Of Gestation Of East African Women. BJOG: An International Journal of Obstetrics and Gynaecology 63 (1), 120–123.

Snedegar, K. 1995. Stars and Seasons in Southern Africa. Vistas in Astronomy, vol. 39, Issue 4, pp.529-538

Stayt , H.A. 1968. The Bavenda. London: Frank Cass & Co. Ltd. (Cass Library of African Studies - General Studies - No 58)

Starry Night Pro (Simulation Curriculum version 6.4.3pe EW 1997-2009)

Stenger, Richard. Thursday, December 5, 2002 Posted: 3:01 PM EST (2001 GMT). “Star Sheds Light on African Stonehenge”. CNN.com http://www.cnn.com/2002/TECH/space/12/05/zimbabwe.observatory/index.html

Stephenson, F. Richard., and David A. Green 2002 Historical Supernovae and Their Remnants. Oxford University Press, Oxford.

Stigand, C.H.1913. The Land of Zinj. pp. 29 to 102

Sullivan, Brian. 6th August 1974. Stanford Artificial Intelligence Laboratory Dump And Restore Technique. SAILDART corpus 1998 - from 229 reels of tape - as is 2002 http://www.saildart.org/ accessed 12 May 2011

Summers, R. 1971. Ancient Ruins and Vanished Civilizations of Southern Africa. T.V. Bulpin.

Summers, R. 1961. Excavations in the Great Enclosure. Occasional Papers of the National Museums of Southern Rhodesia 3(23A): 236-88.

Summers, R. & A. Whitty. 1961. The development of the Great Enclosure. Occasional Papers of the National Museums of Southern Rhodesia 3(23A): 306-25.

Summers, R., K. Robinson & A. Whitty. 1961. Zimbabwe excavations. Occasional Papers of the National Museums of Rhodesia 3(23A): 15-332.

Sutton, D.G. (ed.) 1992. The Origins of the First New Zealander. Auckland: Auckland University Press.

Svensmark H. 1998."Influence of Cosmic Rays on Earth's Climate", Physical Review Letters, v.81, no.22, p.5027, 30 Nov 1998

Swan, R.M.W. in Chapter 5 p 147 - ‘On the Orientation and Measurements of Zimbabwe Ruins’ in Bent, T. 1893. Ruined Cities of Mashonaland. London. (Rhodesiana Reprint Library. Volume Five facsimile reproduction of the third edition).. Books of Rhodesia, Bulawayo.1969- pages 141 - 178).

Swan, R.M.W.1892a. Notes on the Geography and Meteorology of Mashonaland. Proceedings of the Royal Geographical Society and Monthly Record of Geography (New Monthly Series). 14 (5):299-302

Swan, R.M.W.1892b. The Orientation of the buildings at Zimbabwe. Proceedings of the Royal Geographical Society and Monthly Record of Geography (New Monthly Series). 14 (5):306-309

Swan, R.M.W.1892c.Some Features of the Ruined Temples of Mashonaland. The Scottish Geographical Magazine. 8:539-544.

Swan, R.M.W.1892d. On the Orientation and Measurements of Zimbabwe Ruins. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 120-149. London: Longmans, Green & Co.

Swan, R.M.W.1892e. Appendix A: Notes on the Geography and Meteorology of Mashonaland. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 347-354. London: Longmans, Green & Co.

Swan, R.M.W.1892f. Appendix B: List of Stations in Mashonaland astronomically observed, with altitude. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 355-357. London: Longmans, Green & Co.

Swan, R.M.W.1892g. Appendix C: Addenda to Chapter V. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 358-361. London: Longmans, Green & Co.

Swan, R.M.W.1893a. The Orientation and Architectural Features of the Ruined Temples of Mashonaland. Report of the British Association for the Advancement of Science – 1892. 62:816.

Swan, R.M.W.1893b. The Geography and Ethnology of Mashonaland, with a Brief Account of the Ruins Zimbabwe. Proceedings of the Philosophical Society of Glasgow. 24:29-50.

Swan, R.M.W.1893c. The Ruins of Mashonaland. The Geographical Journal. 1: 275-276

Swan, R.M.W.1893d. The Ruins of Mashonaland. The Geographical Journal. 1: 465.

Swan, R.M.W.1896. Some Notes on the Ruined Temples in Mashonaland. The Journal of the Royal Anthropological Institute. 26:2-13

Swan, R.M.W.1897. Some Notes on the Ruined Temples in Mashonaland. The Journal of the Royal Anthropological Institute of Great Britain and Ireland. 26:2-13

Than, Ker 2006 (June 6th) CNN.. CNN.com - Ancient rock art may depict exploding star - Jun 5, 2006. Retrieved May 23, 2010

Tierney, J. 1983. Scholar without a School. Science'83. Volume 4, No.2. March Pg 46.

Tolmacheva, Marina; Weiler, Dagmar (translator). 2005. The Pate Chronicle: Edited and Translated from Mss 177, 321, 344, and 358 of the Library of the University of Dar Es Salaam (African Historical Sources) ISBN 0-87013-336-5

Tyson, P.D. et al. 2000. "The Little Ice Age and Medieval Warming in South Africa". South African Journal of Science, v96. p.121-126, 2000

Van Warmelo. 1944. The Copper Miners of Musina and the Early History of the Zoutpansberg: Vernacular accounts by S.M. Dzivhani, M.F. Mamadi, M.M. Motenda,, E. Mudau in Ethnological Publications Vol. VIII Edited and supplemented by other material by N. J. VAN WARMELO Government Ethnologist - Department of Native Affairs. Printed in the Union of South Africa by the Government Printer, Pretoria 1940 (G.P.S. 1843-1940-800).

Varisco, D. M. 1987. The Rain Periods in Pre-Islamic Arabia. Arabica, Tome xxxiv, Pages 251 -256.

Varisco, D. M. 1985. The Production of Sorghum (Dhurah) in Highland Yemen. Arabian Studies (Cambridge). 7:53-88.

Varisco, D. M. 1989. The Anwã' Stars According to Abu Ishãq al-Zajjãj. In Zeitschrift Für Geschichte Der Arabisch-Islamischen Wissenschaften. Band 5. Johann Wolfgang Goethe-Universität, Frankfurt am Main. P145.

Verschuren D. Laird K. R. and Cumming B. F. et al .2000. Rainfall and drought in equatorial east Africa during the past 1,100 years. Nature 2000, vol.403, No 6768, pp. 410-414

Villalba, R. 1990. Climatic fluctuations in Northern Patagonian during the last 1000 years as inferred from tree-rings records. Quaternary Research 34 (3): 346–60.Bibcode:1990QuRes..34..346V. doi:10.1016/0033-5894(90)90046-N

Villalba, R.1994. Tree-ring and Glacial Evidence for the Medieval Warm Epoch and the Little Ice Age in Southern South America. Climate Change, 26: 183-197.

Vitaliano, D. B., 1968, Geomythology, Journal of the Folklore Institute, Vol. 5, No. 1 (June 1968), 11.

Vitaliano, D.B., 1973, Legends of the Earth: Bloomington, Indiana University Press, 305 p.

Von Sicard, Harald. 1951.The Origin of the Tribes in the Belingwe Reserve. In N.A.D.A. pg. 17 - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. Published by the

Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Von Sicard, Harald. 1953. Reply to Jeffreys – Occam's Razor. In N.A.D.A. pg. 53 - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Von Sicard, H. 1966. Karanga Stars. NADA 9: 45. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Wade, R.P. 2007a. Some Astronomical Aspects of Great Zimbabwe. Prehistory Society of Zimbabwe. Newsletter 133 and 134. Page 5. edited by Paul Hubbard. Harare.

Wade, R.P. 2007b. Archaeoastronomy Of The Great Zimbabwe Cultural Complex. Journal of the Prehistory Society of Zimbabwe. edited by Paul Hubbard. Harare.

Wade, R. P & Broodryk, N. L. 2010. Systematics of interpreting cosmic references in sub Saharan Africa. http://www.communicatingastronomy.org/cap2010/posters.html PDF (1.80MB)

Wade, R.P. 2009. A Systematics For Interpreting Past Structures With Possible Cosmic References In Sub-Saharan Africa. M.Sc. Thesis. University of Pretoria http://upetd.up.ac.za/thesis/available/etd-05052009-174557/

Wade R.P, Eriksson P.G, Duncan G.A and deW. Rautenbach C.J. 2014. Southern African cosmogenic geomythology ("following a star") of the Zion Christian Church. Transactions of the Royal Society of South Africa. Volume 69, Issue 2. Taylor & Francis. UK. www.tandfonline.com DOI:10.1080/0035919X.2014.905880.

Watanabe, O. et al. 1997. A preliminary study of ice core chronology at Dome Fuji station, Antarctica. in Proc. NIPR Symp. Polar Meteorol. Glaciol. 11 (eds. Watanabe, O. et al.) 9–13 (National Institute of Polar Research, Tokyo, 1997).

Watanabe, K. et al. 1999. Non-sea-salt sulfate and nitrate variations in the S25 core, near the coastal region, east Antarctica. Polar Meteorol. Glaciol. 13, 64–74 (1999). 27. Davies, S. R. An Improved test for periodicity. Mon. Not. R. astr. Soc. 244, 93–95 (1990).

Franklin White. 1905. Notes on the Great Zimbabwe Elliptical Ruin. In: The Journal of the Anthropological Institute of Great Britain and Ireland. 35 (1), (1905),S. 39–47.

Whitty, A. 1961. Architectural style at Zimbabwe. Occasional Papers of the National Museums of Southern Rhodesia 3(23A): 289-305.

Wilmshurst, J., Anderson, A., Higham, T., & Worthy, T. 2008. Dating the late prehistoric dispersal of Polynesians to New Zealand using the commensal Pacific rat. Proceedings of the National Academy of Sciences, 105 (22), 7676-7680 DOI: 10.1073/pnas.0801507105

CHAPTER FIVE

SOUTHERN AFRICAN COSMOGENIC GEOMYTHOLOGY ("FOLLOWING A STAR") OF THE ZION CHRISTIAN CHURCH

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Abstract

Oral traditions and indigenous knowledge of the Limpopo Province in South Africa suggest a meteor event that occurred in the area several decades ago. This relatively recent significant meteor event with associated features may have contributed to a revitalization of 13th century ancestral geomythology, also based on an astronomical event, and to an ideological transformation that augmented a vast socio-political belief system in sub-Saharan Africa.

Keywords: Geomythology, Zion Christian Church, Meteor, Impact crater, archaeoastronomy, Lemba, Indigenous knowledge systems, RX J0852.0-4622, G266.2-1.2, Great Zimbabwe, Oral Tradition

27 INTRODUCTION

A study of South African and Zimbabwean indigenous knowledge has led to a preliminary understanding of the legends and myths that deal with how the ancestors of the current Limpopo Province populations, as recorded by the BaLemba/BaSena/VaMwenye peoples, came to establish the Zimbabwe "civilization" (Great Zimbabwe Cultural Complex) and how the earliest metalworking farmers and traders were led to build Great Zimbabwe (20°16'8"S: 30°56'17"E) by following a star (Mathivha 1992; Müller 2000; Arenstein & Hamese 2000; Van Warmelo 1940; Wade 2009). It is possible that Great Zimbabwe may have been designed in terms of a cosmic reference or had as one of its many functions, through time, the aspects of an observatory (Von Sicard 1951; Mathivha 1992; Stenger 2002; Clark & Carrington 2002; Wade 2009; Wade & Broodryk 2010; Bent 1893; Doyle & Frank 1997; Hall 1909; Frobenius 1923 1931).

In this study, evidence is presented to support the hypothesis that an astronomical event in the Vela region of the sky, possibly a supernova, was associated with fourteenth century configured structures at Great Zimbabwe. A recent (1944) meteor event may have revitalized social ideologies related directly to the Zimbabwe-origins mythology and to current beliefs held by members of the Zion Christian Church (ZCC). The two astronomical events, despite chronological separation of ca 700 years, represent a remarkable repetition of cosmogenic foundations for the ZCC's mythology of "following a star", and the discussion of this forms the basis of this paper.

It is widely believed that the Lemba people originated in south Yemen and began migrating south in the mid seventh century BCE. That they had connections with Arabs is confirmed by Mullan (1969, p. 9, drawing on the earlier work of Roger Summers), who noted that 'The

Lemba have undoubted connections with the Arabs ...'. They are variously named Bhuba, Basena and Baphusela (Mathivha, 1992). They were also referred to as Baphusela, from Phusela near Sena. In 300–200 BCE they migrated to Zimbabwe, where they settled in mountains at Sena II 'guided by a star which [sic] shown on top of a hill' (Mathivha 1992, pp. 3). This group split and one section moved south to Mapakomhere. The other moved to the west (Mathivha 1992; Le Roux 2010). Tradition relates that they were led by a star which was visible after midnight, southwards away from Sena, and that a series of settlements took place during this migration (Le Roux 2010).

The oral tradition that makes mention of some sort of star that guided the Lemba people (Mathivha 1992; Le Roux 2010), is mainly prevalent amongst the almost 600 000 people who make up the sections of the South African population in the Mpumalanga and Limpopo Provinces as well as in the southern provinces of Zimbabwe. One group of Lemba, the Bhuba family, moved from Zimbabwe in 1910 and settled at Phusela near Lenyenye (Tzaneen), close to Zion City–Moria. There they lost their ability to see and follow the star (Le Roux 2010) and this was interpreted as a sign God was no longer with them. The Lemba also form part of one of the largest traditional religious groups in southern Africa today - the Zion Christian Church (ZCC), who have a star as their main emblem, in common with the Zimbabwe National Flag. Here, it is interesting to note Sundkler & Steed's (2000, pp. 836) observation that: 'two events of a cosmological and affliction-generating character inspired the forming of their groups; the threatening Haley's comet of 1910, and the devastating "Spanish influenza" of 1919. ... also, in a more general perspective, a political protest against White segregation'.

Since the first application to register the Zion Christian Church in South Africa, in 1925, there was a gradual increase from 925 members to 40 000 by 1943–1944; a sudden and phenomenal expansion of the ZCC to 120 000 adherents a year later took place after the inferred 1944 meteor event and centred at the zone of likely impact and fallout in the vicinity of Moria. Recent claims indicate that the overall African membership exceeds 30 million people of whom at least a third undertakes an annual pilgrimage to Moria, the ZCC headquarters in Limpopo Province. This vast socio-political belief system emulates the magnificence of the past Great Zimbabwe complex and culture, and, we postulate, may have been reinvigorated by a 20th century meteor event that augmented the cosmogenic ideology of the present population holding to ZCC beliefs south of the Limpopo River. There is thus a fundamental connection between the ancient cosmogenic mythology of the Zimbabwe culture and the rejuvenation of these beliefs related to the 1944 meteor event.

Secrecy surrounds the details of the meteor fragment that apparently lies under the main ZCC church built by Edward Lekganyane. After many attempts to apply for permission to the secretary-generals of the ZCC–Moria, no reply has been received. A ban has in fact been ordered restricting research into this sacred area. This may account for the absence of references in works concerning the ZCC (e.g., Anderson 2000; Müller 2011). This chapter thus aims to examine the relationship of the earlier Zimbabwe culture to a cosmogenic event, and how the ZCC which is inferred to be a descendant movement of this ancient civilization, may well have been reinvigorated following a second cosmogenic event, which we postulate might have been a meteor which fell near Moria, during 1944.

28 FORMATION AND GROWTH OF THE ZION CHRISTIAN CHURCH

The Zion Christian Church was established near Great Zimbabwe (Daneel 1970, 1971, 1974, 1988, 2001) and later became centred at Zion City–Moria, near Polokwane (Pietersburg) in South Africa, as it is believed that this is the site where a legendary "star"

fell. Therefore, it is sacred land: 'The ZCC's holy city of Moriah, named after the biblical mountain, continued to provide a sacred refuge for their members' (Müller 2011: 7) as a challenge to economic and political power during the 1930s. Referring to the Lemba, Delius (1996: 45) notes that 'for many migrant workers their rural traditional home, Sekhikuneland, provided a place of refuge in the 1930s from the ongoing impact of racist policies'. This likely also led to the annual mass pilgrimage to Moriah, which acted as a 'magnetic force' (Müller 2011: 9). In addition, 'The significance of "the mountain" in the ZCC and African Initiated Christianity in general appears to be a good example of cross-cultural relevance between the world represented in the Bible and the world of African tradition' (Müller 2011: 124, n. 5).

The star in the flag of Zimbabwe, together with the bird of Zimbabwe, represents the symbol of the origins of their people as well as an aspiration towards socialism as confirmed by the senior leader and the President of the Lemba Cultural Association: A man with the name of Engenas started the ZCC in 1910 (Selamolela 2008). The history of the ZCC is closely linked to a special star and the tradition of the Lemba people (K. Koka, 1999 pers. comm.; Moeti 2005, personal communications in le Roux 2010: 298).

The progenitors of the present ZCC, their Excellencies Bishop Barnabas and Saint Engenas Lekganyane are part of a special lineage – "Lekganyane" ("kganye" = "star") meaning "the keepers of the star knowledge". Bishop Engenas Lekganyane (c. 1880–1948), great-grandfather to the present Bishop, Barnabus Lekganyane, had a vision in 1910 at a time when Halley 's Comet was very prominent in the sky. In late 1924 or early 1925, the founder Lekganyane established the ZCC at Thabakgone, and 926 adherents were claimed in 1925 when the bishop applied for state recognition of the church (Anderson 1999). The membership in the 'Limpopo Province' (northern South Africa) at the time the Zion Christian Church was established by the mid-1920s was thus less than 1000 members. By 1935 membership had grown to ca. 2000, and when it obtained official recognition in 1942, this had increased to 27 487 adherents, spread from southern Zimbabwe, northern South Africa (including the Northern Cape region) and into Botswana; a year later 40,000–45,000 members were estimated by government (Anderson 1999). Quite obviously the founding Bishop, Lekganyane, was a remarkable leader and also had several miracles attributed to him (Anderson 1999).

Bishop Mutenda's centre for the Zion Church in Zimbabwe near the Great Zimbabwe ruins moved officially to Zion City–Moria, at Boyne (Daneel, 1970) at the time of the (inferred meteor) 1944 event discussed in this paper. Engenas, grandfather to the present Bishop Barnabus, died four years after this event took place and affected the area surrounding the land that Bishop Engenas bought at Boyne to form the headquarters of the Zion Christian Church–Moria. Moria' reflects 1 Chronicles 3:1 – a 'new Jerusalem' (Moodley 2008: 75) symbolising refuge, protection, healing and cleansing. In a Truth and Reconciliation Commission interview, Motolla (1999) revealed that the membership increase after the 1944 event was profound, with ca. 120, 000 members by 1948. The 5-pointed (as opposed to the 6-pointed Star of David) star emblem as well as the dove emblem of the ZCC was adopted after the 1944 event occurred. Following Engenas Lekganyane's death in 1948, his two surviving sons, unable to resolve the succession issue, formed two factions; the majority under Edward comprised the ZCC and used the star emblem, with the minority following Joseph into what became St. Engenas Zion Christian Church denoted by the dove symbol (Anderson 1999).

29 GEOMYTHICAL BACKGROUND

29.1 Oral Tradition

A study of the indigenous knowledge and the myths and legends of the BaLemba/BaSena/VaMwenye peoples within the Mpumalanga and Limpopo Provinces of South Africa and in the southern provinces of Zimbabwe provides insight into the founding and building of the Great Zimbabwe cultural complex and the Zimbabwe civilisation, through migrations of the people who followed some kind of star or celestial object (Van Warmelo 1940; Mathivha 1992; Müller 2000; Arenstein & Hamese 2000; Wade 2009; Wade & Broodryk 2010). Professor Mathivha has recorded these in his 1992 book, which details "a star" which was visible every evening.

A significant feature is the indications of astronomic observations (under the influence of Gumbu chena Mhani) undertaken from a settlement which preceded the stellar-led migration to the locality where Great Zimbabwe was later built. This provides some substantiation for the postulate that Great Zimbabwe had cosmic references in its layout and design and may have served, amongst a range of many different functions, as an observatory (Von Sicard 1951; Mathivha 1992; Stenger 2002; Clark & Carrington 2002; Wade 2009; Wade & Broodryk 2010; Bent 1893; Doyle & Frank 1997; Hall 1909; Frobenius 1923; 1931).

The importance of the star and following that star, in the beliefs of these people is obvious from the Lemba oral traditions (Mathivha, 1992 particularly pp. 3-18). The leading by a star in a westerly direction in this source resonates with the biblical star coming from the east (Matthew 2: 1-10) to Bethlehem, south west of Jerusalem. Debate about possible astronomical explanations of the star over Bethlehem has been ongoing for over 40 years (e.g., Kaufmanis 1973; Mosley 1981; Humphreys 1995; Tipler 2005; Landau 2010; Schaefer 2013).

29.2 Great Zimbabwe as an Astronomical Observatory?

From the position of the 'platform area' at Great Zimbabwe, it would appear that the Great Enclosure's Main Wall was used to define the backdrop of stars, with monoliths marking specific ascending stars and the equinox sunrises, amongst other aspects. Bent (1893) and Swan (1893) were the first to assess the ruins for any possible astronomical functions at Great Zimbabwe, followed by Hall (1909) (Figs. 1, 2 and 3). Further investigation by Doyle and Frank (1997) found Swan's assumptions incompatible with the data but concluded that more research was required (Figs. 1 and 2). Surveys by the first author (see also, Wade 2009) found that from the Platform Area several arrangements exist such as the equinox sunrises, Moon and Venus over the small conical tower (Figs. 1 and 2). Prior to the construction of the Main Outer wall the platform would have been used in alignment with the small conical tower to make observations on the horizon of the spring and autumn equinox sunrises. The outer wall marked Venus and the Moon with monoliths or stelae from the same vantage point and the large conical tower and outer wall are dated to 1320±20 CE (Vogel & Huffman 1991; Vogel 1998; Huffman 2011).

The reconstructed 11 m conical tower in the Great Enclosure aligns with the supernova remnant RX J0852.0-4622 in Vela, as seen from the Platform Area, and may be a preserved structural edifice related to the Lemba legend of a star guiding them to their present homeland (Fig. 2). The supernova remnant aligns with the Conical Tower and a monolith on the wall as viewed from the Platform Area (Fig. 1), at an azimuth of 130º50´30´´ when rising, and with a monolith on the wall, at an azimuth of 193º09´36´´, when setting. In computer simulations, RX J0852.0-4622 would have risen directly over the conical tower in about the mid-13th century and then proceeded in line with the tower, on its vertical journey for most of the late evening and set at dawn, in alignment with another monolith on the western side of the main wall, for a few months in a year.

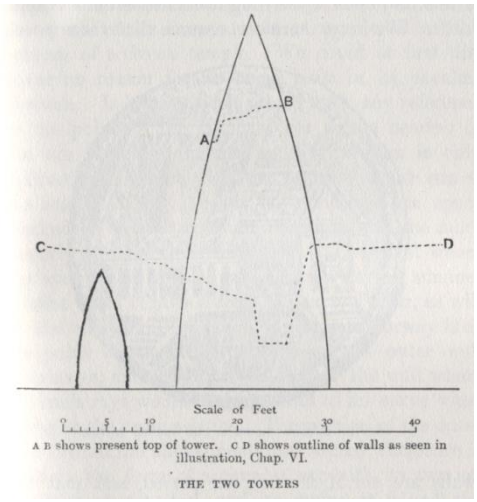


Figure 106 Large Conical Tower and Small Conical Tower in the Great Enclosure at Great Zimbabwe. As reconstructed by Bent and Swan.

The platform area is suggestive of a sort of 'stage' that would effectively have placed viewers in the secluded gathering place, to see the 'bright star' reach the tip of the conical tower each night and perhaps during the day while visible. If the remnant was sub-luminous this 'alignment' would be an extraordinary coincidence, specifically in light of the structures and oral tradition record (Figs. 1–5).

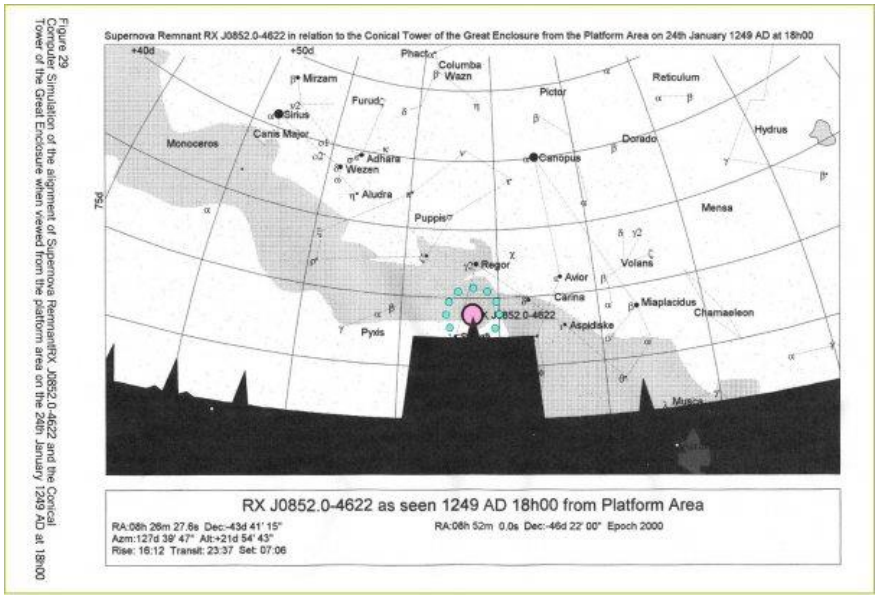


Figure 107 Supernova remnant RX J0852.0-4622 rising behind the large Conical Tower during the time of Great Zimbabwe's flourish as a culture. Computer Simulation by RP Wade of the alignment in relation to the wall and Conical Tower of the Great Enclosure when viewed from the Platform Area at a randomly chosen date of 24th of January 1249 AD at 18h00. The simulation of the Large Conical tower has a flat top instead of a point due to the nature of the graphics (Courtesy Nkwe Ridge Observatory and Bisque Software - The Sky Version IV)

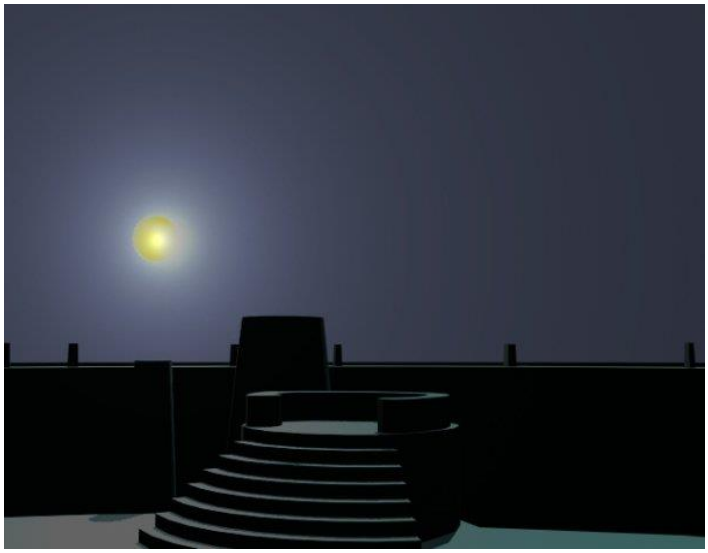


Figure 108 Reconstruction of Supernova rising above Conical Tower at Great Enclosure at Great Zimbabwe by Jan-Willem Van Bergen and RP Wade

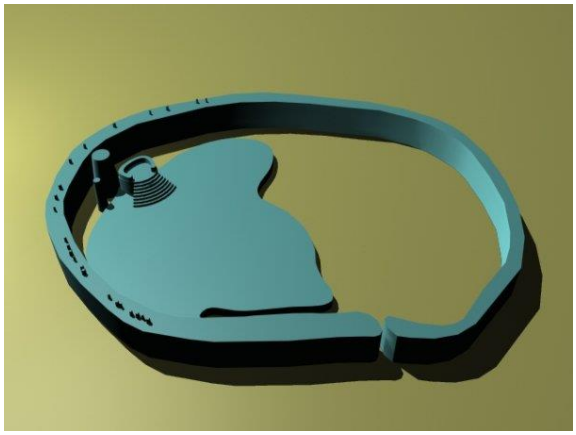


Figure 109 Reconstruction of Great Enclosure at Great Zimbabwe showing extent of monoliths in relation to the platform area and conical towers by Jan-Willem Van Bergen and Richard Peter Wade

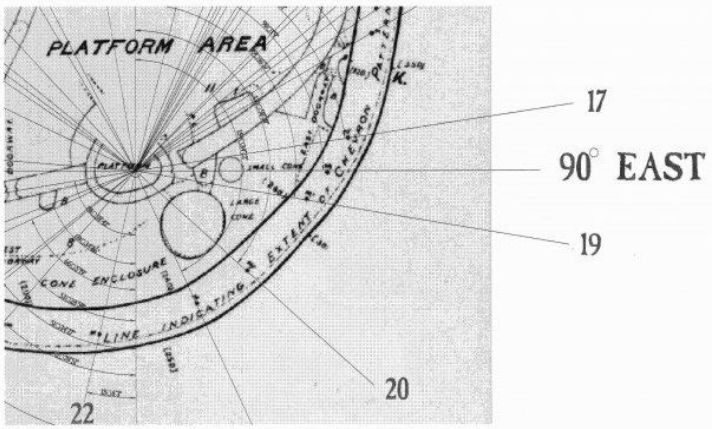


Figure 110 Detail of Plan of Great Enclosure surveyed and draughtsmanship by Franklin White Detail of reconstruction of alignments – RP Wade

29.3 De-mythologizing the Lemba star-lore

The Lemba star-lore, with conflicting chronological aspects that have yet to be demythologized, reveals in all probability that a celestial phenomenon is embedded in the oral traditions handed down by early Zimbabweans. It is still remembered in legend, and symbols such as the 'Ndoro' suggest very bright objects that are depicted and found in renderings on monoliths, wooden carvings and rocks facing the declinational direction of the supernova remnant RX J0852.0-4622 risings and settings (Muhlanga 1926; Frobenius 1923, 1931; Von Sicard 1951; Latham 1986; Chigwedere 1996). It is notable that the route followed by the BaLemba/BaSena in their migration points toward the direction where this particular supernova would have set, with stop-over sites inhabited for short periods during the supernova's lifespan and superimposed on the vague history by descendants as "cities" (Mathivha 1992; Arenstein & Hamese 2000; Wade 2009, 2012) (e.g., Fig. 6).

The Lemba's star operated as a guide and protector, and its regular reappearance was a symbol of the transitory nature of their destination until it disappeared. This was interpreted as a confirmation of the permanence of their relocation. Some allowance must be made for the chronology of settlements (termed "cities" and "suburbs" in translations of the legend and oral tradition) apparently made during the star-guided migration inherent in Lemba lore.

While a supernova might be expected to fade within a matter of months, a series of inhabited localities on a migration route would imply a much greater time scale. A possible explanation for this problem could be that a small, more astronomically adept group travelled along the apparent celestial path over some months, thereby establishing the migration route, which was then gradually and sequentially settled at a number of locations determined by more mundane and practical considerations related to the needs of a larger group of people.

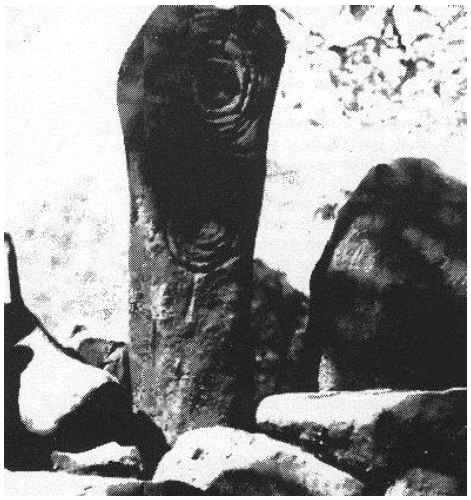


Figure 111 Milaboni's Kraal where the artist's rendition of the 'ndoro' (circle-within-circles symbol) faces the RX J0852.0-4622 setting horizon declination of 222°

Ice-core data reveal that nitrate peaking appears at depths corresponding to known supernovae (Burgess & Zuber, 2000) and a historically unrecorded supernova remnant in the Vela Region - RX J0852.0-4622 (Vela Jr.) has been detected by radio, X-rays, and the ^{44}Ti γ-ray line. This is the likeliest remnant in the region for the time period, which we postulate could have been the scientific basis for the Lemba star lore, and which may have been portrayed as a pinpoint of light with concentric rings in the rock art and other artefacts

(Aschenbach 1998a, b; Aschenbach et al. 1995, 1999; Iyudin et al. 1998, 2010; 2011; Chen and Gehrels 1999; Wade 2009).

These data relate to evidence of a similar period in suggested histories and archaeological data of southern hemisphere cultures in Australasia, South and Central America where, for some regions, the predominantly pre-literate societies' lack of historical records suggest that the cosmic event may have not been visible in those places. Comparative symbols and data are found in other examples of geomythology, and specifically emanating from Peñasco Blanco (Krupp 1997; Green and Stephenson 2003; Pankenier 2006; Than 2006), Bolivia - Lakha Manta petroglyphs (Sullivan 1974), an Honduran Mayan Glyph at Copan (Michanowsky 1977; Tierney 1983) and most specifically, the New Zealand oral traditions of Mahutonga (Best 1922; Sutton 1992; Orchiston 2000, 2002; Green & Orchiston 2004).

Mahutonga has been described as "... a star of the south that remains invisible" (Best 1955, p. 46). As noted by Orchiston (2000, 2002), in Best (1955) there is thus the intriguing suggestion that there may be a record of a southern supernova in the Maori oral tradition as well. Orchiston (2000) has identified the overall Crux region as the likely original location of Mahutonga (Harris et al., 2013). Green and Orchiston (2004) therefore provide an analogous southern hemisphere example, also based on oral tradition, to the geomythological cosmic reference postulate of Great Zimbabwe through their record of a Maori oral tradition of a possible supernova within the last millennium, in the general region of Crux/Velum. As New Zealand was settled at about A.D. 1000 by the Maori, the supernova can be placed within the last millennium (Best 1922; Sutton 1992; Orchiston 2000 2002; Green & Orchiston 2004).

30 AN INFERRED 1944 METEOR EVENT

A 2006 report on a NASA website (APOD) stated that in 1944 a meteor was seen to pass over Bulawayo, Zimbabwe. Oral traditions of the Lemba, Venda and Northern Sotho people about a possible meteor that may have impacted close to Polokwane in South Africa at about the same period allow a hypothesis that they reflect the same cosmic event, and that this set the ZCC to build their church on or close to a meteorite impact site. Engenas Lekganyane was called from a mountain in Lesotho and guided by God to search for the star and the symbol of the tracks of cows on the "Holy Mount Zion" – similar to the mountain of miracles in the Bible. He was promised that many miracles will happen there. Lemba tradition holds that they lost the star in Zimbabwe (Mberengwa) and it moved straight and fell down at the present Moria (not far from Polokwane, Limpopo Province). The oral tradition describes hot, melted rocks, and local farmers confirm such an event, but remembered by them as having been in 1946 (le Roux 2010: 298).

This is relatively close to the 1944 date. Verification of this event was established through many years of fieldwork, surveys and eyewitness accounts of a strewn field, craters and associated ring features located 16–25 km from Zion City–Moria, where the movement has grown such that up to 7,6 million followers out of a total throughout Africa of nearly 35 million met in 2011. According to tradition, a large meteor fragment might have fallen close to Moria itself. The followers gather every year mainly to revere Easter and the memory of a star that returned since the time of their origins at Great Zimbabwe; this has revitalized some social ideologies of the Zimbabwe origins mythology to 'follow a star sent by God'.

Zion City–Moria lies approximately 450 km south-southeast of Bulawayo and eyewitness accounts mention that the inferred meteor event happened in the late afternoon behind and against the high point side of the Strydpoort range, on its northern-face, nearest the gorge

where the Malips River runs. One eyewitness also stated that there was a large scar left in the mountain face and a hole in the mountain nearest a hill called "Mamba koppie". The meteor event apparently left a crater at an angle on the steep slopes and the trees for approximately 2km around were flattened. The owners of a nearby rural store were not sure if it was a storm that had caused the devastation but they investigated the crater behind the range on the mountain and found that all the animals normally grazed there were missing or dead. The local people moved away from the area regarding it as bewitched. They mention that stones were thrown at their huts and the zone today is almost unpopulated.

The main eyewitnesses that provided a record of events that day and confirmation of the date were Valerie Sharpe, King (Kgoshe) Albert Molepo, Rosina Letsoalo, Smithers Mashiya, Norman Appleton and Matjie Selina Mashitoa. Matjie Selina Mashitoa lived at the Downs in Lekgalameetse, 5 km from the inferred crater located at 24º05'32.34"S: 30º11'7.17"E. She was born in 1938 and was six years old when she was woken by a very loud bang shortly after her sisters and brothers had retired for the night. It was early evening and they saw red flashes and stars and heard a loud 'woof woof woof' noise with flares being flung from the west to the north. The earth shook so much that there were cracks in the hut walls and things fell to the ground. It was not raining and they were terrified. Much later, when they went to fetch cattle in 1974, they found a hole where the supposed star (naledi) had fallen. On the edges of this they picked up small (approximately 30 mm) metallic stones that were shiny and heavy for their size. Some of the elders still have pieces. Selina was interviewed on the 25 May 2012 at Mashushu (Mafefe) 24º06'39.3"S: 30º07'11.9", roughly 8 km from the inferred crater. Her village area is also known as Mampas Valley.

30.1 Norman Appleton eyewitness account

During his military service in November 1944, Norman Appleton witnessed a remarkable meteor pass over Bulawayo and published a painting he made of the event (Appleton 2000; www.astronomypictureoftheday.com NASA).

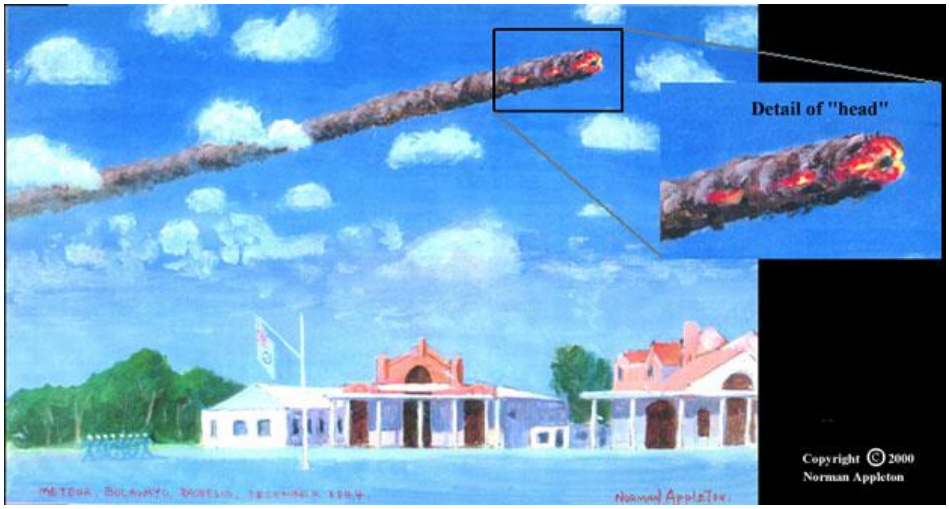


Figure 112 Meteor traversing the sky over Bulawayo in December 1944 toward the direction of Polokwane District as seen and painted by Norman Appleton on WW2 military duty. This meteor is possibly the same that made a strewn field at the Moria City area. Internet October 3rd 2006. www.astronomypictureoftheday.com NASA

In June 2006, he provided the following account in an e-mail (Appleton 2006 pers. comm.).

> *I can confirm without a shadow of doubt that the meteor was NOT SUPERSONIC. You know my permanent interest in matters aviation and having heard so many sonic bangs from aircraft, over the years, I am 100 % sure that this object was subsonic. You know that I live almost under an authorised civil aircraft flight corridor and on a fine day, I can see up to 25 jet airliners per hour passing over our garden at between 30,000 and 40,000 feet. The average speed of these aircraft is known to be around 500 miles per hour and they can take anything up to 8 minutes to pass through a visual arc of about 120 degrees - visibility permitting. The Bulawayo meteor took no more than 5 minutes to pass through about 100 degrees which does imply that its speed may have been fairly close to mach 1 - certainly faster than a jet airliner. One can only assume that the meteor's speed would deteriorate as it lost height and also its temperature would increase at the same rate, as it hit the higher barometric pressure of the lower atmosphere, thus resulting in its break-up. Regarding the height of the meteor, it must have been very high because the sound - that of a continuous clap of thunder, (no sonic bang) - did not reach me until it was almost out of sight, going away from me. The initial direction of the sound started at the point of its appearance and followed its cloud trail across the sky, i.e. the sound was traveling about 90 degrees behind the object. I know this happened a long time ago but the event is imprinted in my mind quite clearly.*

His son, Phil Appleton from the California Institute of Technology, Pasadena, investigated the details of the meteor's path, and was able to provide further details from two newspaper reports, in the *Bulawayo Chronicle*. The first provided a date and time (ca 15h00 on 01.11.1944) for the event and speculated that it may have been ball lightning. The second report, quoting different witnesses, confirms the date, gives a time of 15h55, and notes the horizontal trajectory of the celestial object observed.

Meteorological records from the then-Southern Rhodesia were returned to the United Kingdom after the Second World War, and are stored at Exeter. Mr. Normal Appleton contacted the relevant archivist who confirmed a meteorological report from Bulawayo on 1st November 1944 stating that a “meteorite” had been observed at 15h55, but lacking any specific location. While the written sources thus agree on this possible meteor event having occurred at about 16h00 on 1st November 1944, this contrasts with Mr. Appleton’s painting of the event, dated December 1944; however, in a personal communication to the first author, Mr Appleton corrected this to November.

30.2 The Zion City–Moria area: possible evidence for a meteor event

A meteor fragment (or perhaps the largest fragment, accompanied by a strewn field of smaller fragments) is believed to have fallen within an area of ≤ 25 km radius from where Zion City–Moria now stands. In legend, the actual site is denoted by the star immediately adjacent to Moria symbol (Fig. 7). While the possible impact site of the major meteor fragment reported by eyewitnesses has not been located (and it may lie obscured beneath the Zion City–Moria built-up complex) possible strewn field fragment craters have been found and are described and illustrated below.

Figure 113 Headquarters of the Zion City – Moria (Zion Christian Church –ZCC) near Polokwane district. The Star emblem on the hill-slope is believed to be the site where a large meteorite fell. Google Earth 5/15/2009.

The Strydpoort mountain range at GaMolepo is the border between Moria and the Wolkberg region and was initially assessed for impact features in accordance with the oral traditions. It is a formidably inaccessible and unoccupied zone that recently proved hazardous even to remote sensing and air photography. The cliff face is said to have undergone a rock fall as well as a colour change when a large 'German aircraft' crashed in the early evening beyond the cliff face on a day in 1944, according to local account. A rock roughly a meter in size is said to have landed at the point now marked by a star emblem on the mountain and was rolled into the foundation of the church built at Moria.

At the farm Mizpah a feature was identified through remote sensing after local informants mentioned that a star fell on a ridge in the 1940s. Geomorphological indications are that it may be a crater roughly 10 m in diameter that has been filled by use as a cattle watering hole.

On the mountain ridge of Mamotswiri closest to Mampas Valley in the Serala forest area, a bowl-shaped hole, 20 m in diameter and 6 m deep, is regarded by the villagers of Mafefe and Fertilis 10 km further east as being the place where a star exploded violently in the early evening in November 1944. Sacred metallic stones were found at this place by the elders (Crater A, below). Another similar but smaller circular feature is seen nearby on the ridge (Crater B).

Interestingly, the GPS initially failed to guide us to the site on the ridge, possibly due to the reflectivity of the almost vertically exposed highly metamorphized quartzite strata that form the ridge, which may also explain why two aircraft crashed into the cliff face at Mamotswiri in 2011, a few hundred metres from the site at Crater A.

Rings or circular features that resemble 'fairy circles' (Juergens 2013) have been identified by remote sensing and follow-up ground surveys roughly 3 km from the Mamotswiri ridge. These lie 600 m west of a 20 m long furrow about 2 m deep and 5 m wide that appears to have an exotic boulder roughly 1 m in size embedded in it (possible fragment of target rock dislodged by meteorite?). The original landowner's grave was erected at this site and it was revealed to us by his brother's descendants.

The terrain in which these various possible impact features occur falls partially in a nature reserve area at present and vegetation over the inferred meteor impact features prevents

further investigation. However, changes in the vegetation clearly provide speciation indicators to the geomorphology that are roughly 60 years old.

- "Impact Furrow" 24º7'46.30"S, 30º11'51.56"E 823 m
- Circular Structures 24º7'51.65"S, 30º11'19.15"E 616 m
- Crater A 24º5'31.40"S, 30º11'29.83"E 958 m
- Crater B 24º5'33.77"S, 30º11'12.39"E 1440 m
- Mizpah Crater 24º4'59.90"S, 29º54'26.99"E 194 m
- Rock Fall 24º2'56.42"S, 29º47'34.41"E 1876 m
- Star Emblem of Moria 23º56'43.05"S, 29º47'7.96"E 422 m
- Church of Moria 23º56'34.34"S, 29º47'16.07"E 410 m

See figures 116 to 124.

Figure 114 Ring features as seen from the surface near the Downs at Lekgalameetse Nature Reserve. S 24° 07' 52.79", E 30° 11' 18.58 at elev 1365m

Figure 115 Ring features as seen from the surface near the Downs at Lekgalameetse Nature Reserve. Zoom detail S 24° 07' 52.79", E 30° 11' 18.58 at elev 1365m

Figure 116 Ring features as seen from the surface near the Downs at Lekgalameetse Nature Reserve. Patch in grass is a portion of one of the rings. S 24° 07' 52.79", E 30° 11' 18.58 at elev 1365m

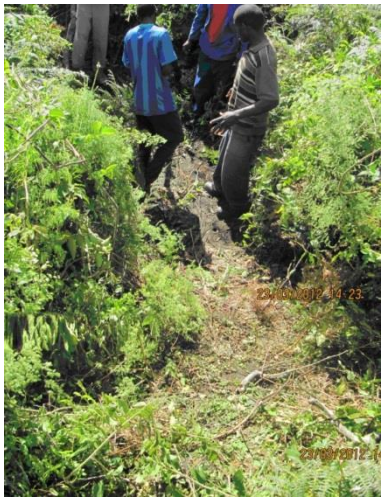
Figure 117 Meteor Impact Crater associated with the Zion City – Meteor Event in the Wolkberg region of South Africa. A circular patch of fern growth marks the 20m diameters by 6m depth of crater filled with ferns, 3km distant from the circular marks in figures 42 - 44.

Figure 118 Meteor crater as seen from Google Earth May 2012 imaged 2008 from 3.10km eye altitude. S 24° 05' 32.34", E 30° 11' 27.17" at elevation 1538m in Lekgalameetse Nature Reserve area of Wolkberg.

Figure 119 Meteor crater as seen from Google Earth May 2012 imaged 2008 from 3.10km eye altitude. 20m diameter bowl shaped crater approximately 6m deep. Covered in tuft of bracken and ferns. S 24° 05' 32.34", E 30° 11' 27.17" at elevation 1538m in Lekgalameetse Nature Reserve area of Wolkberg.

Figure 120 Meteor crater as seen from Google Earth May 2012 imaged 2008 from 3.10km eye altitude. 20m diameter bowl shaped crater approximately 6m deep. Covered in tuft of bracken and ferns. S 24° 05' 32.34", E 30° 11' 27.17" at elevation 1538m in Lekgalameetse Nature Reserve area of Wolkberg – detail zoom.

Figure 121 Meteor crater as seen from the surface. 20m diameter bowl shaped crater approximately 6m deep. Covered in tuft of bracken and ferns. S 24° 05' 32.34", E 30° 11' 27.17" at elevation 1538m in Lekgalameetse Nature Reserve area of Wolkberg.



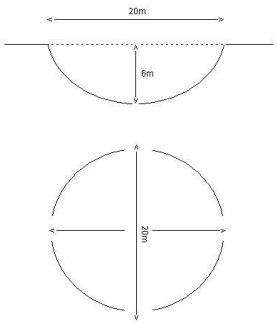


Figure 122 Meteor crater as seen from the surface. 20m diameter bowl shaped crater approximately 6m deep. Covered in tuft of bracken and ferns. S 24° 05' 32.34", E 30° 11' 27.17" at elevation 1538m in Lekgalameetse Nature Reserve area of Wolkberg. Ferns and bracken were removed from the lip

to the centre of the pit to reveal the crater shape. A sample of soil was removed from the centre of the crater base.

31 DISCUSSION

We discuss here the cosmogenic geomythology of the Lemba peoples that can be tied directly with the current and very large Zion Christian Church (ZCC) of today. Oral tradition and some of the preserved architecture at Great Zimbabwe together support the concept of "following a star" in the 14th century (1320±30 CE) southern Zimbabwean-northern South African culture, and how it was likely tied to cosmically inspired migrations along a transect marked by successive cultural-religious settlements, culminating at Great Zimbabwe. We suggest that this "star" can be reconciled with the supernova remnant RX J0852.0-4622 and that the direction in which this set, during its lifespan, determined the migration route and the location thereon of the successive settlements. The power of such a celestial inspiration in religious terms has well known parallels in the star that the Wise Men followed at the time of Jesus' birth and in the meteorite associated with Mecca, the holy site of the Muslim Faith in Saudi Arabia (Buchner et al., 2012). Another less well known analogue is given by the Mahutonga legend in Maori oral tradition, ascribed also to a southern supernova (Orchiston, 2000). In 1910, when Halley's Comet was prominently visible in the night skies, this phenomenon led to a revitalization of the earlier Zimbabwe-culture based faith, and the ZCC fathers ("keepers of the star knowledge") subsequently established the church at Thabakgone in Limpopo Province. At this stage the ZCC had just below 1000 active followers, which had increased to ca. 27,000 by 1942.

Massive growth in the Church's adherents soon after can be ascribed to a 1944 meteor event that was visible passing over Bulawayo, Zimbabwe and is thought to have fallen to Earth at Moria near Polokwane in South Africa, where the current ZCC headquarters is located. Once again a move of the Church was implicit and once more, a massive rebirth of the star-legend-based faith was enacted by a natural cosmogenic event, leading to massive growth in ZCC membership, where today it is in excess of 30 million people. It is quite remarkable that cosmic re-enactment of the star legend has occurred at least three times in the history of the Lemba peoples, each time reaffirming their faith and promoting growth of the religion and concomitant migration of its adherents.

32 REFERENCES

ANDERSON, A.H. 1999. The Lekganyanes and Prophecy in the Zion Christian Church. Journal of Religion in Africa, 29 (Facsimile 3): 285-312.

ANDERSON, A. 2000. Zion and Pentecost: The spirituality and experience of Pentecostal and Zionist/Apostolic churches in South Africa. Pretoria, UNISA Press.

Appleton, N. 2000. www.astronomypictureoftheday.com NASA http://antwrp.gsfc.nasa.gov/apod/ap001116.html (accessed 3rd May 2004).

Appleton, N. & Appleton, P. 2006. www.astronomypictureoftheday.com NASA http://spider.ipac.caltech.edu/staff/apple/WWW/statement.html (accessed 8th August 2006).

ARENSTEIN, J. & HAMESE, C. 2000. SA's Black Jews Search For Ancient Lost Cities. Article in the Reconstruct section of The Sunday Independent Newspaper, South Africa, Sunday 17 September 2000: 4. African Eye News Service.

ASCHENBACH, B. 1998a. Discovery of a Young Nearby Supernova Remnant. Nature 396 (6707): 141 - 142.

ASCHENBACH, B. 1998b. Jahresbericht 1998 ROSAT. Max Plank Extraterrestrial Physics, Garching http://www.gamma.mpe-garching.mpg.de/~hcs/hcs.html (accessed 29 July 1999).

ASCHENBACH, B., EGGER, R. & TRÜMPER, J. 1995. The Vela Supernova Remnant: Discovery of explosion fragments outside of the Vela supernova remnant shock-wave boundary (ROSAT All-Sky Survey). Nature 373: 587-590.

ASCHENBACH B, IYUDIN A.F & SCHONFELDER, V. 1999.Constraints of age, distance and progenitor of the supernova remnant RXJ0852.0- 4622/GROJ0852-4642. Astronomy and Astrophysics 350: 997–1006.

BALZ, H.R. & SCHNEIDER, G. 1990. Exegetical dictionary of the New Testament, Volume 1. (173–174). Grand Rapids, Michigan: Eerdmans, pp. 173-174.

BEACH, D.N. 1980. The Shona and Zimbabwe 900-1850: An Outline of Shona History. Gweru: Mambo Press, London: Heinemann, New York: Putnam.

BEACH, D.N.1983. Oral history and archaeology in Zimbabwe. Zimbabwean Prehistory, 19: 8-11.

BEACH, D. 1998. Cognitive archaeology and imaginary history at Great Zimbabwe. Current Anthropology 39 (1): 47-72.

BENT, T. 1893. Ruined Cities of Mashonaland. London, U.K.: Rhodesiana Reprint Library, Volume Five facsimile reproduction of the third edition (Bulawayo, Books of Rhodesia, 1969), pp. 141 - 178.

BEST, E. 1922. In Best, E 1955. Astronomical Knowledge of the Maori. Dominion Museum Monograph No. 3. (Reprinted, Wellington: Government Printer, Originally published 1922), pp. 46.

BUCHNER, E., SCMIEDER, M., KURAT, G., BRANDSTATTER, F., KRAMAR, U., NTAFLOS, T. & KROCHERT, J. 2012. Buddha from space — An ancient object of art made of a Chinga iron meteorite fragment. Meteoritics & Planetary Science 47 (9): 1491–1501. doi: 10.1111/j.1945-5100.2012.01409.x

BURGESS, C.P. & ZUBER, K. 2000. Footprints of the Newly-Discovered Vela Supernova in Antarctic Ice Cores? Journal of Astroparticle Physics. Volume 14. pp.1-6.

CHEN, W. & GEHRELS, N. 1999.The progenitor of the new COMPTEL/ROSAT supernova remnant in Vela, Astrophysical Journal Letters 514: L103.

CHIGWEDERE, A. 1996. The Karanga Empire. Harare, Zimbabwe: Books for Africa.

CLARK, S. & CARRINGTON, D. 2002. 12:53 04 December 2002. Eclipse Brings Claim of Medieval African Observatory. New Scientist http://www.newscientist.com/news/print.jsp?id=ns99993137 (accessed 4th December 2002).

DANEEL, M.L. 1970. The God of the Matopo Hills: An Essay on the Mwari Cult in Rhodesia. Leiden, Mouton.

DANEEL, M.L. 1971. Old and New in Southern Shona Independent Churches. Volume I: Background and Rise of the Major Movements. The Hague, Mouton.

DANEEL, M. L. 1974. Old and New in Southern Shona Independent Churches (Vol. 2). The Hague, Mouton, pp. 217-232.

DANEEL, M. L. 1988. Old and New in Southern Shona Independent Churches (Vol. 3). Gweru, Zimbabwe, Mambo Press, pp.

DANEEL, M.L. 2001. African earthkeepers: Wholistic interfaith mission. Maryknoll, Orbis, pp.

DELIUS, P. 1996. A lion amongst the cattle: Reconstruction and resistance in the northern Transvaal. Johannesburg, Ravan.

DOYLE, L. & FRANK, E. 1997. Astronomy in Africa. Encyclopedia of the History of Science, Technology, and Medicine in Non-Western Cultures. Dordrecht, Kluwer.

FROBENIUS, L. 1931. Erythräa: Lander und Zeiten des heiligen Königsmordes. Berlin, Atlantis Verlag.

FROBENIUS, L. 1923. Das sterbende Afrika :Veröffentlichung des Forschungsinstitutes für Kulturmorphologie. München, O.C. Recht.

GAYRE OF GAYRE, R. 1972. The Origin of the Zimbabwean Civilization. Salisbury, Galaxie Press, pp. 156.

GREEN, D.A. & ORCHISTON, W. 2004. In Search of Mahutonga: A Possible Supernova Recorded in Maori Astronomical Traditions?, Archaeoastronomy 18: 110-113.

GREEN, D.A. & STEPHENSON, F.R. 2003. Historical Supernovae. In Weiler, K.W. (Ed.) Supernovae and Gamma-Ray Bursters. Lecture Notes in Physics 598: 7-19. Berlin, Springer.

HALL, R.N. 1909. Prehistoric Rhodesia. London, Maskew & Miller, pp. 344-345

HARRIS, P., MATAMUA, R., SMITH, T., KERR, H. & WAAKA, T. 2013. A review of Maori astronomy in Aotearoa-New Zealand. Journal of Astronomical History and Heritage 16(3): 325-336.

HUFFMAN, T.N. 2011. Debating Great Zimbabwe, South African Archaeological Bulletin 66 (193): 27-40.

HUMPHREYS, C. 1995. The Star of Bethlehem, Science and Christian Belief 5 (October): 83-101.

IYUDIN, A. F., YU. V., PAKHOMOV, N. N., CHUGAI, J., GREINER, M., AXELSSON, S., LARSSON & RYABCHIKOVA, T. A. 2011. Search for broad absorption lines in spectra of stars in the field of supernova remnant RX J0852.0-4622 (Vela Jr.), Astronomy & Astrophysics, August 2011, pp.1-9.

IYUDIN, A., ASCHENBACH, B., BECKER, W., DENNERL, K & HABERL, F. 2010. XMM-Newton observations of the supernova remnant RX J0852.0-4622/GRO J0852-4642. Astronomy & Astrophysics.

IYUDIN, A.F., SCHÖNFELDER,V., BENNETT, K, BLOEMEN, H., DIEHL, R., HERMSEN, W., LICHTI, G.G., VAN DER MEULEN, R.D., RYAN, J. & WINKLER, C. 1998 Emission from 44Ti associated with a previously unknown Galactic supernova. Nature 396 (6707): 142 -144.

JUERGENS, N. 2013. The Biological Underpinnings of Namib Desert Fairy Circles,. Science 339 (6127): pp. 1618-1621. DOI: 10.1126/science.1222999
KAUFMANIS, K. 1973. The Star of Bethlehem. Minnesota Astronomy Review 18(Fall): 3-4.

KRUPP, E.C. 1997. Skywatchers, Shamans and Kings. New Jersey, John Wiley and Sons, pp. 196-199.

LAN, D. 1987. Guns & Rain : Guerrillas & Spirit Mediums in Zimbabwe. London, James Currey London and Los Angeles, University of California Press Berkeley.

LANDAU, B. 2010. Revelation of the Magi [RM]: The lost tale of the wise Men's journey to Bethlehem. New York, Harper Collins.

LATHAM, C.K.J. 1986. Mwari and the divine heroes : guardians of the Shona : pan Shona religion as an inspiration for nationality. MA thesis, Rhodes University, South Africa.

LE ROUX, M. 2003. The Lemba: A lost Tribe of Israel in Southern Africa? Pretoria, University of South Africa Press.

LE ROUX, M. 2010. 'The Bhuba: A paternally inherited Jewish priesthood in southern Africa? Ekklesiastikos Pharos 92 N.S. 21: 286-304.

LEWIN, D.I. 1997. Barking up the Lemba family tree with DNA polymorphisms. Journal of NIH Research.

LOCKYER, J.N. & PENROSE, F.C. 1901. An attempt to ascertain the date of the original construction of Stonehenge. Proceedings of the Royal Society of London 69 (1901): 137-147.

LOWE, D.J. 2008. Polynesian settlement of New Zealand and the impacts of volcanism on early Maori society: an update. In Lowe, D.J. (Ed.) Guidebook for Pre-conference North Island Field Trip A1 'Ashes and Issues' (28-30 November, 2008). Australian and New Zealand 4th Joint Soils Conference, Massey University, Palmerston North (1-5 Dec. 2008), New Zealand Society of Soil Science, pp.142-147.

MACIVER, R.D. 1906. Medieval Rhodesia. London, Macmillan, pp. 74 plate XXV, Plan drawn and surveyed by Franklin White.

MATHIVHA, M.E.R. 1992. The Basena / Vamwenye / Balemba. Morenster, Morenster Printers, South Africa.

MICHANOWSKY, G. 1977. The Once and Future Star. New York, Hawthorn Books, New York.

MOODLEY, E.J. 2008. Shembe, ancestors and Christ: A Christological inquiry with missiological implications. Eugene, Oregon, Pickwick.

MOSLEY, J. 1981. Common Errors in "Star of Bethlehem" Planetarium Shows, Planetarian Third Quarter: 4-7.
MOTOLLA, E. 1999. Zion Christian Church spokesperson Emmanuel Motolla's testimony before the Truth and Reconciliation Commission, East London, South Africa 19 November 1999

MUHLANGA, S. (Contributed by Elaine M. Lloyd). 1926. Mbava and Others. In Taylor, G.A. (Ed.) The Southern Rhodesia Native Affairs Department Annual 4: 91–92. Facsimile published 1972 by Books of Rhodesia Publishing Company, Mardon Printers.

MULLAN, J.E. 1969. The Arab builders of Zimbabwe. Umtali [Mutare], Rhodesia Mission Press.

MÜLLER, K. 2000. The Great Zimbabwe Supernova. Article in the Sunday Dispatches section of The Sunday Independent Newspaper, South Africa, Sunday 3 September 2000: 13. Johannesburg, South Africa, Independent Newspapers Holdings Ltd

MÜLLER, R. 2011. African pilgrimage: Ritual travel in South Africa's Christianity of Zion. Farnham, Surrey, Ashgate.

NORRIS, R. P. & HAMACHER, D.W. 2009. The Astronomy of Aboriginal Australia. In D. Valls-Gabaud, D. & Boksenberg, A. (Eds.) The Role of Astronomy in Society and Culture. Proceedings of IAU Symposium No. 260, Paris, France, 19-23 January 2009.

ORCHISTON, W. 2000. A Polynesian Astronomical Perspective: The Maori of New Zealand. In Selin, H. (Ed.) Astronomy Across Cultures: A History of Non-Western Astronomy. Dordrecht, The Netherlands, Kluwer Academic Publishers, pp. 161–196.

ORCHISTON, W. 2002. Southern Hemisphere Observations. In Rickman, H. (Ed.) Highlights of Astronomy, Vol. 12. San Francisco, Astronomical Society of the Pacific, pp. 322–325.

PANKENIER, D. 2006. Notes on translations of the East Asian records relating to the Supernova of AD 1054. Journal of Astronomical History and Heritage 9.1: 77-82.

SCHAEFER, B.E. 2013. The Star of Bethlehem is not the Nova DO Aquilae (nor any other nova, supernova, or comet). The Observatory 133: 227-231.

SELAMOLELA (BHUBA), M.G. 2008. Bhuba to le Roux. Private communication, Pretoria, South Africa.

SPURDLE, A.B. & JENKINS, T. 1996.The Origins of the Lemba "Black Jews" of Southern Africa: Evidence from p12F2 and Other Y-Chromosome Markers. The American Journal of Human Genetics 59 (5): pp. 1126.

STENGER, R. 2002. Star Sheds Light on African Stonehenge. Thursday, December 5, 2002 Posted: 3:01 PM EST (2001 GMT). CNN.com http://www.cnn.com/2002/TECH/space/12/05/zimbabwe.observatory/index.html (accessed 5 December 2002).

SULLIVAN, B. 1974. SAILDART corpus 1998. 6th August 1974. Stanford Artificial Intelligence Laboratory Dump And Restore Technique. SAILDART corpus 1998 - from 229 reels of tape - as is 2002. http://www.saildart.org/ (accessed 12 May 2011).

SUNDKLER, B. 1976. Zulu Zion and some Swazi Zionists. London, Oxford University Press.

SUNDKLER, B. & STEED, C. 2000. A history of the church in Africa. Cambridge, Cambridge University Press.

SUTTON, D.G. (ED.) 1992. The Origins of the First New Zealander. Auckland, Auckland University Press.

SWAN, R.M.W. 1893. On the Orientation and Measurements of Zimbabwe Ruins. In Bent, T. (Ed.) Ruined Cities of Mashonaland. London, Chapter 5 p 147. Rhodesiana Reprint Library, Volume Five, facsimile reproduction of the third edition. Bulawayo, Books of Rhodesia, 1969, pp. 141 - 178.

THAN, K. 2006. CNN.com - Ancient rock art may depict exploding star - Jun 5, 2006. 6th June 2006. CNN. http://www.cnn.com/. (accessed 23 May 2010).

THOMAS, M.G, PARFITT, T, WEISS, D.A, SKORECKI, K, LE ROUX, M, BRADMAN, N. & GOLDSTEIN, D.B. 1999. Y- Chromosomes Travelling South: The Cohen Modal Haplotype and the Origins of the Lemba - The "Black Jews of Southern Africa". American Journal of Human Genetics 66 (2): 674-686.

TIERNEY, J. 1983. Scholar without a School. Science 4(2): p. 46.

TIPLER, F.J. 2005. The Star of Bethlehem: a Type Ia/Ic Supernova in the Andromeda Galaxy. Department of Mathematics and Department of Physics, Tulane University, New Orleans, LA 70118. http://www.math.tulane.edu/~tipler/starofbethlehem.pdf (accessed 22 August 2013).

VAN WARMELO, N.J. (Ed.) 1940. The Copper Miners of Musina and the Early History of the Zoutpansberg: Vernacular accounts by S.M. Dzivhani, M.F. Mamadi, M.M. Motenda,, E. Mudau. Pretoria, Government Printer, Ethnological Publications, Vol. VIII.

VOGEL, J.C. 1998. Radiocarbon dating of the Iron Age sites on Greefswald (appendix). In Meyer, A. (Ed.) The Archaeological Sites of Greefswald – Stratigraphy and Chronology of the Sites and a History of Investigations. Pretoria, V & R Printing Works.

VOGEL, J.C. & HUFFMAN, T.N. 1991. The chronology of Great Zimbabwe. South African Archaeological Bulletin 46: 61-70.

VON SICARD, H. 1951. The Origin of the Tribes in the Belingwe Reserve. In The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers, p. 17.

WADE, R.P. 2009. A systematics for interpreting past structures with possible cosmic References in Sub-Saharan Africa. M.Sc. Thesis. University of Pretoria, South Africa. http://upetd.up.ac.za/thesis/available/etd-05052009-174557/

Wade, R. P & Broodryk, N. L. 2010. Systematics of interpreting cosmic references in sub Saharan Africa. http://www.communicatingastronomy.org/cap2010/posters.html.

Wade R.P, Eriksson, P.G, Duncan G.A, Rautenbach C.J de Wet. 2014. Southern African cosmogenic geomythology ("following a star") of the Zion Christian Church. Transactions of the Royal Society of South Africa. Volume 69 No.2. Taylor & Francis U.K.

ZULUAGA, J.I. & FERRIN, I. 2013. A preliminary reconstruction of the orbit of the Chelyabinsk Meteoroid. Instituto de Fısica - FCEN, Universidad de Antioquia, Calle 67 No. 53-108, Medellın, Colombia 21 Feb 2013 arXiv:1302.5377v1 [astro-ph.EP]

CHAPTER SIX

ARCHAEOLOGY AND ASTRONOMY IN AFRICA, WITH SPECIAL REFERENCE TO GREAT ZIMBABWE

Abstract

The postulate that astronomical aspects are found in the archaeological record of the Great Zimbabwe Cultural complex is linked to the ethnographic data and may be shown in arrangements and structural configurations, specifically of observations made of the ruins at Great Zimbabwe. Various hypotheses are presented and tested with the data found in the ethnographic, archaeological and cultural astronomical records to date.

The postulate that a cosmic reference may be prevalent in the structural arrangement of the Great Enclosure at Great Zimbabwe is rigorously assessed to determine causal relationships of the incomplete and lost systematics.

The hypotheses examined are that at least some archaeological stone structures in Africa, apart from the Pyramids of Egypt, were conceptually associated with astronomy; that Mapungubwe had evidence of an aligned structure; that Ndzalama terraces, Tshimedzi Moon and the pre-Islamic Anwã system 'Talama' reveal the origin of the extant astronomical knowledge; that Venus and the Moon were relevant to the construction of Great Zimbabwe; that Supernova RXJ 0852.0-4622 is related to the construction of the Great Enclosure at Great Zimbabwe; and that a Japanese sighting of an astronomical phenomenon is related to the Supernova RX J0852.0-4622.

Keywords: Great Zimbabwe, Mapungubwe, Agricultural Marker Stars, Morgenster, Tshimedzi Moon, Ndzalama, Nichiren, RX J0852.0-4622, Venus synodic period

33 INTRODUCTION

In my high school years our history teacher introduced us to the ruins of Great Zimbabwe and mentioned that the stelae placed in the walls were made to look as sentries on the walls to possible enemies. So I was always intrigued by this statement and when I first enrolled as an archaeology student I took an interest in this idea.

Observation made of one of the main ruins within the plan survey by Franklin Wright in the early 20th century of the Great Enclosure at Great Zimbabwe had a strange anomaly, the enemy seemingly would always come from outside only one side of the wall!

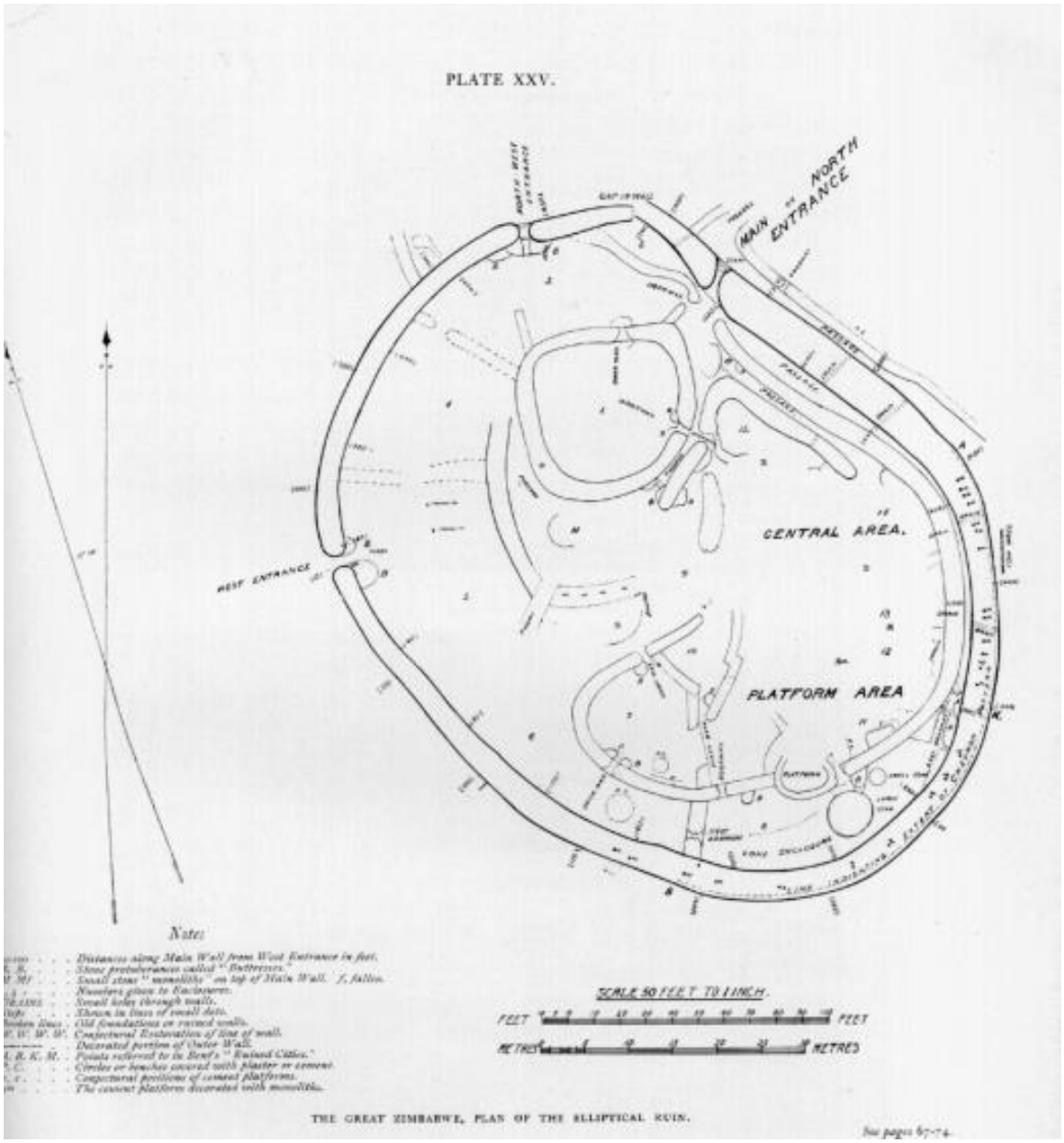


Figure 123 Plan of Great Enclosure surveyed and drafted by Franklin White (MacIver, 1906:74 plate XXV).

The stelae on the main wall were all on the southern to the eastern part of the almost ellipsoid structure (Fig. 123).

I also noted that the stelae are not spaced regularly to my conception of military fashion but are spread out gradually from south to east on the wall and compressed almost exponentially with the wider spacing between the southern stones and a denser spacing on the more easterly stones.

The stelae were also placed on the wall area that has a chevron pattern which is not found elsewhere on the main wall (Figs.124 and 125).

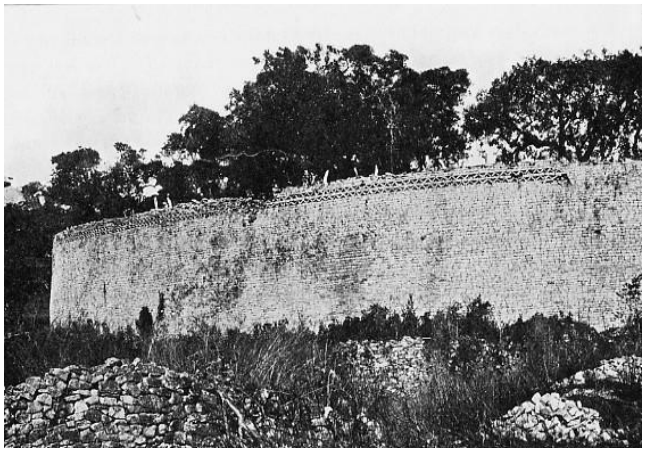


Figure 124 Great Zimbabwe, view of southeast wall of Great Enclosure. The stelae are arranged above a chevron pattern in the top part of the wall. (Randall MacIver, 1906) https://commons.wikimedia.org/wiki/File:Exterior_of_great_enclosure,G.Zimbabwe.JPG

Figure 125 Outside view (close) of the wall of the great enclosure of Great Zimbabwe. Jens Klinzing https://commons.wikimedia.org/wiki/File:Wall_of_the_great_enclosure,_Great_Zimbabwe.JPG#filelinks

In trying to ascertain meaning in this arrangement through the years I extrapolated that the intervals between the stelae ranging from five metres to less than a metre may deal with astronomical placements of the stelae being sighted or aligned to a specific viewing point. The conical towers were an even more perplexing mystery.

Initial questions dealt with what rising celestial objects would represent the spread and where was the vantage or viewing point? And in so doing I began to formulate a crude notion that the stelae were associated with the rising celestial phenomena of the eastern horizon.
In my 4th to 5th year in archaeology I began to realize that this notion was controversial and without relevant field evidence was not acceptable.

My search thereafter in further years, when affordable, allowed the field research albeit marred by hostilities and war.

Eventually, years later I was permitted to survey the ruins in Zimbabwe and managed to retrieve as much information as possible in hostile conditions.

My hypothesis by this stage was that there is sufficient evidence to suggest that Great Zimbabwe Great Enclosure may have functioned at certain stages of its construction as an observatory.

I studied under the foremost archaeologists that ever researched Great Zimbabwe and was shown that the main wall of the Great Enclosure was dated to almost two hundred years after an initial walling phase. The Main wall and large conical tower were contemporaneous (Huffman 2011; 2008; 1996; Huffman & Vogel 1991).
The Platform Area in the Great Enclosure was the only discernible viewing point of the horizon and in the pre-Main wall phase would have been statistically inflexible to an alignment between the Platform and the vernal and equinox sunrises on the horizon.

This further substantiated my search and corroborated the possibility of an astronomical function; however, the Main wall phase and introduction of a large conical tower remained perplexing factors in this idea.

Furthermore, actual data from the present arrangement of the wall was affected by reconstructions and damage of trees not to mention removal of stelae in the colonial era. The conical towers were not destroyed or removed at any stage but were reduced in height.

Franklin White's survey therefore proved the most accurate for reconstructions of the skies.
Ethnographic data validated my astronomical search and specifically prominent was the historiography of the Lemba / Ba Sena people.

The idea that the stelae on the main wall marked the passage of a specific rising object over time from the Platform area was tested by observation of Venus (as a morning star or Massassi), where ethnographic oral tradition of the concepts of Massassi and Morongo corroborated the Great Zimbabwe Cultural complex's formative means of recording the Venus synodic period.

Through the years I therefore began to form an hypothesis which would need to be tested and extrapolated.

The hilltop ruins at Great Zimbabwe in my viewpoint gave a similar set of ideas but due to tremendous changes in the structures noted by archaeologists, became virtually impossible to work with, regardless of how intriguing the possibilities were.

It was at this time that an announcement from the Max Planck Institute's astrophysics team mentioned that a possible medieval era supernova remnant should have been visible to southern hemisphere populations (Iyudin 1998; Aschenbach 1998).

Placing the astrophysical data in a planetarium computer simulation of a 360° photo-realistic horizon panorama of the Great Enclosure for the time range as viewed from the Platform area provided an astounding observation.

The reconstructed top of the large conical tower would have aligned impeccably with the supernova remnant at the time presented by the astrophysicists, which was coincident with construction of tower together with the Main wall in 1320+/-30 C.E (Huffman & Vogel 1991).

These coincidences together with the Lemba/Sena historiography of building the settlement by following a strange 'star' and creating various settlements in the direction or vector of the setting supernova discovered by the astrophysicists, gave the incentive to scrutinize the data.

Over a few years various other instances of finds were examined concerning the Tshimedzi rain period and Venda and Shona ethnographic records as well as the relationships between pre-Islamic trade influences of star lore that are preserved in the descendant etymology and methods of agriculture.

Data and research which all initiated preliminary deductions to my observations.

The astrophysical data relating to the possible supernova remnant was substantiated by an ice-core nitrate level for the extrapolated time period and it remains a mystery without historical endorsement. Also, the data retrieved at the time appeared inadequate without proper revision in indigenous astronomical systematics of southern Africa as well as other cases in point of sighting records worldwide.

The interpretation of the data therefore led to inferences that the supernova remnant forms an unclassified sub-luminous stellar category that could not have been seen by the builders of the Great Enclosure and that the data was contaminated by inductive speculation and coincidences.

More research into possible southern hemisphere records led to various enticing non-literal semi-confirmations that could not provide proper testing of the data. It is expected that only once the postulate is publicized, would proper instances emerge that can eventually provide conclusions to the original postulate that Great Zimbabwe's Great Enclosure functioned at certain stages as an observatory and that the structure preserves a cosmic reference of a supernova.

At the time of submitting this thesis new information came to light and may reveal a written account, discussed below in section 35.

34 MEGALITHS, ALIGNMENTS, STELAE, MONOLITHS AND STRUCTURES

The earliest attempts by Baity (Baity 1973) to formalise the systematics of research into structures with related astronomical aspects identified problems that required a multi-disciplinary approach to better understand past cultures. The refutation and rebuttal of her attempts (Hicks 1979; Baity 1974) proved the haphazard nature of this research and various attempts throughout time to survey Stonehenge (Trotter 1927; Krupp 1978) which found statistical patterns were largely dismissible (Atkinson 1966; MacKie 1977).

Europe lacked the ethnographies and historical records of early colonizers which allowed the New World anthropologists to motivate and claim proposals that the Maya and Uxmal sites were built in accordance with astronomical alignments (Aveni 1981); these postulates seemed comparatively weak to the non-historically backed statistical analyses of European megalithic research (Zeilik 1985; 1986).

Many of the great monuments and ceremonial constructions of early civilizations were astronomically aligned. The accurate cardinal orientation of the Great Pyramid at Giza in Egypt or the Venus alignment of the magnificent Maya Palace of the Governor at Uxmal in Yucatan are outstanding examples (Aveni 1981; 1989). Much is learned about the development of science and cosmological thought from the study of both the ancient astronomies and surviving indigenous traditions around the world.

And in recent times the dichotomy of methodologies between New and Old World have become formalized as archaeoastronomy - the study of the astronomical practices, celestial lore, mythologies, religions and world-views of all ancient cultures - in essence, the

"anthropology of astronomy", distinguished from the 'history of astronomy' (Ruggles 1993; Aveni 1982; 1989; Krupp 1978).

The view that the only "really important" astronomies are those that contributed to the main development of Western astronomy, from the Babylonians through the Greeks to Ptolemy and Copernicus are no longer seen as important or essential to astronomies with mythological or broadly philosophical elements, seen as strongly rooted in cultures as opposed to the alternatively mathematical predictions or models that are not.

Archaeoastronomy is sometimes seen to have a kind of fringe status due to the misconception of ley-lines and astrological alignments and where New-Age conceptions of hidden energy and powers in megaliths has severely clouded the scientific issue (McCluskey, 2005). A number of relevant hypotheses are discussed next, to enlarge this context to the Great Zimbabwe structures at the heart of this southern African research.

34.1 Hypothesis One – At least some archaeological stone structures in Africa, apart from the Pyramids of Egypt, were conceptually associated with astronomy

To determine the ethnic, indigenous and cultural astronomical aspects of southern Africa, an attempt to address the apparent absence of research in sub-Saharan Africa is found in a previous methodological treatise (Wade 2009).

The earliest recordings of the San star-lore by Bleek and Lloyd (e.g., 1911) provide a profound legacy of stellar knowledge and this research specifically refers to the relatively unknown cultural astronomy of the formative Bantu speaking peoples that moved across the Limpopo River in the medieval East African Trade Network Era, as discussed by Wade (2009: 34).

However research relating to the entoptic phenomena (Lewis-Williams 2002; 2003 Lewis-Williams & Pearce 2005; Pearson 2002; Hancock 2005) may explain or elucidate the various so-called astronomical data that extend from the rock-art record to the later Bantu mythology and oral traditions, and can imply that rock art records and art symbols that are construed to have astronomical validity may be part of the neuropsychological renditions adherent in Man (Thackeray & Knox-Shaw1992; Thackeray 1988). A general synopsis of southern African knowledge on meteors, comets and shooting stars is given by Alcock (2014:313-327) and an in depth discussion is made regarding renditions of astronomical phenomena (Alcock 2014: 289).

Although there were earlier attempts to document and characterize the indigenous astronomical knowledge in sub-Saharan Africa such as the astronomical charts relating to the expeditions of Admiral Zheng He and the Kangnido cartography of Ch'uan Chin and Li Hui, Prince Henry the Navigator in Senegal, the Malian Timbuktu Arabic Astronomical records, and the Arabian and Chinese sources of the East African Trade Coast Network (Dreyer 2007; Major 1868; Menzies 2002; Hunwick, & Boye 2008; Wade 2009), the first known and documented sources were those of Norman Lockyer and his colleagues, Bent & Swan (1893); Hammond-Tooke, Theal, Bleek and Lloyd (Lockyer & Penrose 1901; Hammond-Tooke 1888; Theal 1886; Bleek 1935; 1936; 1956; Bleek & Lloyd 1911).

General discussion is made in the earlier thesis (Wade, 2009) in regard to the astronomical aspects of southern Africa specifically the sites found elsewhere in Africa south of Egypt, such as Nabta, Ng'amoritung'a Megaliths, Tiya in Ethiopia and the Borana Calendar (Wade 2009; Huntingford 1950; 1955; Krzyzaniak et al., 2000; Turton & Ruggles 1978; Lynch 1978; Lynch & Robbins 1978; 1983; Holbrook et al., 2008; Malville et al., 1998; Murdock 1959) and more detailed aspects that have been documented in the extensive publication of Alcock (2014).

It is interesting to note that Murdock sees a megalithic tradition of 'Cushitic' origin that exists in the eastern half of Africa that extends to the Great Zimbabwe Cultural Complex and which is associated with specific crops and terrace farming and which Lynch (1978; Lynch and Robbins, 1978, 1983) accepted as a possibility (Murdock 1959; Wade 2009: 30).

Chami equally records an intriguing rich tradition of rock-art figures as "*evidence of renditions of 'stars' and 'sun and rays' that are part of a deification of the sun and moon pointing to a form of Solastic religion or otherwise extensive knowledge in astronomy*" (Wade 2009: 31; Ruggles 2005; Chami 2008; Leakey 1983) as opposed to cognitive archaeological ideas on entoptic phenomena.

Extensive stone walling ruins can be found throughout southern Africa but the stone circles and terrace ruins in Mpumalanga have received special attention.

In areas where wood was excessive the ruins are less prominent. In Mpumalanga, South Africa there are roughly 10 000 square kilometres of bewildering mazes of stone-walling associated with terrace farming throughout the valleys surrounding Ohrigstad, Carolina, Waterval-Boven (Emgwenya) and Lydenburg. The peak phase of the occupation appears to end in the 1800's and starts apparently from the 1500's according to some historians. Little is known and various unsubstantiated attempts have been made to classify who these people were (Wade 2009: 51; Schoeman et al. 2014; Hromnik 1981; Heine & Tellinger 2008).

The earliest 'Lydenburg' Culture defined by Evers is associated with the rare African artworks known as the Lydenburg Heads (Fig. 126) and are dated from 300 C.E. with a rough flourish in 700 C.E. (Evers 1980; 1982; Evers & Hammond-Tooke 1986; Greenfield & Miller 2004). The various attempts to classify these stone-walling ruins exclude the Lydenburg culture data with preferences associated with outlandish aliens, Indian traders and politically opportunistic historians.

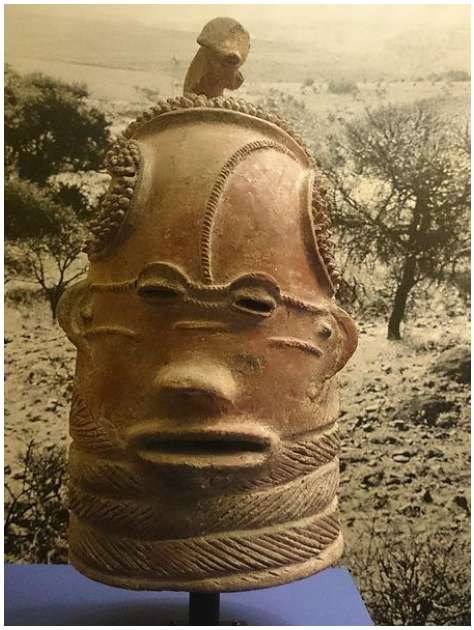


Figure 126 The Lydenburg heads are the earliest known examples of African sculpture in Southern Africa. Two of the heads are large enough to have been worn as ceremonial helmet masks. The other five smaller heads have a hole on either side of the neck, by which they could have been attached to a pole or costume during a performance. One of the small heads has an animal-like nose and mouth, which would have been of symbolic importance to the makers of the heads. Accessed 2 July 2014, 10:36:45. https://commons.wikimedia.org/wiki/File:Iziko_Lydenburg_Heads_2.JPG

Although the crops grown in the terraces are those mentioned in Murdock as forming part of the pre-maize 'Cushitic' traditions which he maintained formed the Great Zimbabwe Cultural Complex (Murdock 1959), it is more likely that they are the ruin fields formed through the various phases that are linked to the East African Trade Network era and the earliest formation of the Nguni people (Huffman 2004). These ruin fields are associated with metal working, agriculture and astronomy.

34.2 Hypothesis Two – Mapungubwe had evidence of an aligned structure

In Chapter One an argument is presented that the hilltop of Mapungubwe had a surface find of a stone arrangement that may have aligned to the cardinal points (Fouche 1937:149; Wade 2009:110; Mapungubwe Archive – University of Pretoria UP/AGL/D/68, 51, 52 and 53).

It is a circle of monolith stones that had two cardinally aligned perpendicular lines of stone slabs crossing one another and placed on two layers of stone slabs within the circle of monoliths.

The east-west line of stone slabs aligns with the vernal and autumnal equinox sunrise and sunset. The ethnography of the descendants of the Mapungubwe people are known to have rituals preferably at the vernal equinox such as the Tshimedzi Moon rain-making 'Mademba Ndiku-teme Conjunction' sacrificial burning (N.H.W., 1926; von Sicard, 1966; Wilson, 1931; Wade 2009: 91; 159; Theal 1898-1903: 197).

This stone circle arrangement is the same general size as the 'grain-bin bases' discussed by the early archaeologists but it may be a truly bizarre coincidence that the possible alignment of stone slabs also lies above a stratigraphy of two gravel cement floors and a sediment of burnt bones and bangles that all lie above a significantly sized layer of burnt wood and charcoal; all factors that clearly associate with a ritual cremation or sacrificial incineration site. Burnt human remains are found in these layers of Mapungubwe and it would seem odd to place grain bins over roughly twelve known graves found to date on the hilltop (Fouche 1937:149; Wade, 2009:108).

At the site known as K2, the relatively unknown earliest phase of Mapungubwe, there were records of 'isivivane' or stone cairns and dolmen-looking structures similar to the 'Heitsi-Eibib' cairns found further south in southern Africa. Hannes Eloff showed me one of the arrangements he identified as an 'Heitsi-Eibib' cairn midway between Mapungubwe hill and K2 at a water source. It was a roughly 1m x 50cm stone slab 50mm thick, supported by 4 stone monoliths of about 50cm in height, almost like a dolmen or table. Unfortunately this was destroyed during the military occupation of Mapungubwe and no records were made of these possible astronomical features and structures.

34.3 Hypothesis Three - Ndzalama Terraces, Tshimedzi Moon and the pre-Islamic Anwã system 'Talama' reveal the origin of the astronomical knowledge

Detail is given (Wade 2009: 31) and repeated in Chapter One concerning the likely origin of an agricultural method found to exist in the northern and eastern portions of southern Africa, that a natural rock is chosen within an acceptable agrarian zone to denote the season changes by means of the shadow the rock creates in the duration of seasons.

In preliminary surveys of the ruin fields of Mpumalanga several monoliths were found that were erected by the early farmers in the agricultural terraced valleys and could have been used for this reason. Hromnik further elucidates finding monoliths used to determine seasonal change (Hromnik 1981).

An Ndzalama rock is a natural rock, which according to oral tradition elsewhere in Mpumalanga, is central to agricultural terraces and is said to have functioned as a gnomon that determines the time to plough and sow crops. The Tsonga people are known to have a prominent 'finger rock' which they name Ndzalama, usually located central to an agricultural settlement for this purpose (Junod 1912 – 1913; 1962).

Figure 127 Ndzalama Rock 23° 48' 53.05" S 30° 33' 45.87" E photo by Arcon Media http://www.panoramio.com/user/2237530?with_photo_id=44081268

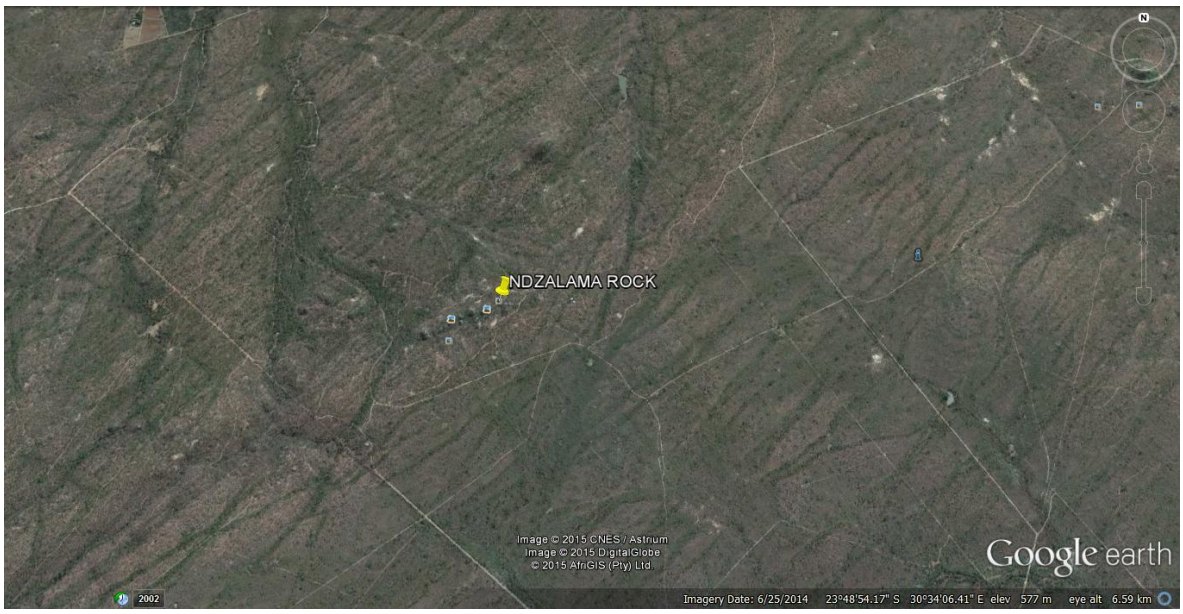


Figure 128 Ndzalama Rock east of Kruger National Park central to a former Tsonga settlement surrounded by agricultural terraces. Courtesy Google Earth 1st July 2015

The Ndzalama' rock usually chosen from nature, or fashioned, and found central to a Tsonga-Shangaan settlement, may be named after the shadow-rock used to indicate the ploughing or 'talama' period, i.e., the Ndzalama Sacred Rock of the Ndzalama Reserve at

23° 48' 53.05" S 30° 33' 45.87" E (Figs. 127 and 128). Other examples are known from Zimbabwe (Figs. 129 and 130).

There is a distinct etymological link between the verb – 'to plough' (talama) and the naming of the sacred shadow rock of the Tsonga – Ndzalama. There is an analogy amongst the south western Yemenite agricultural terraced valleys, specifically in al-Ahjur. The earliest reference is in the 10th century concerned with growing sorghum (dhurah) by al-Hamdani Abu Muhammad al Hasan (al Hasan 1884 -1891:199) for talama, which is the root word used in the Yemenite Anwã concept of 'agricultural marker stars' – 'ma'ãlim al-zirã'ah', with the emphasis being the root - 'lim' or 'lam' (Varisco 2004: 77-78; Varisco 1985:61; Wade 2009:86). The agricultural marker stars 'ma'ãlim al-zirã'ah' were the Pleiades and are also referred to as 'talma' - time period or season, as in the season at the rising of the Pleiades (talmat tulüc al-thurayya) (Varisco 2004:78).

The Tsonga name for the Pleiades is 'shirimelo' or 'the one who announces the tilling season' (Junod 1927; Alcock 2014:257).

Severe lack of rain and water resources in Yemen made it vital to make use of the stars to determine the start of the rain season to provide farmers an accurate planting period which usually lasted ten days. Twenty seven species of sorghum would be planted in these ten days, called the al-'ashr al-mukhtãrah (lit., the ten select days), and this period was defined as the middle of a thirty day period which was considered optimum for planting sorghum after the spring rain (Varisco 1985:61; Wade 2009:86).

In al-Ahjur they make use still today of a shadow scheme which is identical in many respects to the Tsonga Ndzalama shadow scheme:

> "*As the sun rises in the morning, the top of the plateau of Husn al-'Arus (located east of the valley) casts a shadow (ghawm) on the western side of the valley wall in al-Ahjur. This shadow appears to migrate as the sun moves along the ecliptic during the course of the year. By observing where the shadow falls at dawn, it is possible to construct a simple seasonal calendar. A landmark (ma'lam) is fixed to mark the time when sorghum should be planted* "(Varisco 1985: 62-63; Wade 2009:86).

Figure 129 Finger Rock, Morgenster, Zimbabwe at -20.316667; 30.933333. The date "1891-1941" is on a sign attached to one of the rocks. Photo by Percy Chikwezvero http://4towold.blogspot.com/

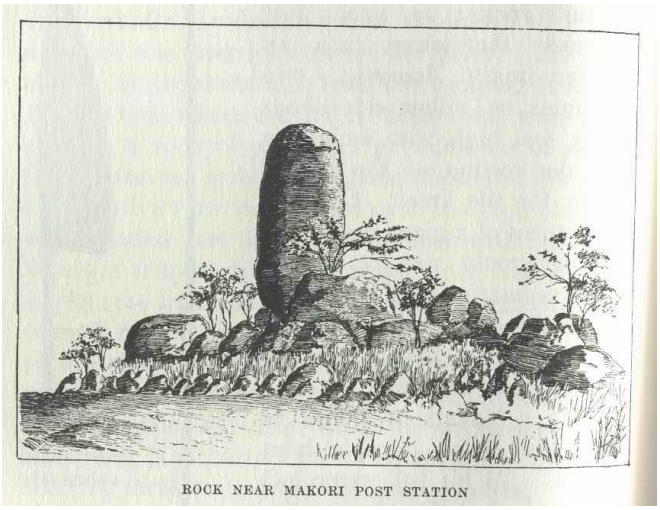


Figure 130 An 'Ndzalama' Rock found in Zimbabwe by JT Bent. In Bent, J.T. 1969. (Reprinted from 1896) The Ruined Cities of Mashonaland. Books of Rhodesia. Page 254.

The concept of 'Tshimedzi' Moon discussed in detail in Chapters One and Three provides a further link with the anwã system of the pre-Islamic astronomers of Yemen.

The 'Tuda' asterism and 'Makhali' asterism (i.e. the Giraffe and Rhinoceros) form a naw' (plural anwã) which is accentuated by the first new moon sighting when the Giraffe asterism sets as the Rhinoceros asterism rises at Tshimedzi new Moon (Varisco 1987; 1989; Wade 2009:85).

In Chapter Three, section 15 it is discussed that a monolith on the wall of the Great Enclosure was likely a marker for the Tshimedzi Moon at the Great Enclosure at Great Zimbabwe, and the possibility is also discussed there, that the trader links of terrace farming that has existed throughout southern eastern Africa for centuries and is still practiced from Yemen and Ethiopia to South Africa since Trade Network times, forms the likeliest origin of the astronomical knowledge of the early African people including those at Great Zimbabwe.

34.4 Hypothesis Four - Venus and the Moon were relevant to the construction of Great Zimbabwe.

In Chapters One, and Two details are presented dealing with 'divination bowls', the Moon and the Venus synodic period codification in the Great Enclosure structure. Chapter Three provides amongst other observations, computer simulations of a range of Venus alignments from the Platform of the Great Enclosure.

Mention should be made here of the immense importance of the findings in the Aegean region concerned with the so-called 'frying pans' (Tsikritsis et al. 2015; Coleman 1985; Papathanassoglou & Georgouli 2009; Varoucha 1925-26; Rambach 2000).

The idea of using bowls for astronomy has never been fully understood until discoveries made almost a century ago were described recently:-

> "…*that the Cycladic frying pan contain calendars that are not only based on the periodicities of the Sun and Moon, but in a very advanced knowledge of the movements of the planets, their periodicities in relation to the Earth and the*

> *phases of Venus, which is used as calendar, as well as pregnancy and birth predictor calculator* " (Tsikritsis et al. 2015: 1).

This description together with the mediaeval Arab-Islamic divination bowls such as the one researched by Hostetter and similar Persian metal divination / magic bowls produced between the 8th and 13th centuries in the Middle East, and which depict the Moon, Venus and celestial cycles, affirm a tradition of astronomical knowledge that relates to the 13th Century Muslim philosopher/astronomer Nasir al-Din al-Tusi in his source document of these codifications - Kitab al-Zij al-Ilkhani in 1270 CE (Badakchani 2005; Hostetter 1979).

The ethnographic narratives therefore of the 'zodiac' and 'divination bowls' (Duffey 2012; Wade 2009; Thompson 1942; Le Roux 2005; Stayt 1931; Mathivha 1992; van Warmelo 1940) found amongst the Lemba and Venda appear in many respects to be part of the envisaged geomantic diffusion from the Middle east and ancient Bronze age of the Mediterranean (van Binsbergen 1996). And this is reinforced, as in Chapters One and Two from my observation that the bowls in southern Africa were mainly used for correlation of the biological pregnancy cycle with that of the Venus movement through the sky, apart from various 'divinatory' and arbitration roles (Wade 2009: 44). All the bowls mentioned were capable of holding a liquid possibly reflecting the sky.

However as a caveat, the plain definitions related in Alcock may provide a realistic role of the bowls, that there is no calendrical use other than the sighting of the thin crescent moon (Thompson 1942; Le Roux 2005; Stayt 1931; Mathivha 1992; van Warmelo 1940; Alcock 2014: 139).

The symbol of the python or snake 'chevron' and the use of a snakeskin python belt for the gestation period which is released nine times (Wade 2009: 78) nevertheless is associated with the chevron pattern on the wall of the Great Enclosure and the Enclosure is also regarded as the housing of the 'queens' (Wade 2009; 233; Huffman; 1981; 1996).

The 'python' dance or 'domba' is part of the 'Vhusha' or 'Vhukomba' initiation ceremony amongst the Lemba/Venda people (Blacking 1998; Mathivha 1992: 48) where the youth are initiated into the concepts of fertility, conception, gestation and birth; this has been shown in previous chapters to be associated with the movements of Venus, the Moon and structural frames of references formed by the monoliths and the wall of the Great Enclosure, as well as specific examples of oral tradition selected in Chapter 2 describing the term 'Massassi' and 'Morongo' (Frobenius & Fox 1938: 237-242; 261-265).

This 'Vhusha' or 'Vhukomba' initiation ceremony and the domba are all part of the practice relating to ideals of conceiving (becoming pregnant) that takes place at the advent of the rain at Tshimedzi Moon or closest to the vernal equinox.

It would appear that through time, perhaps every 8 years when pattern 5 of the Venus synodic period occurs, a 'Vhusha' or 'Vhukomba' initiation ceremony would form to select the future queens of the mambo or king.

My contention is that impregnation would occur shortly before Venus as an 'evening star' changes to a 'morning star' almost 8 days later and all successful gestations on the winter solstice would result in new queens and potential royal progeny.

Incomplete assumptions based on ethnography and possible alignments of stelae with the range of Venus's appearances as seen from the platform area on the Main Wall at Great Zimbabwe as a 'morning star' should, however, be treated with caution.

The small conical tower indeed presents an alignment of the equinoxes from the Platform, as would have been visible before the Main Wall obstructed the view of the horizon, and the stelae were placed on the Main Wall possibly to reinforce this observation.

Furthermore, in the pre-walling phase, the mid-star of Orion – Alnilam, makes an equally convincing case of arranged structural orientation together with one of the synodic periods every eight years, of Venus (pattern 5).

From the Platform area Venus could be seen on the horizon in the pre-Wall phase as beginning a synodic period as a morning star and ending at the same point in line with the small conical tower. There is also a relationship with the new thin crescent moon when this occurs.

From the same vantage of the Platform a solitary monolith on the western side just happens to possibly announce when the rain season begins at Tshimedzi Moon.

In testing the hypothesis these are all factors that need to be considered to establish a reasonable doubt to the validity of the magnitude of various coincidental possibilities.

Relevant to this hypothesis is the find at a later ruin – Dhlo-Dhlo of a stele that has markings which seem to have been made in recording a synodic period of a planet such as Venus, Mercury, Jupiter or Saturn. Observations and further research were denied to the author by the head of the museum administration and the government of Zimbabwe based on recommendations by their colleague archaeologist in South Africa.

The artefact clearly marks a visual sighting of something that is seen as a crescent and which denotes the amount of days Venus is seen in one of its five synodic periods throughout eight years. Confirmation is required of the full count of markings.

34.5 Hypothesis Five - Supernova RXJ 0852.0-4622 is related to the construction of Great Zimbabwe

The relevant data and discussed in earlier chapters, obtained to address finality to the concept that a specific supernova remnant can be associated with the Great Enclosure are problematic in many respects.

Several notions presented are:-

- That there exists a geomythology amongst some descendants that the people followed a ‘star’ and established settlements on route;

- That amongst the Pare and Hehe people in eastern Africa there exists a concept of a star Tsisulwe that was known to exist as two stars with the same name and which rose in the east and set in the west similar to Venus as a morning and evening star, as well as the path of RX J0852.0-4622;

- That a distinctly significant alignment is made between the Platform area at the Great Enclosure with the supernova remnant RX J0852.0-4622 and the large conical tower;

- That the ethnography of the descendants of Great Zimbabwe conceives this ‘star’ as an *Ndoro* which was regarded as a round and shining object, and later reflected a star or blaze and is found in the rock art and certain artefacts;

- That 'supernova remnant' RX J0852.0-4622 was luminous and occurred when the large conical tower and Main Wall of the Great Enclosure were constructed, in relation to the ice-core data;

- That throughout the world there were changes in climate that caused migrations and movements of people in directions orientated to the risings and settings of RX J0852.0-4622 and that many cultures were affected;

- That the supernova remnant is seen as a dot with a circle and that rock art depictions found in other southern hemisphere populations may be consistent with the chronology;

- That the star known as Mahutonga amongst the Maori is RX J0852.0-4622;

- That the descendants formed a vast socio-political belief system as a result of an inferred super bolide airburst in 1944 that reinvigorated their ancestral stellar migration theology.

A problem common to many of the ideas listed above is a lack of chronology for RX J0852.0-4622; the next section addresses this issue and has also a more general relevance for the ideas comprising this fifth hypothesis.

35 JAPANESE SIGHTING OF AN ASTRONOMICAL PHENOMENON IS RELATED TO THE SUPERNOVA RX J0852.0-4622

A Japanese written record on the 13th September 1271 appears to verify and revere a strange orb of light that appeared before dawn which is depicted as a mandala circular ring surrounding a dot. The viewing altitude and azimuth of this orb coincides with the path taken by RX J0852.0-4622 at the exact times recorded in the texts.

Written records provided by an extraordinary event in Japan could be evidence that RX J0852.0-4622 was seen and eventually depicted as an object of Buddhist reverence since 1271 at the advent of a major climatic change (Jansen 1995; Neumann 1975; Watson 1993; Tanabe 2002; Tanabe & Tanabe 1989).

A particularly unusual drought in Japan led to a conflict between various religious leaders and those opposing Buddhist monk Nichiren's predictions were further humiliated after severe winds occurred and Nichiren was unlawfully arrested, and was to be beheaded on the 10th September 1271.

Two days later Nichiren was taken to Tatsunokuchi beach (Fig. 136 for location) to be beheaded, and where they stopped at the shrine of the god Hachiman to allow Nichiren to address the deity. On reaching the execution site, just before dawn on 13th September, almost at the moment he was to be beheaded, a luminous sphere appeared in the sky, and the executioners could not continue the beheading of Nichiren (Watson 1993).

According to the account, "*a brilliant orb as bright as the moon*" forced Nichiren's executioners to inaction (Tanabe 2002: 357) (Figs. 131 and 132).

Later in exile nearby on an island, he wrote a letter (extract below) to his loyal samurai follower Shijō Kingo in 1271, in the ninth month, on the twenty-first day, only nine days after the Tatsunokuchi Persecution:-

> *"I cannot adequately express my gratitude for your frequent letters. At the time of my persecution on the twelfth, not only did you accompany me to Tatsunokuchi, but also you declared that you would die by my side. This can only be called wondrous…*
>
> *I have heard unofficially that by the order of the lord of Kamakura I am to be exiled to Sado Province.*
>
> *Among the three heavenly sons of light, the god of the moon saved my life at Tatsunokuchi by appearing as a shining object, and the god of the stars descended four or five days ago to greet me. Now only the god of the sun remains, and he is certain to protect me. How reassuring! How encouraging! The "Teacher of the Law" chapter states, "I will dispatch persons magically conjured who will act to guard and protect them." This passage leaves no room for doubt. The "Peaceful Practices" chapter reads, "Swords and staves will not touch him." The "Universal Gateway" chapter states, "The executioner's sword will be broken to bits!" There is nothing false in these sutra passages. The strong and steadfast power of faith is precious indeed.*
>
> *With my deep respect,*
> *Nichiren*
>
> *The twenty-first day of the ninth month in the eighth year of Bun'ei (1271)"* (Watson 1993; Tanabe 2002: 357)

The reference to the god of the moon indicates the bright object that appeared in the sky just prior to the Daishonin's scheduled execution, which frightened his executioners to the extent that they aborted their attempt on his life.

It is generally thought that this was a meteor from later written references; however the only discernible information from the records is that the object first appeared over the area known as Enoshima which is south-east from the beach at Tatsunokuchi. The object traversed the sky and in later versions was seen to enigmatically 'shoot' across the sky to the south-west (Watson 1993: 269).

The Daishonin, later confined to Homma's residence in Echi, relates that a luminous object fell from the sky and struck the branches of a plum tree before him accompanied by a thunder-like roar and strong winds which may relate to a meteor seen after the first event by Nichiren (Watson 1993: 237; Tanabe & Tanabe 1989).

Nichiren clearly makes a distinction between what he saw on two occasions. That a meteor is a heavenly son of light from the god of the stars and that the shining object he saw on the dawn of his intended beheading, was a son of light from the god of the Moon.

The object was as bright and possibly as large as the moon. The Moon was visible as a 23-day old waning crescent and no mention is made that the object seen was accompanied by tremors, sounds or flashes. The object is seen as a luminous entity that moved across the sky from the southeast over the sea horizon (Courtesy Starry Night Pro - Simulation Curriculum version 6.4.3pe EW 1997-2009 - The object is seen and recorded from Tatsunokuchi beach, Ishikawa town located in Nomi District, Ishikawa, Japan at the place of executions near the shrine of the god Hachiman 36°29'35.97"N 136°32'5.83"E on the early morning before dawn of the 13th September 1271. Rising just before dawn south east over the sea at 04h44am) (Figs. 133a and b, 134a and b, 135a and b). The object seen was later to become part of the symbolism of the Nichiren Buddhist movement (Fig. 137).

Figure 131 "At Execution Ground of Tatsunokuchi in Sagami Province" (on September 13, 1271). Nichiren's life is miraculously saved when rays emanating from the sun shatter the sword of his would- be executioner. Illustrated Abridged Biography of Kôsô (Nichiren) by Utagawa Kuniyoshi. Publisher Ise-ya Rihei (Kinjudo) 1835-1836 (Kuniyoshi 1835 – 1836).

Figure 132 At the time of Ushi-Tora, between the time of Ushi (Cow: 2:00 a.m.) and Tora (Tiger: 4:00 a.m.), scarcely when the cuttman threw up his sword over the head, something spherical and strongly shining appeared above Eno-shima Island. The soldiers were overwhelmed and ran away, overcome by terror all at once. http://www2s.biglobe.ne.jp/~shibuken/Nichiren/Pages/P35.htm

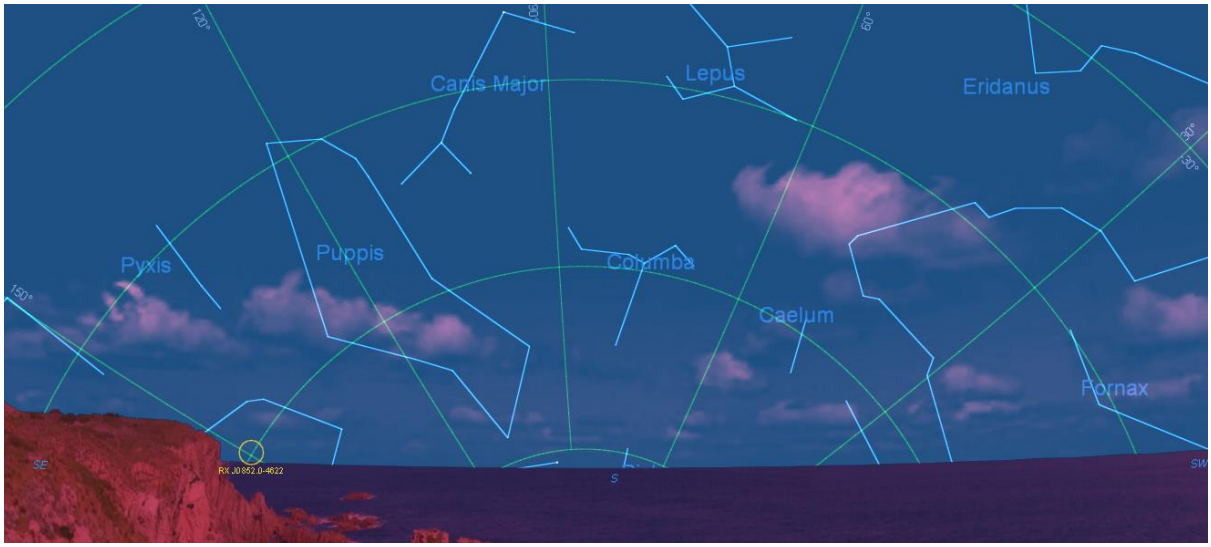


Figure 133a The object is seen and recorded from Tatsunokuchi beach, Ishikawa town located in Nomi District, Ishikawa, Japan at the place of executions near the shrine of the god Hachiman 36°29'35.97"N 136°32'5.83"E on the early morning before dawn of the 13th September 1271. Rising just before dawn south east over the sea at 04h44am (Courtesy Starry Night Pro - Simulation Curriculum version 6.4.3pe EW 1997-2009).

Figure 133b The object is seen and recorded from Tatsunokuchi beach, Ishikawa town located in Nomi District, Ishikawa, Japan at the place of executions near the shrine of the god Hachiman 36°29'35.97"N 136°32'5.83"E on the early morning before dawn of the 13th September 1271. Rising just before dawn south east over the sea at 04h44am (Courtesy Starry Night Pro - Simulation Curriculum version 6.4.3pe EW 1997-2009).

Figure 134a The object is seen and recorded from Tatsunokuchi beach, Ishikawa town located in Nomi District, Ishikawa, Japan at the place of executions near the shrine of the god Hachiman 36°29'35.97"N 136°32'5.83"E on the early morning before dawn of the 13th September 1271. At Transit at 08h19am at 15°Altitude (Courtesy Starry Night Pro - Simulation Curriculum version 6.4.3pe EW 1997-2009).

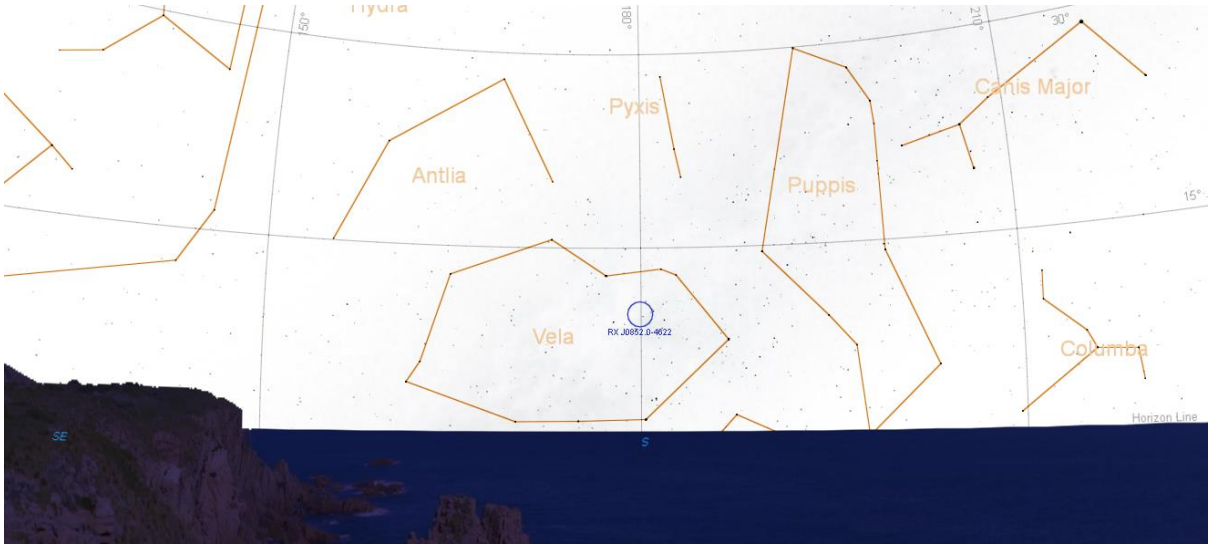


Figure 134b The object is seen and recorded from Tatsunokuchi beach, Ishikawa town located in Nomi District, Ishikawa, Japan at the place of executions near the shrine of the god Hachiman 36°29'35.97"N 136°32'5.83"E on the early morning before dawn of the 13th September 1271. At Transit at 08h19am at 15°Altitude (Courtesy Starry Night Pro - Simulation Curriculum version 6.4.3pe EW 1997-2009).

Figure 135a The object is seen and recorded from Tatsunokuchi beach, Ishikawa town located in Nomi District, Ishikawa, Japan at the place of executions near the shrine of the god Hachiman 36°29'35.97"N 136°32'5.83"E on the early morning before dawn of the 13th September 1271. Setting at 11h52am. Sun overhead and the moon is also visible as a 23 day old waning crescent (Courtesy Starry Night Pro - Simulation Curriculum version 6.4.3pe EW 1997-2009).

Figure 135b The object is seen and recorded from Tatsunokuchi beach, Ishikawa town located in Nomi District, Ishikawa, Japan at the place of executions near the shrine of the god Hachiman 36°29'35.97"N 136°32'5.83"E on the early morning before dawn of the 13th September 1271. Setting at 11h52am. Sun overhead and the moon is also visible as a 23 day old waning crescent (Courtesy Starry Night Pro - Simulation Curriculum version 6.4.3pe EW 1997-2009).

The object in this Japanese account can be equated perfectly with the placement of supernova RX J0852.0-4622 at that place, date and time. RX J0852.0-4622 rose just before dawn south east over the sea at 04h44am, reaching transit at 08h19am at 15°Altitude and setting at 11h52am (as shown in Figs. 133, 134 and 135 for the “object”).

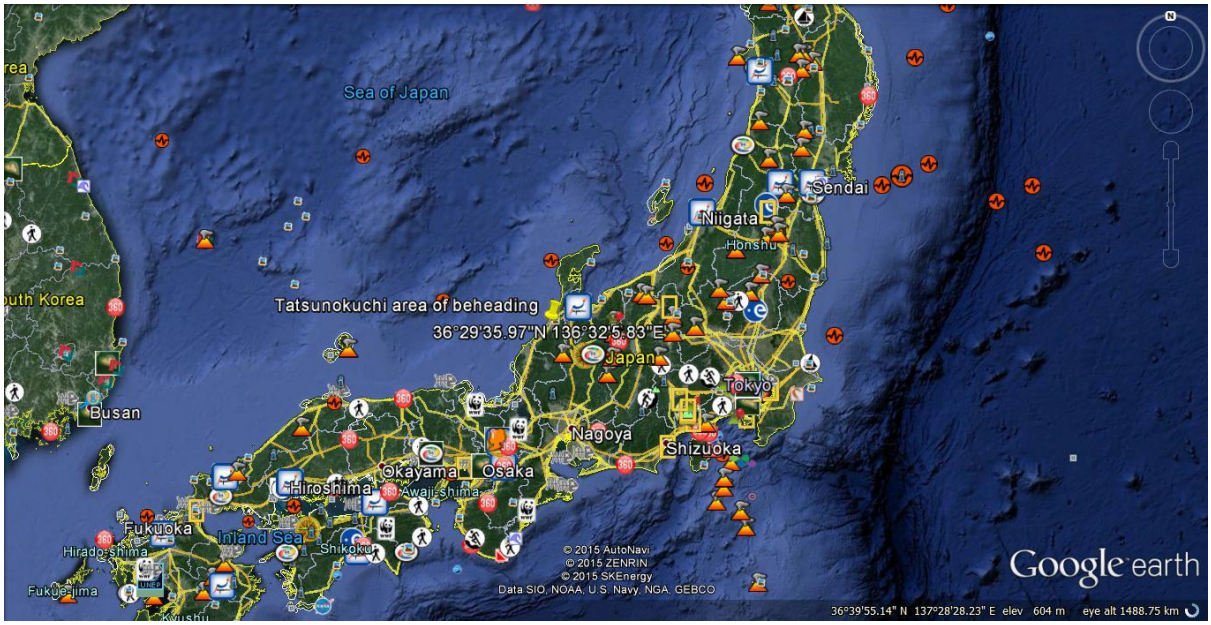


Figure 136 Tatsunokuchi beach, Ishikawa town located in Nomi District, Ishikawa, Japan 36°29'35.97"N 136°32'5.83"E (Courtesy Google Earth).

Figure 137 When the Second High Priest Nikko Shonin moved to Taisekiji in 1289, He brought the Dai-Gohonzon, original writings, and remains of Nichiren Daishonin. Biography of Nichiren Daishonin, Nichiren Shoshu Head Temple, Taisekiji, 1981. Of particular interest is the mandala carried by the second person which later became the main emblem or crest of Dai-Gohonzon for the Nichiren Buddhists. http://www.nichirenshoshumyoshinji.org/sermons/intro.php

The Tatsunokuchi Persecution of Nichiren clearly provides a positive conclusion to verifying that a written record may be found in the vast written legacy found in Japan, and possibly other sources world-wide. The object is not referred to as a comet and although some have added that it was a meteor, Nichiren differentiates the object as part of the moon deity as opposed to a meteor event that happened a while later and that hit a plum tree where he

was walking, which he distinguishes as a tribute from the star deity as opposed to the Moon deity. He mentions that he looks forward to a tribute from the Sun deity.

It is interesting to note that there are various climatic changes that coincide globally at this time and are referenced as the advent of 'The Little Ice-Age'. The specific Japanese texts verify the extraordinary abruptness that takes place in regard to the droughts and subsequent rainfall as well as the two attempts made by the Mongols to invade Japan. Extraordinary that the seasoned sailors could not predict the 'Divine Winds' that destroyed fleets of ships in 1274 and 1281 AD (Jansen 1995 ; Neumann 1975) (Fig. 138).

Figure 138 The Mongol Invasion of Japan. Kamikaze of 1274 and 1281 – Encyclopaedia Britannica file:///C:/Users/Richard/Documents/2015/Kamikaze%20%E2%80%93%20The%20Divine%20Winds%20that%20Saved%20Japan%20_%20Ancient%20Origins.html Accessed 5 May 2015http://beyondsilkroads.tumblr.com/post/41067907028/the-term-kamikaze-popularized-during-the-second

36 DISCUSSION

The suggestion that Great Zimbabwe's Great Enclosure functioned in part as an observatory is sufficiently reflected in the data, however incomplete, and together with ethnographic correlations of the hypotheses in the cultural complex as well as worldwide information, a reasonable doubt emerges to not ignore such a possibility.

It is indeed odd that stelae are found at the Great Enclosure, effectively viewable only from one vantage point, that cover a range of morning star appearances that mark the first appearance of Venus to the disappearance of Venus on the wall over 93 days (3 months, 1 day), which implies that the stelae were not necessarily the 'horns of the bull' and symbols of status and gender as described in the archaeological record (Huffman 1996).

An isolated marker stone likewise coincidentally aligns with the Sun and the Moon from the same point as a herald of the rain season. The small conical tower and Venus together with

the vernal equinox and autumnal equinox sunrises, once again visible from the same point of observation, show intentionality rather than random coincidence.

Comets and meteors are not rare but an object described as a round and shining blaze of light is very rare and substantiates that the star followed was a supernova. The direction of migration in following a star also happens to be the same vector as the supernova risings and settings. The mythology associated with a king who builds a stairway of ladders to reach a strange star is later regarded as being associated with the moon but clearly is referred to as an ndoro (a dot with circles worn as a pendant).

The direction of migration and the characteristic appearance over a certain time also infers a supernova as opposed to comets and meteors and the Milaboni monolith with an ndoro facing the setting declination cannot be purely dismissed as coincidental.

Almost five hundred years after the formation of Great Zimbabwe that was associated with the Mwari Cult as a centre of religious fervour, a new temple devoted to a star is established by the followers of one of the largest growing religions in Africa in 1944.

Research and geophysical mapping of a set of super bolide airburst associated crater features is required to answer questions as to why a new star temple headquarters of a 'Zion' (Sayuna?) relocated to Moria in 1944, in accordance with ancestral tradition of following a star (Wade et al. 2014; Daneel 1970; 1971; 1974; 1988).

More research is needed on the chronology of the South American petroglyphs found on the islands near Brazil, comprising of dots with circles, but indications are that they were made from roughly 1300 C.E.

The radio carbon dating of the exotic rat remains which were brought in by the Polynesian navigator's canoes as they made landfall in New Zealand (Holdaway 1996), possibly in their phenomenal sea voyage from the Cook Islands 6000km away, provide a date of roughly 1278 C.E. Could it possibly suggest that these Polynesian sailors were trying to follow a star as well? Was Mahutonga RX J0852.0-4622?

The glyph found by Michanowsky, an Honduran Mayan Glyph at Copan (Michanowsky 1977; Tierney 1983: 46.) (Fig. 18) and which he fervently attributed to being a rendition of the supernova remnant in Vela thousands of years in the past, proved to him that the Mayans were therefore three thousand years old. Perhaps the glyph refers to the recent Vela supernova remnant (RX J0852.0-4622) instead, which Michanowsky was unaware of?

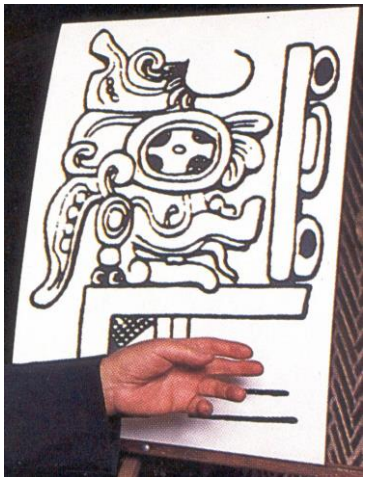


Figure 139 Michanowsky's Honduran Mayan Glyph as found at Copan and dated to 1320+/-30 C.E., "a new star is born in Vela" depicted as a dot in a circle (Tierney 1983: 46).

The profound statistically impossible odds that the orb of light seen by the Japanese from the Tatsunokuchi beach as it rises on the horizon at Enoshima in the south east, precisely at the times indicated in the texts of Ushi-Tora, between the time of Ushi (Cow: 2:00 a.m.) and Tora (Tiger: 4:00 a.m.), is remarkable when compared with a computer simulation of RX J0852.0-4622 rising just before dawn south east over the sea at 04h44am.

This extraordinary coincidence forms part of many such coincidences noted throughout the attempt to reconcile the data observed in this thesis with a coherent general interpretation, that African and specifically southern African peoples did have a measure of astronomic ability and that Great Zimbabwe, at least partially, had the function of a celestial observatory.

37 REFERENCES

Alcock, P. G. 2014. Venus Rising: South African Astronomical Beliefs, Customs and Observations. ISBN 978-1-919966-04-5. Dewey No. 398.3620968. Jo Marwick, Pietermaritzburg, South Africa. http://assa.saao.ac.za/astronomy-in-south-africa/ethnoastronomy/venus-rising/

Al-Hamdani, Abu Muhammad al Hasan. 1884 -1891. Sifat jazirat al- 'Arab. Leiden

Aschenbach, Bernd. 1998. Discovery of a Young Nearby Supernova Remnant. In Nature, Vol. 396 : 6707. November 12th 1998 pages 141 -142. see also http://antwrp.gsfc.nasa.gov/apod/ap990413.html

Atkinson, R.J.C. 1966. Moonshine on Stonehenge, Antiquity Vol 49:159, 1966, 212-6
Baity, Elizabeth Chelsey. 1973. "Archaeoastronomy and Ethnoastronomy So Far". Current Anthropology 14 (1973); 389-449.

Aveni, Anthony F. 1981. Archaeoastronomy in the Maya Region: A Review of the Past Decade. Archaeoastronomy (JHA Supplement 3, 1981) S1 – S37

Aveni, A. F. (ed.). 1982. Archaeoastronomy in the New World: American Primitive Astronomy, CUP, 1982, ISBN 0521247314; D. C. Heggie (ed.), Archaeoastronomy in the Old World, CUP, 1982, ISBN 0521247349

Aveni, A.F. 1989. World Archaeoastronomy, CUP, 1989, xi-xiii, ISBN 0521341809

Badakchani, S. J. 2005. Ṭūsī, Naṣīr al-Dīn Muḥammad ibn Muḥammad; Paradise of Submission: A Medieval Treatise on Ismaili Thought, Ismaili Texts and Translations 5, London: I.B. Tauris in association with Institute of Ismaili Studies, pp. 2–3, ISBN 1-86064-436-8

Baity, Elizabeth Chesley. 1974. Archaeoastronomy and Ethnoastronomy So Far. Current Anthropology October 1974 Vol15 (4): 320-326.
Accessed 2006. March. http://www.publicanthropology.org/Archive/Ca1973.htm

Bent.T. 1893 Ruined Cities of Mashonaland. London.

Bent, J.T. 1969. (Reprinted from 1896) The Ruined Cities of Mashonaland. Books of Rhodesia.

Blacking, John. March 1998. Venda Girls' Initiation Schools. Department of Social Anthropology. University of Belfast. http://sapir.ukc.ac.uk/QUB/Introduction/TitlePage.html

Bleek, D.F., 1935. Beliefs and customs of the /Xam Bushmen. Part VII . Sorcerers. Bantu Studies, 1.

Bleek, D.F. 1936. Special Speech of Animals and Moon Used by the /Xam Bushmen: from material collected by Dr W.H.I Bleek and Miss L.C. Lloyd between 1870 and 1880. Bantu Studies. Vol 10 (2) pp 163 -199.

Bleek, D.F., 1956. A Bushman dictionary. American Oriental Society, New Haven.

Bleek, W.H.I. & Lloyd, L.C., 1911. Specimens of Bushman folklore. Allen, London.

Bleek, D.F., 1929. Bushman folklore. Africa. Vol 2 (3). Pp 302- 313.

Chami, F.A. 2008. Evidence of Ancient African Beliefs in Celestial Bodies. In Holbrook, J. Urama, Johnson O. & Medupe,Thebe R. (eds.), African Cultural Astronomy – Current Archaeoastronomy and Ethnoastronomy Research in Africa. Springer Science+Business Media B.V. 2008. Pages 121-130.

Daneel, M.L. 1970. The God of the Matopo Hills: An Essay on the Mwari Cult in Rhodesia. Leiden, Mouton.

Daneel, M.L. 1971. Old and New in Southern Shona Independent Churches. Volume I: Background and Rise of the Major Movements. The Hague, Mouton.

Daneel, M. L. 1974. Old and New in Southern Shona Independent Churches (Vol. 2). The Hague, Mouton, pp. 217-232.

Daneel, M. L. 1988. Old and New in Southern Shona Independent Churches (Vol. 3). Gweru, Zimbabwe, Mambo Press, pp.

Dreyer, Edward L. 2007. Zheng He: China and the Oceans in the Early Ming, 1405–1433. Library of World Biography. Longman. ISBN 0-321-08443-8.

Evers, T.M. 1980. Klingbeil Early Iron Age sites, Lydenberg, Eastern Transvaal, South Africa. South African Archaeological Bulletin 35:46-57.

Evers, T.M. 1982. Excavation at the Lydenberg Heads site, Eastern Transvaal. South African Archaeological Bulletin 37:16-33.

Evers, T.M. & Hammond-Tooke, W.D.1986. The emergence of South African chiefdoms: an archaeological perspective. Journal of African Studies, 45 (1986), pp. 37–42

Greenfield, H & Miller D. 2004. Spatial patterning of Early Iron Age metal production at Ndondondwane, South Africa: the question of cultural continuity between the Early and Late Iron Ages. Journal of Archaeological Science. Volume 31, Issue 11, November 2004, Pages 1511–1532

Hammond-Tooke, W. 1888. The Star lore of the South African natives. Transactions of the South African Philosophical Society. Vol 5 (2). Pp. 304-312.

Hancock, Graham. 2005. Supernatural. United Kingdom. Century Press.

Heine, J & Tellinger, M. 2008. Adam's Calendar – Discovering the Oldest Man-made Structure On Earth 75,000 years ago. Zulu Planet Publishers. South Africa.

Hromnik, C.A. 1981. Indo-Africa. Juta & Company, Cape Town.

Hicks, Ronald. 1979. "Archaeoastronomy and the Beginnings of a Science." Archaeology 32. no. 2 (March/April, 1979). 46-52.

Holbrook, J. Urama, Johnson O. & Medupe,Thebe R. (eds.) 2008. African Cultural Astronomy – Current Archaeoastronomy and Ethnoastronomy Research in Africa. Springer Science+Business Media B.V. 2008

Holdaway, R. 1996. Arrival of rats in New Zealand. Nature, 384 (6606), 225-226 DOI:10.1038/

Hromnik, C.A. 1981. Indo-Africa. Juta & Company, Cape Town.

Huffman, T.N. 1996. Snakes and Crocodiles. Wits University PressJohannesburg: Witwatersrand University Press 1996.

Huffman, T.N. & Vogel, J.C. 1991. The Chronology of Great Zimbabwe. The South African Archaeological Bulletin **46** (154): 61-70.

Huffman, T.N. 2011. Debating Great Zimbabwe. South African Archaeological Bulletin **66** (193): 27-40, 2011

Huffman, T.N. 2008. Mapungubwe and Great Zimbabwe: The origin and spread of social complexity in southern Africa Journal of Anthropological Archaeology. Volume 28, Issue 1, March 2009, Pages 37-5

Huffman, T.N. 1981. Snakes and Birds: Expressive Space at Great Zimbabwe. In African Studies. Vol. 40, no. 2 1981.

Huffman T.N. 2004. The archaeology of the Nguni past. Southern African Humanities. Vol 16. Pages 79–111. Pietermaritzburg.

Huntingford, G. W. B. 1950. The Hagiolithic Cultures of East Africa. Eastern Anthropologist, III: 119-136.

Huntingford, G. W. B. 1955. The Galla of Ethiopia; the kingdoms of Kafa and Janjero. London: International African Institute.

Hunwick, J.O. & Boye, A. 2008. The Hidden Treasures of Timbuktu: Historic City of Islamic Africa, London: Thames & Hudson. ISBN 9780500514214.

Iyudin, A.F., Schönfelder,V., Bennett, K, Bloemen, H., Diehl, R., Hermsen, W., Lichti, G.G., Van Der Meulen, R.D., Ryan, J. & Winkler, C. 1998 Emission from 44Ti associated with a previously unknown Galactic supernova. Nature 396 (6707): 142 -144.

Jansen, Marius, ed. 1995. Warrior rule in Japan. Cambridge University Press

Junod H. A. 1962. The life of a South African tribe. I, Social life. New York : University Books.

Junod H. A. 1962. The Life of a South African tribe. II, Mental life. New York : University Books.

Junod H. A. 1912-1913. The life of a South African tribe. Neuchâtel : Attinger Frères.

Krupp, E. C., ed. 1978. In Search of Ancient Astronomies. Garden City, N.Y.: Doubleday & Company, 1978 (and New York: McGraw-Hill Book Company, 1979 paperback reprint).

Krupp, E. C., ed. 1978. In Search of Ancient Astronomies. Garden City, N.Y.: Doubleday & Company, 1978 (and New York: McGraw-Hill Book Company, 1979 paperback reprint).
Accessed 2006. April. http://ecuip.lib.uchicago.edu/diglib/science/cultural_astronomy/

Krzyzaniak, L., Kroeper, K. & M. Kobusiewicz (eds.). 2000. Recent Research Into the Stone Age of Northeastern Africa. Studies in African Archaeology 7, Poznan (Poznan Archaeological Museum): 21-31.

Le Roux, Magdel. The Lemba: A lost Tribe of Israel in Southern Africa? University of South Africa Press 2003.

Leakey, M. 1983. African's Vanishing Art: the Rock Painting of Tanzania. New York: Doubleday and Comp

Lewis-Williams, David. 2002. The Mind in the Cave. Thames & Hudson, London.

Lewis-Williams, David & Pearce, David. 2005. Inside the Neolithic Mind. Thames & Hudson Ltd, London. Page 149.

Lewis-Williams, J.D. 2003. Review - Shamanism and the Ancient Mind: A Cognitive Approach to Archaeology. In Journal of Anthropological Research. Vol 59, No 1 (Spring 2003) pp 93-95. University of Mexico

Lockyer, J.N. and Penrose, F.C. 1901. An attempt to ascertain the date of the original construction of Stonehenge. Proceedings of the Royal Society of London, 69, 1901, pp. 137-147

Lynch, B.M. 1978. The Namoratunga Cemetery and Rock Art Sites of North-Western Kenya: A Study Of Early Pastoralist Social Organization. Unpublished Ph.D. Thesis, Michigan State University, Michigan.

Lynch, B.M. & Robbins, L.H. 1978. Namoratunga: The First Archaeoastronomical Evidence in Sub-Saharan Africa. Science 200: 766-768.

Lynch, B. M., Robbins, L. H. 1983. Namoratungu: The first archaeoastronomical evidence in sub-saharan Africa", in Blacks in Science: Ancient and Modern, Van Sertima, I., New Brunswich, N.J.: Transaction Books, New Brunswich, NJ.

MacKie, E. 1977. Science and Society in Prehistoric Britain, St Martin's Press, 1977, ISBN 023640041X

Major, R. H. 1868. Life of Prince Henry the Navigator, London.

Malville, J.M., Wendorf, F., Mazar, A.A., & Schild, R. 1998. Megaliths and Neolithic astronomy in southern Egypt. Nature 392: 488.

Murdock, G. P. 1959. Africa: Its People and Their Culture History. New York: McGraw-Hill. See Southern Cushites pg. 193 and Ancient Azanians pages 204-211. and again page 222 in Lynch, B. Mark. 1978. The Namoratunga Cemetery and Rock Art Sites of North-Western Kenya: A Study Of Early Pastoralist Social Organization. Ph.D. Dept. Anthropology at Michigan State University.

McCluskey, S. C. 2005. Different Astronomies, Different Cultures, and the Question of Cultural Relativism, in John Fountain and Rolf Sinclair, eds., Current Studies in Archaeoastronomy: Conversations across Time and Space. Woodbourne. USA

Menzies Gavin. 2002. 1421, The Year China discovered the world. Bantam Press, London.

Michanowsky, George. 1977. The Once and Future Star. Hawthorn Books Inc, New York.

Neumann, J., 1975: Great Historical Events That Were Significantly Affected By the Weather: I. the Mongol Invasions of Japan. Bull. Amer. Meteor. Soc., 56, 1167– 1171.

N.H.W. 1926. Note on Darwin Ritual Murder. In N.A.D.A. - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. pg. 61 - 62. Edited by Guy A. Taylor. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Pearson, J.L. 2002. Shamanism and the Ancient Mind: A Cognitive Approach to Archaeology. Walnut Creek, California: Altamira Press.

Ruggles, C.L.N. 1993. Archaeoastronomy in the 1990s, Group D Publications. 1993, ix, ISBN 1874152012

Ruggles, C. 2005. Ancient Astronomy. Santa Barbara:ABC-Clio

Schoeman, A, Delius, P & Maggs, T. 2014. Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment, Wits University Press

Swan, R.M.W 1893 in Chapter 5 p 147 - 'On the Orientation and Measurements of Zimbabwe Ruins' in Bent, T. Ruined Cities of Mashonaland. London. 1893. (Rhodesiana Reprint Library. Volume Five facsimile reproduction of the third edition).. Books of Rhodesia, Bulawayo.1969- pages 141 - 178).

Stayt, H.A.. 'Notes on the Balemba'. The Journal of the Royal Anthropological Institute of Great Britain and Ireland, Vol. 61 (Jan. - Jun., 1931), pp. 231-238. Page 232.

Stayt , H.A. 1968. The Bavenda. London: Frank Cass & Co. Ltd. (Cass Library of African Studies - General Studies - No 58)

Tanabe, George. 2002. Writings of Nichiren Shonin: Doctrine 2. University of Hawaii Press, ISBN 978-0824825515, Page 357.

Tanabe, George J. Jr. & Tanabe, Wilma Jane eds. 1989. The Lotus Sutra in Japanese Culture. University of Hawaii Press, Honolulu

Theal, G. McG.1898-1903. Records of South Eastern Africa. Cape Town: Government Printers. 9vols. Vol. VII.

Theal, G.M. 1886. Kaffir Folk-Lore: a Selection From the Traditional Tales Current Among the People Living on the Eastern Border of the Cape Colony with Copious Explanatory Notes. Swan Sonnenschein. Le Bas and Lowry. London 226pp.

Thackeray, F. & Knox-Shaw, P. 1992. Astronomical and Entoptic Phenomena. Monthly Notes of the Astronomical Society of Southern Africa (MNASSA). Vol 51 (1/2). Pp 6-12.

Thackeray, J.F. 1988. Comets, Meteors and Trance: Were these conceptually associated in southern African pre-history? Monthly Notes of the Astronomical Society of Southern Africa (MNASSA). Vol 47 (5/6). Pp 49-52.

Thompson L.C. 1942. The BaLemba of Southern Rhodesia. NADA. Vol 19. Pp 76 – 86.

Tierney, J. 1983. Scholar without a School. Science'83. Volume 4, No.2. March.

Trotter, A.P. 1927. Stonehenge as an Astronomical Instrument, Antiquity Vol 1:1, 1927, 42-53

Turton, D. and Ruggles, C.L.N. 1978. Agreeing to Disagree: The Measurement of Duration in a Southwestern Ethiopian Community, Current Anthropology Vol. 19.3, 1978, 585-600

van Binsbergen, W.M.J., 1996, 'The astrological origin of Islamic geomancy', paper read at The SSIPS/ SAGP 1996, 15th Annual Conference: 'Global and Multicultural Dimensions of Ancient and Medieval Philosophy and Social Thought: Africana, Christian, Greek, Islamic, Jewish, Indigenous and Asian Traditions', Binghamton University, Department of Philosophy/ Center for Medieval and Renaissance studies (CEMERS), October 1996 (PDF)

Varisco, D. M. 1989. The Anwã' Stars According to Abu Ishãq al-Zajjãj. In Zeitschrift Für Geschichte Der Arabisch-Islamischen Wissenschaften. Band 5. Johann Wolfgang Goethe-Universität, Frankfurt am Main.

Varisco, D.1991. 'The Origin of the Anwâ' in Arab Tradition'. Studia Islamica, vol 74, 1991, pp 5-28.

Varisco, D. M. 1987. The Rain Periods in Pre-Islamic Arabia. Arabica, Tome xxxiv, Pages 251 -256.

Varisco, D. M. 1985. The Production of Sorghum (Dhurah) in Highland Yemen. Arabian Studies (Cambridge). 7:53-88.

Von Sicard, H. 1966. Karanga Stars. NADA 9: 45. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Wade, R P. 2009. A Systematics for Interpreting Past Structures with Possible Cosmic References in Sub-Saharan Africa. MSc Thesis. University of Pretoria. http://upetd.up.ac.za/thesis/available/etd-05052009-174557/

Wade, R. P & Broodryk, N. L. 2010. Systematics of interpreting cosmic references in sub Saharan Africa. http://www.communicatingastronomy.org/cap2010/posters.html.

Wade R.P, Eriksson P.G, Duncan G.A and deW. Rautenbach C.J. 2014. Southern African cosmogenic geomythology ("following a star") of the Zion Christian Church. Transactions of the Royal Society of South Africa. Volume 69, Issue 2. Taylor & Francis. UK. www.tandfonline.com DOI:10.1080/0035919X.2014.905880.

Watson, Burton. 1993. The Lotus Sutra. Columbia University Press. New York. http://www.nichirenlibrary.org/en/wnd-1/Content/23 Accessed 5 May 2015
The Letter of Petition from Yorimoto http://www.nichirenlibrary.org/en/wnd-1/Content/97 Accessed 5 May 2015
The Actions of the Votary of the Lotus Sutra (page 269) http://www.nichirenlibrary.org/en/wnd-1/Content/93 Accessed 5 May 2015
The Opening of the Eyes (I) http://www.nichirenlibrary.org/en/wnd-1/Content/30 Accessed 5 May 2015
The Letter of Petition from Yorimoto http://www.nichirenlibrary.org/en/wnd-1/Content/97 Accessed 5 May 2015

Wilson, Agnes. 1931. The Human Sacrifice. In N.A.D.A. - The Southern Rhodesia Native Affairs Department Annual, No. 9, 1931. pg. 6 - 10. Edited by A. B. D. Spicer. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Zeilik, M. 1985. The Ethnoastronomy of the Historic Pueblos, I: Calendrical Sun Watching, Archaeoastronomy No. 8 (Supplement to the Journal for the History of Astronomy), 1985, pp. S1-S24; The Ethnoastronomy of the Historic Pueblos, II: Moon Watching, Archaeoastronomy No. 10 (Supplement to the Journal for the History of Astronomy), 1986, pp. S1-S22.

CONCLUSION

In retrospect, the attempt to discern cosmogenics of sub-Saharan Africa through exemplifying archaeoastronomical aspects of the Great Zimbabwe cultural complex has indeed been a formidable task. This encompassed an intricate perplexing tapestry of interrelated profane and sacred secrets instead of simplified descriptions of celestial observations.

The movement of the stars, planets, Moon and Sun are seen as formidable beings that somehow govern lives of the living and dead. They are personified as spirit-mediums or forces that bring fertility, rain and changes.

The early hunter-gatherer populations preceding the formative agricultural and stock-herder peoples into the sub-continent shared their profound belief systems as much as their genetics and the earliest traders brought new magic to the harsh realities of being Man in Africa.

No overwhelming recorded mass hostilities, genocide and destruction are evident. Instead, a perplexingly calm transition to the birth of the Bantu is inferred. The legends speak of how movements of people steadily encroached the hinterland and its undisturbed symphony of cohesion and existence. A harmonious ecology of man and environment who noted the skies as much as their heartbeats with a disdain for irregularities of seasons and rain.

The territorial imperatives created by a northern need for gold and goods brought about dreaded change where anticipation of requirements by foreign encroachment brought about a concept for time keeping. Agriculture forced the means to calculate and prepare for seasons and specifically the rain. Trade, navigation and exchange formed a respect for time-keeping and a need to use the stars, planets, Moon and Sun for those purposes.

The earliest formative settlements south of the equatorial forests coalesced eventually as the Great Zimbabwe ‘civilization’, where the hunter-gatherers, stock-herders and migrant agriculturists formed a unique people now known by their linguistic term as Bantu during the so called mediaeval period in Europe.

Mapungubwe is seen as the earliest formal agricultural zone of transition which eventually formed into Great Zimbabwe (Chapter 1). It holds the first clues of trade exchanges and has apparently limited remains suggesting any cosmogenic reverence. At K_2, the relatively unknown earliest phase of Mapungubwe, there were records of ‘isivivane’ or stone cairns and dolmen-looking structures similar to the ‘Heitsi-Eibib’ cairns found further south in southern Africa. The petroglyphs may have untapped celestial records and the rock art found in the region is regarded as predominantly ‘trance dance’ and rain related.

The burials, however, hold more clues to possible astronomical aspects specifically when assessed in the proposed methodology, and, the ethnographic and archaeological findings of the use of ‘bowls’ to observe the heavens form a stronger link to the past and present practices of the mediaeval trade network populations in general.

The ‘bowl’ may be a morphological or anthropomorpological depiction of the cosmos and total environment of a specific people. It holds connections to the geomantic diffusion of an earlier use in the Near- and Middle-East and the Mediaeval Islamic ‘divination bowls’ (Chapter 2). It is seen as a depiction of the clans or moiety of groups of people and is used in diffusing altercations and factions. Furthermore, they can be used almost as a calendar and observation tool of the movements through the year of the Moon, Venus and the Sun and possibly the Magellanic Clouds.

Whether Tshiendeulu, Mapungubwe and Great Zimbabwe can be shown to have ‘divination bowls’ is debatable and yet probable in respect of the many past and present finds.

The concept of an asterism (constellation) like ‘Tuda’ to anticipate accurately the seasonal beginnings of the rain period is rather remarkable and required centuries of tradition to formulate and the Great Enclosure structure that may mark this concept with a simple stele on an ellipse-shaped wall is highly convincing cosmogony.

The naming of the Pleiades – ‘isilimela’ (Zulu), ‘tshilimela’ (Venda), ‘kilimela’ (kikuyu) may draw etymological comparisons with ‘ploughing’(lima) and ‘ma‘ãlim al-zirã‘ah’ (agricultural marker stars), together with many other instances, to the pre-Islamic anwã system and therefore the trader origins and directions. Amongst the earliest traded crops were ‘dhurah’ (sorghum) and so too an idea of the origin of the method for planting this crop such as the use of terraces and ‘al-‘ashr al-mukhtãrah’ (ten select days) in the Yemenite and pre-Islamic period.

These agricultural practices, together with the rain-maker traditions of ‘counting and naming’ of stars, ‘Mademba-Ndikuteme’ sacrificial rituals, Tshimedzi Moon related structural marker at the Great Enclosure, ‘divination’ bowls - ultimately determine a rich legacy of trader and external cosmogenic influence on the southern African indigenous astronomical knowledge system that was eventually epitomised by the Great Zimbabwe Cultural Complex.

The astronomical aspects are difficult to perceive and to properly understand the situation requires an in-depth perspective of the archaeology of the structures. This thesis deals with surveys done mainly on the Great Enclosure but there is need for surveys of many other ruins throughout the Great Zimbabwe zone.

From the surveys of Great Zimbabwe (Chapter 3), the Platform Area of the Great Enclosure appears to have been used to mark or align various celestial movements with monoliths on the wall and the small and large Conical towers.

The Enclosure was likely constructed over two hundred years and the outer wall and Large Conical Tower dates circa 1290 to 1350. The structures pre-dating the Outer Wall were changed over two centuries and the Platform together with the Small Conical Tower form an interesting relationship with the equinox sunrises. The centre of the Platform directly lines up with the Sun on the horizon and the hypothetically extended tip of the Small Conical Tower at the equinox (vernal and autumnal). There may have been other towers but appear to have been no monoliths in the walls before the Outer Wall Phase.

Centuries later the Outer Wall and Large Conical Tower dominate the horizon and it is possible that the height of the Platform was changed to accommodate this. From the same vantage of the Platform various monoliths on the Outer Wall bring into line the movement of Venus as a Morning Star from the vernal equinox to the winter solstice.

The oral traditions give an indication of the importance of Venus and its disappearance ‘behind’ the Sun at the vernal equinox as an Evening Star and its appearance from behind the Sun at the winter solstice as a Morning Star. The implication is that royal births should

replicate Venus's relationship with the Sun for conception and birth, i.e., conceive at the vernal equinox and give birth when the sun is 'reborn' at the winter solstice. The annual 'Domba' dance (python dance) imparts secret information to the initiates of the role of Venus specifically and may have been the method employed to designate new queens in the past.

The solitary monolith on the western part of the wall almost at 270° from the vantage point of the Platform also aligns with the Sun set and Moon set on the Tshimedzi Moon, thereby making it a marker for the equinox sunset. And, from the same vantage the supernova remnant RX J0852.0-4622 rises from the tip of the hypothetically extended or reconstructed Large Conical Tower.

The astrophysical and ice-core data reveal a tentative date of the supernova event to the same time that the Large Conical Tower was constructed.

This research then led to finding other possible records amongst the southern hemisphere continents (Chapter 4), as the supernova would have been visible from that part of the planet, and out of the various probabilities was one particularly notable and well recorded case of the oral traditions of 'Mahutonga' found amongst the Maori of New Zealand. 'Mahutonga' is a star that is now invisible which exists in the same region of the sky of the supernova remnant RX J0852.0-4622. The tradition seems to have existed amongst the Polynesian navigators who left the Cook Islands and Easter Islands to follow this 'star' when they arrived at New Zealand circa 1278; a C_{14} date made by the exotic rats transported roughly 6000km on an ocean into New Zealand by Polynesian navigator canoes.

Global effects appear at this time of 1278 which are regarded as being volcanically caused. The Greenland Vikings eat their dogs in haste to leave Greenland, the Anasazi experience a prodigious drought compared to their usual sparse existence and migrate, the sudden and strange winters throughout Europe cause massive deaths and famine, Mapungubwe goes into instant decline and a thick burn layer is found that coincides with the emergence of the Great Zimbawe flourish, the Mongols invade China, the Peruvians flourish into an Inca Civilization and Polynesian navigators occupy New Zealand. The phenomenon is termed the start of the 'Little Ice-Age'.

However the ice-core data reveal high levels of nitrogen oxides and nitrate ions rather than sulphur oxides that would corroborate global volcanism for the same time zone. The supernova remnant RX J0852.0-4622 appears to be a near-Earth event which may have affected the biosphere by means of an intense gamma ray flux sufficient to cause atmospheric change.

These 'alignments' need to be addressed and the cosmogenic geomythological and structural coincidences form a plausible argument that there is sufficient evidence to suggest that there are cosmic references and that the supernova remnant was marked by the people of Great Zimbabwe.

They followed a 'star', probably with two or three rings, that was visible for a short while in the day and which disappeared completely after a few years while they established various settlements. This legendary concept of 'following a star' reemerged amongst the descendants in 1944 when a massive meteoroid bolide airburst smashed fragments into some mountains and made craters in South Africa.

The vast socio-political belief system that developed formed into a prodigious church which has almost forty million followers that all wear a 'star' as an emblem of faith because the star returned and showed them to leave Great Zimbabwe and move to their new headquarters at Moria (Chapter 5).

Various cosmic references and geomythology in the southern African context reveal that external influences on an existent cosmogony are identifiable and persistent. That artifacts and structures may provide cognitive dimensions that are cosmogenically codified and misread as purely symbolic decorative stylization or functional expressions. African astronomy remains intensely rich, complex and unrecorded with surprising value through its mysterious interrelated structure of sub-systems that venerate the skies as a holistic part rather than reduced measure of existence.

Although the data suggesting that the Great Enclosure was at times an observatory remains inconclusive there is a possibility that the stelae and conical towers were intentionally orientated with the platform area.

The isolated stele on the western part of the Enclosure may indeed mark the advent of the rain, and in accordance with oral tradition and ethnography the Sun, Moon and Venus may have been observed and referenced in the structures for agriculture, human gestation, timing for trade and rain-making.

It is highly unlikely that the strange round shining blaze referred to as an Ndoro was a comet or meteor. It could very well be a reference to the star which led them to settle where they did in a sort of migration and which aligns significantly with the Large Conical Tower and Platform area. It was most likely a supernova or nova that was visible for a few years.

The Ndoro was revered as the emblem of these people until replaced or substituted by another stellar event in the 1940's to a star badge. The event was so profound that it may have caused one of the largest religions in Africa. This reinvigoration of the star that was followed clearly refers to something unusual and extraordinary.

The astrophysical observations of a recently found supernova remnant in the area of the sky known as the 'False Cross' is likewise inconclusive as it was not witnessed and recorded in literature. The star or object that transformed into a massive outburst of energy may have occurred as recently as 1300 C.E. and would have been almost a bright as the moon for a short while and possibly seen as a pin point of light with rings.

Ice-cores found in Antarctica have layers of nitrates that are likely produced by the gamma rays given off by nearby supernovae as they strike the biosphere of Earth. There is a layer of nitrates that dates to the time when the Large Conical Tower and outer Main Wall of the Great Enclosure was constructed around 1300 C.E.

Perhaps the supernova did occur as described by the astrophysicists and perhaps the historiography, ethnography and non-literal orientations of the structure make a cosmic reference to the same event, but more evidence is required to say conclusively that this is so.

The most likely candidate is the unclassified supernova remnant known as RX J0852.0-4622 which was found to exist behind another mass of supernova energy and obscurity called the Vela Supernova remnant that occurred thousands of year before Vela Junior or RX J0852.0-4622.

There appear to be other references found in the southern hemisphere continents of rock art and traditions concerned with a dot with circles and a star that was seen but has since disappeared. The tradition of the Maori speaks of Mahutonga which is associated with Crux close to Vela and which may have been seen at the arrival of the Polynesian navigators that arrived in New Zealand around 1300 C.E. Was Mahutonga RX J0852.0-4622?

A Mayan researcher believed he found that the Mayans could be dated by one of their glyphs to thousands of years older than thought as the glyph describes that a new star is born in the 'False Cross' constellation. The glyph indicates the constellation of Vela that has a 'star' (a sort of plus sign) that is new. It is drawn as a dot with a circle! Michanowsky died before they found that Vela had another supernova or star that may have been visible.

This study has proved puzzling at best with many extraordinary coincidences that form part of many attempts to reconcile the data, but recent to the submission of the dissertation new information was found (Chapter 6).

A Buddhist monk in Japan was about to be beheaded for suggesting new methods of prayer and he recorded that his decapitation did not happen because of a bright orb of light like the moon that became visible south east over the sea at the very time he was about to be executed in the pre-dawn of 13th September 1271.

In computer simulations of the skies from the vantage point of the area at the matched time noted another profound statistically impossible coincidence occurred.

Vela Junior supernova remnant is seen to rise about ten degrees above the south east horizon, for roughly an hour if there were mists common at that time of year, according to various recorded chronicled documents of Nichiren Daishonin's Tatsunokuchi persecution at a Japanese beach, on the pre-dawn of the 13th September 1271 C.E. at 04h44am.

38 BIBLIOGRAPHY

Abdullah Yusuf Ali. Ibn al-kalbi's Kitrâb-ul-asnâm, of the late second century of the Hijra. pp. 1612-1623 of the holy Qur'an, text, translation and commentary. 1946.

Al-Hamdani, Abu Muhammad al Hasan. 1884 -1891. Sifat jazirat al- 'Arab. Leiden

Alcock, P. G. 2014. Venus Rising: South African Astronomical Beliefs, Customs and Observations. ISBN 978-1-919966-04-5. Dewey No. 398.3620968. Jo Marwick, Pietermaritzburg, South Africa. http://assa.saao.ac.za/astronomy-in-south-africa/ethnoastronomy/venus-rising/

Allen, James de Vere. 1996. Lamu, with an appendix on Archaeological finds from the region of Lamu by H Neville Chittick: Kenya National Museums.

ANDERSON, A.H. 1999. The Lekganyanes and Prophecy in the Zion Christian Church. Journal of Religion in Africa, 29 (Facsimile 3): 285-312.

ANDERSON, A. 2000. Zion and Pentecost: The spirituality and experience of Pentecostal and Zionist/Apostolic churches in South Africa. Pretoria, UNISA Press.

Anderson, A. 2000. Differential reliability of 14C AMS ages of Rattus exulans bone gelatin in south Pacific prehistory. Journal of the Royal Society of New Zealand, 30 (3)

Andrews, Johnathan. 2007 March/April. Mapungubwe Outcry! Discussion Forum. In The Voyage of the Planet. Issue #3. pages 40-48.JCA Archaeological Foundation for Research JCA Management Services. South Africa. ISSN 1991-5039

Appleton, N. 2000. www.astronomypictureoftheday.com NASA http://antwrp.gsfc.nasa.gov/apod/ap001116.html (accessed 3rd May 2004).

Appleton, N. & Appleton, P. 2006. www.astronomypictureoftheday.com NASA http://spider.ipac.caltech.edu/staff/apple/WWW/statement.html (accessed 8th August 2006).

Arenstein, J & Hamese, Chuene. 2000. SA's Black Jews Search for Ancient Lost Cities in The Sunday Independent Newspaper - Article in the Reconstruct section of Sunday 17 September 2000, page 4. Issue 262. Johannesburg - South Africa African Eye News Service

ASCHENBACH, B. 1998b. Jahresbericht 1998 ROSAT. Max Plank Extraterrestrial Physics, Garching http://www.gamma.mpe-garching.mpg.de/~hcs/hcs.html (accessed 29 July 1999).

ASCHENBACH, B., EGGER, R. & TRÜMPER, J. 1995. The Vela Supernova Remnant: Discovery of explosion fragments outside of the Vela supernova remnant shock-wave boundary (ROSAT All-Sky Survey). Nature 373: 587-590.

Aschenbach, Bernd. 1998a. Discovery of a Young Nearby Supernova Remnant. In Nature, Vol. 396 : 6707. November 12th 1998 pages 141 -142. see also http://antwrp.gsfc.nasa.gov/apod/ap990413.html

Aschenbach et al. 1999. Constraints of Age, Distance and Progenitor of the Supernova Remnant RX J0852.0-4622/ GROJ0852-4642 in Astronomy & Astrophysics. Volume 350, Issue 3 - 1999. Pp 997-1006.

Aschenbach, B. 1998c. Personal Communication Dec 16th 1998. Max Planck Institute for Extraterrestrial Physics, Garching/Germany

Aschenbach B, Iyudin A. F and Schonfelder V. 1999. Constraints of age, distance and progenitor of the supernova remnant RXJ0852.0- 4622/GROJ0852-4642. ASTRONOMY AND ASTROPHYSICS . Astron. Astrophys. 350, 997–1006 (1999) Max-Planck-Institut fur Extraterrestrische Physik, 85740 Garching, Germany.

Aschenbach, Bernd. Discovery of a Young Nearby Supernova Remnant. In Nature, Vol. 396 : 6707. November 12th 1998 pages 141 -142. see also http://antwrp.gsfc.nasa.gov/apod/ap990413.html

Atkinson, R.J.C. 1966. Moonshine on Stonehenge, Antiquity Vol 49:159, 1966, 212-6

Baity, Elizabeth Chelsey. 1973. "Archaeoastronomy and Ethnoastronomy So Far". Current Anthropology 14 (1973); 389-449.
Aveni, A. 1993. 'Africa's Socialized Astronomy', in Ancient Astronomers, Montreal: St. Remy Press

Aveni, A. F. (ed.). 1982. Archaeoastronomy in the New World: American Primitive Astronomy, CUP, 1982, ISBN 0521247314; D. C. Heggie (ed.), Archaeoastronomy in the Old World, CUP, 1982, ISBN 0521247349

Aveni, A.F. 1989. World Archaeoastronomy, CUP, 1989, xi-xiii, ISBN 0521341809

Aveni, Anthony F. 1981. "Archaeoastronomy". In Advances in Archaeological method and Theory.". Vol 4. Princeton, N.J.: Academic Press, 1981, pp.1 –77

Aveni. A.F. 2003. Archaeoastronomy in the Ancient Americas. Journal of Archaeological Research 11 (2): 149–91. doi:10.1023/A:1022971730558

Aveni, Anthony, Stairways to the Stars – Skywatching in Three Great Ancient Cultures. (John Wiley & Sons, Inc. Astronomy in the Maya Codices. 1997).

Aveni, Anthony F. 1981. Archaeoastronomy in the Maya Region: A Review of the Past Decade. Archaeoastronomy (JHA Supplement 3, 1981) S1 – S37

Badat, Noor-Jehan Yoro. 25 September, 2004. The real Lost City is back on the map. The Star Newspaper (South Africa). http://www.thestar.co.za The real Lost City is back on the map

Badakchani, S. J. 2005. Ṭūsī, Naṣīr al-Dīn Muḥammad ibn Muḥammad; Paradise of Submission: A Medieval Treatise on Ismaili Thought, Ismaili Texts and Translations 5, London: I.B. Tauris in association with Institute of Ismaili Studies, pp. 2–3, ISBN 1-86064-436-8

Baity, Elizabeth Chesley. 1974. Archaeoastronomy and Ethnoastronomy So Far. Current Anthropology October 1974 Vol15 (4): 320-326.
Accessed 2006. March. http://www.publicanthropology.org/Archive/Ca1973.htm

BALZ, H.R. & SCHNEIDER, G. 1990. Exegetical dictionary of the New Testament, Volume 1. (173–174). Grand Rapids, Michigan: Eerdmans, pp. 173-174.

Bednarik, G. B. 'The global evidence of early human symboling behaviour', Human Evolution Vol. 12, no. 3 (1997), pp. 147–168.

Bednarik, R.G., 'Wonders of Wonderwork Cave', The Artefact Vol. 16 (1993), p 61.

BEACH, D. 1998. Cognitive archaeology and imaginary history at Great Zimbabwe. Current Anthropology 39 (1): 47-72.

Beach, D.N.1980. The Shona and Zimbabwe 900-1850: An Outline of Shona History. Gweru, Mambo Press. & London : Heinemann New York : Putnam, 1980.

Beach, D.N.1983a 'Oral history and archaeology in Zimbabwe', Zimbabwean Prehistory, 19, 8-11.

Beaumont, P., de Villiers, H. & Vogel, J., 'Modern man in sub-Saharan Africa prior to 49,000 B.P.: a review and evaluation with particular reference to Border Cave' South African Journal of Science Vol. 74 (1978), pp. 409–419.

Beaumont, P., 'The time depth of aesthetic and symbolic behaviour in southern Africa'. Paper presented to the Biennial Conference of the Southern African Association of Archaeologists, Johannesburg. 1992.

Bent, T. Ruined Cities of Mashonaland. London. 1893. (Rhodesiana Reprint Library. Volume Five facsimile reproduction of the third edition).. Books of Rhodesia, Bulawayo.1969

Bent.T. 1893 Ruined Cities of Mashonaland. London.

Best, Eldson 1955 Astronomical Knowledge of the Maori. Dominion Museum Monograph No. 3. Reprinted. Government Printer, Wellington. Originally published 1922.
http://www.nzetc.org/tm/scholarly/tei-BesAstro-t1-body-d1-d3.html

Blacking, John. 'The Great Enclosure and Domba' Man Vol. 20 (1985) pp.542-3. Page 76-99.

Blacking, John. March 1998. Venda Girls' Initiation Schools. Department of Social Anthropology. University of Belfast. http://sapir.ukc.ac.uk/QUB/Introduction/TitlePage.html
http://www.qub.ac.uk/VendaGirls/GrDombaSong/GDS_Music_Text03.html

Bleek, D. 1933. Belief and customs of the /Xam Bushmen. From material collected by Dr. W.H.I. Bleek and Miss L.C. Lloyd between 1870 and 1880. Edited by D.F.Bleek. Rain. Bantu Studies VIII: 297-312.

Bleek, D.F. 1936. Special Speech of Animals and Moon Used by the /Xam Bushmen: from material collected by Dr W.H.I Bleek and Miss L.C. Lloyd between 1870 and 1880. Bantu Studies. Vol 10 (2) pp 163 -199.

Bleek, D.F., 1956. A Bushman dictionary. American Oriental Society, New Haven.

Bleek, W.H. & Lloyd, L.C. 1911. Specimens of Bushman Folklore. London: G. Allen.

Boyle, J. A. 1963. The Longer Introduction to the Zij-i Ilkhani of Nasir ad-Din Tusi , Journal of Semitic Studies (1963) 8(2), pp.244-254

Brauen, M. 1997. The Mandala, Sacred circle in Tibetan Buddhism Serindia Press, London
Brody, Thomas A. 1993. The Philosophy Behind Physics. Springer Verlag, ISBN 0-387-55914-0 .

Brooks, A.S. & Smith, C.C. 'Ishango revisited: new age determinations and cultural interpretations', The African Archaeological Review, 5 (1987), pp. 65-78.

BUCHNER, E., SCMIEDER, M., KURAT, G., BRANDSTATTER, F., KRAMAR, U., NTAFLOS, T. & KROCHERT, J. 2012. Buddha from space — An ancient object of art made of a Chinga iron meteorite fragment. Meteoritics & Planetary Science 47 (9): 1491–1501. doi: 10.1111/j.1945-5100.2012.01409.x

Bunton, George and Ciotti, Joseph. 'Stonehenge A Fifty-Six Year Eclipse Cycle?' Griffith Observer, (April 1976).

Burgess, C.P. & Zuber, K. 2000. Footprints of the Newly-Discovered Vela Supernova in Antarctic Ice Cores? Journal of Astrophysics. McGill University

Casson, Lionel. The Periplus Maris Erythraei: Text With Introduction, Translation, and Commentary. (Princeton University Press, 1989). ISBN 0-691-04060-5.

Caton-Thompson, G. 1931. The Zimbabwe Culture: Ruins and Reactions. Oxford: Clarendon Press.

Chami, F.A. 2008. Evidence of Ancient African Beliefs in Celestial Bodies. In Holbrook, J. Urama, Johnson O. & Medupe,Thebe R. (eds.), African Cultural Astronomy – Current Archaeoastronomy and Ethnoastronomy Research in Africa. Springer Science+Business Media B.V. 2008. Pages 121-130.

Chaplin, J.H. 1967. Vernacular month names from Zambia. African Studies 26: Issue 3, pages 145 – 169.
Chen, W. and Gehrels, N. 1999.The progenitor of the new COMPTEL/ROSAT supernova remnant in Vela, Astrophysical Journal Letters v. 514, p. L103 (1999), (astroph/9812154 v2).

Chirikure, Shadreck & Pikirayi, Innocent. 2008. Inside and Outside the Dry Stone Walls: revisiting the material culture of Great Zimbabwe. Antiquity 82 (2008): 976-993.

Clark, Stuart and Carrington, Damian. 12:53 04 December 2002. Eclipse Brings Claim of Medieval African Observatory. © Copyright Reed Business Information Ltd.
NewScientist.com. http://www.newscientist.com/news/print.jsp?id=ns99993137.

Coleman, John E. 1985. Frying Pans of the Early Bronze Age Aegean, American Journal of Archaeology, vol. 89, pp. 191-219.

DANEEL, M.L. 1970. The God of the Matopo Hills: An Essay on the Mwari Cult in Rhodesia. Leiden, Mouton.

DANEEL, M.L. 1971. Old and New in Southern Shona Independent Churches. Volume I: Background and Rise of the Major Movements. The Hague, Mouton.

DANEEL, M. L. 1974. Old and New in Southern Shona Independent Churches (Vol. 2). The Hague, Mouton, pp. 217-232.

DANEEL, M. L. 1988. Old and New in Southern Shona Independent Churches (Vol. 3). Gweru, Zimbabwe, Mambo Press, pp.

DANEEL, M.L. 2001. African earthkeepers: Wholistic interfaith mission. Maryknoll, Orbis.

Davis, S. 1955. Divining Bowls: Their Uses and Origin: Some African Examples, and Parallels from the Ancient World. Man – Royal Anthropological Institute of Great Britain and Ireland. Vol. 55, (Sep., 1955), pp. 132 – 135.

d'Errico, F. 'Palaeolithic Lunar Calendars: A Case of Wishful Thinking?' Current Anthropology, Vol. 30, No. 1 (Feb., 1989), pp. 117–118.

de Heinzelin, Jean. 'Ishango', Scientific American, 206:6 (June 1962) 105-116.

de Vaal, J.B. (edited by de Vaal P) Die Matšhema Bouval. Mapungubwe Archive 2002 – University of Pretoria, South Africa.

Duffey, Alex, 'Mapungubwe: Interpretation of the Gold Content of the Original Gold Burial M1, A620'. Journal of African Archaeology, Volume 10 (2), 2012, pages 175-187, DOI 10.3213/2191-5784-10223.

Defrémery, C and Sanguinetti, B.R. 1854. Les Voyages d'Ibn Batoutah. Vol II. Paris. Pp 179 – 96 in Freeman-Grenville, G.P.S. 1962 Select Documents From The First To The Earlier Nineteenth Century by Clarendon Press. Oxford.

DELIUS, P. 1996. A lion amongst the cattle: Reconstruction and resistance in the northern Transvaal. Johannesburg, Ravan.

Dornan, S.S.1927. Moon Lore amongst the Bantu. Native Affairs Department Annual No.5: 29-35.

Dornan, S.S. 1927-29. Rainmaking in South Africa. Bantu Studies III: 185-195.
Doyle, L., Frank, E. 1997. "Astronomy in Africa". Encyclopedia of the History of Science, Technology, and Medicine in Non-Western Cultures, Helaine Selin, Dordrecht: Kluwer

Doyle, L.R. & Wilcox, T.J. 1986. Statistical Analysis of Namoratunga: An Archaeoastronomical Site in Sub-Saharan Africa? Azania 21: 125-129.

Doyle, L., Frank, E. 1997. "Astronomy in Africa". Encyclopedia of the History of Science, Technology, and Medicine in Non-Western Cultures, Helaine Selin, Dordrecht: Kluwer

Dreyer, Edward L. 2007. Zheng He: China and the Oceans in the Early Ming, 1405–1433. Library of World Biography. Longman. ISBN 0-321-08443-8.

Duffey, A. 2012. Mapungubwe: Interpretation of the Gold Content of the Original Gold Burial M1, A620. Journal of African Archaeology, Volume 10 (2), 2012, pages 175-187, DOI 10.3213/2191-5784-10223.

Evers, T.M. 1980. Klingbeil Early Iron Age sites, Lydenberg, Eastern Transvaal, South Africa. South African Archaeological Bulletin 35:46-57.

Evers, T.M. 1982. Excavation at the Lydenberg Heads site, Eastern Transvaal. South African Archaeological Bulletin 37:16-33.

Evers, T.M. & Hammond-Tooke, W.D.1986. The emergence of South African chiefdoms: an archaeological perspective. Journal of African Studies, 45 (1986), pp. 37–42

Fagan, B. 2000a. The Little Ice Age, Perseus Book Group.

Fagan, Brian. 2000b. When the Rains Stopped - Constant Shifts in Climate Molded Much of Human History. In Scientific American Discovering Archaeology - Focus July/August 2000 Issue 9

Fouche, Leo. 1937. Mapungubwe: Ancient Bantu Civilization on the Limpopo. Reports on Excavations at Mapungubwe from February 1933 to June 1935, edited on behalf of the Archaeological Committee of University of Pretoria by Leo Fouche. London Cambridge University Press. 1937. Page 149.

Frank, M. R., Bengoa, J. A. Hunting the European sky-bears: on the origin of the non-zodiacal constellation. In Ruggles, C., Prendergast, F., Ray, T. (eds) Astronomy, Cosmology and Landscape. (Leicester: Ocarina Books 2001) pp 15–44.

Freeman-Grenville, G.P.S. Select Documents from the First to the Earlier Nineteenth Century (Clarendon Press. Oxford 1962).

Frobenius Leo & Fox Douglas C. African Genesis: Folk Tales and Myths of Africa. (Faber & Faber Ltd UK 1938). pp 237-242; 261-265

Frobenius, Leo Erythräa: Lander und Zeiten des heiligen Königsmordes. (Berlin: 1931. Atlantis Verlag).

Frobenius, Leo. 1923. Das sterbende Afrika :Veröffentlichung des Forschungsinstitutes für Kulturmorphologie. München: O.C. Recht.

GAYRE OF GAYRE, R. 1972. The Origin of the Zimbabwean Civilization. Salisbury, Galaxie Press, pp. 156.

Gehrels Neil, Laird Claude M, Jackman Charles H, Cannizzo John K, Mattson Barbara J , Chen Wan. 2003. Ozone Depletion from Nearby Supernovae. Astrophys.J. 585 (2003) 1169-1176

Gerdes, Paulus. On The History of Mathematics in Africa South of the Sahara, African Mathematical Union, Commission on the History of Mathematics in Africa. 1991.

Chigwedere, Aeneas. 1996. The Karanga Empire. Books for Africa, Harare

Giacobbe, F. W. 2005. How a Type II Supernova Explodes. Electronic Journal of Theoretical Physics 2 (6): 30–38. Bibcode 2005EJTP....2f..30G

Gibbon, W. B. 'Asiatic Parallels in North American Star Lore: Ursa Major', The Journal of American Folklore, Vol. 77, No. 305 (1964) pp. 236–250.

Gold, Peter 1994. Navajo & Tibetan sacred wisdom: the circle of the spirit. ISBN 0-89281-411-X. Rochester, Vermont: Inner Traditions International.

Green, D.A. and Orchiston, W., 2004. In Search of Mahutonga: A Possible Supernova Recorded in Maori Astronomical Traditions? Archaeoastronomy, 18, 110-113.

Green, David A., and F. Richard Stephenson 2003 Historical Supernovae. In Supernovae and Gamma-Ray Bursters, edited by K. W. Weiler, pp. 7–19. Lecture Notes in Physics, Vol. 598. Springer, Berlin.

Greenfield, H & Miller D. 2004. Spatial patterning of Early Iron Age metal production at Ndondondwane, South Africa: the question of cultural continuity between the Early and Late Iron Ages. Journal of Archaeological Science. Volume 31, Issue 11, November 2004, Pages 1511–1532

Hall, R.N. & Neal, W.G. 1902. The Ancient Ruins of Rhodesia. Methuen.

Hall, R.N. 1909. Prehistoric Rhodesia. London: Maskew & Miller.

Hammond-Tooke, W. 1888. The Star lore of the South African natives. Transactions of the South African Philosophical Society. Vol 5 (2). Pp. 304-312.
Hancock, Graham. 2005. Supernatural. United Kingdom. Century Press.

HARRIS, P., MATAMUA, R., SMITH, T., KERR, H. & WAAKA, T. 2013. A review of Maori astronomy in Aotearoa-New Zealand. Journal of Astronomical History and Heritage 16(3): 325-336.

Hawting, G.R. The idea of idolatry and the emergence of Islam: from Polemic to History (Cambridge Studies in Islamic Civilization) Kitab al-aṣnām / 'an abī al-mundhir hishām ibn muḥammad ibn al-sāʾib al-kalbī ; bi-taḥqīq aḥmad zakī. Aḥmad zakī, 1866 (ca.)-1934. Published al-qāhirah : al-maṭba'ah al-amīrīyah, 1914. Original from Cornell University. And Ibn al-kalbī, d. 819? Kitāb al-aṣnām / 'an abī al-mundhir hishām ibn muḥammad ibn al-sāʾib al-kalbī ; bi-taḥqīq aḥmad zakī. (al-qāhirah : al-maṭba'ah al-amīrīyah. Published al-qāhirah: al-maṭba'ah al-amīrīyah, 1914. Http://onlinebooks.library.upenn.edu . Cambridge university press. 1999.
Al-muqaddasarabianblog.blogspot.com/2011/09/deity-nasr.html

Heine, J & Tellinger, M. 2008. Adam's Calendar – Discovering the Oldest Man-made Structure On Earth 75,000 years ago. Zulu Planet Publishers. South Africa.

Henshilwood, Christopher S., et al. 'A 100,000-Year-Old Ochre-Processing Workshop at Blombos Cave, South Africa'. Science, 334 (2011), pp 219-222.

Henshilwood, C.S. Origins of symbolic behaviour. In: McGraw-Hill Yearbook of Science & Technology 2013.

Holbrook, J. 1998. African Astronomy. Essays from Archaeoastronomy & Ethnoastronomy News, The Quarterly Bulletin Of The Center For Archaeoastronomy and ISAAC. Number **28** June Solstice 1998.

Holdaway, R. 1996. Arrival of rats in New Zealand. Nature, 384 (6606), 225-226 DOI:10.1038/

Hostetter, Clyde. Star Trek to Hawa-i'i : Mesopotamia to Polynesia. (San Luis Obispo, California: Diamond Press 1991.

Hostetter, Clyde. 'The Bowl of Ishtar', Griffith Observer, Volume 43, Number 7, July 1979, pages 14-?).

Hostetter, Clyde. 'A 56-Year Eclipse Prediction System', Archaeoastronomy: The Bulletin of The Center for Archaeoastronomy, Volume III, Number 2, April-June 1980, pp 29-30.

Joseph, R. 'Evolution of Paleolithic Cosmology and Spiritual Consciousness, and the Temporal and Frontal Lobes'. Journal of Cosmology, 14. (2011)

Hicks, Ronald. 1979. "Archaeoastronomy and the Beginnings of a Science." Archaeology 32. no. 2 (March/April, 1979). 46-52.

Holbrook, J. Urama, Johnson O. & Medupe,Thebe R. (eds.) 2008. African Cultural Astronomy – Current Archaeoastronomy and Ethnoastronomy Research in Africa. Springer Science+Business Media B.V. 2008

Holdaway, R. 1996. Arrival of rats in New Zealand. Nature, 384 (6606), 225-226 DOI:10.1038/

Houghton, J. et al. 1995. "Climate Change 1995: The Science of Climate Change", Cambridge Univ. Press, UK, 1995

Hromnik, C.A. 1981. Indo-Africa. Juta & Company, Cape Town.

Huffman, T.N. 1982. Archaeology and ethnohistory of the African Iron Age. Annual Review of Anthropology **11**: 133–50.

Huffman, T.N. 1985. 'The soapstone birds from Great Zimbabwe'. African Arts, 18 1985, pp 68-73.

Huffman, T.N. 1981. Snakes and Birds: Expressive Space at Great Zimbabwe. In African Studies. Vol. 40, no. 2 1981.

Huffman, T.N. 1996. Snakes and Crocodiles: power and symbolism in ancient Zimbabwe. Johannesburg: Witwatersrand University Press 1996.

Huffman, T.N. 1986. Iron Age settlement patterns and the origins of class distinction in southern Africa.In: F. Wendorf & E. Close, eds., Advances in World Archaeology 5. New York: Academic Press, pp. 291–338.

Huffman, T.N. & Vogel, J.C. 1991. The Chronology of Great Zimbabwe. The South African Archaeological Bulletin **46** (154): 61-70.

Huffman, T.N. 2001. The Central Cattle Pattern and interpreting the past. Southern African Humanities **13**: 19–35.

Huffman, T.N. 2011. Debating Great Zimbabwe. South African Archaeological Bulletin **66** (193): 27-40, 2011

Huffman, T.N. 2008. Mapungubwe and Great Zimbabwe: The origin and spread of social complexity in southern Africa Journal of Anthropological Archaeology. Volume 28, Issue 1, March 2009, Pages 37-5

Huffman, Thomas N. 2008. "Climate change during the Iron Age in the Shashe-Limpopo Basin, southern Africa". Journal of Archaeological Science 35: 2032–2047.doi:10.1016/j.jas.2008.01.005.

Huffman, T.N. 2005. Mapungubwe: ancient African civilisation on the Limpopo. Johannesburg : Wits University Press.

Huffman T.N. 2004. The archaeology of the Nguni past. Southern African Humanities. Vol 16. Pages 79–111. Pietermaritzburg Hughes, M.K. and H. Diaz. 1994. The Medieval Warm Period, Kluwer Academic Press, 1994.

(IGC 2004 Proceedings International Geological Conference - http://www.32igc.org/stampa/32igc%20informs6%20.pdf accessed 12 May 2011),

HUMPHREYS, C. 1995. The Star of Bethlehem, Science and Christian Belief 5 (October): 83-101.

Huntingford, G. W. B. 1950. The Hagiolithic Cultures of East Africa. Eastern Anthropologist, III: 119-136.

Huntingford, G. W. B. 1955. The Galla of Ethiopia; the kingdoms of Kafa and Janjero. London: International African Institute.

Hunwick, J.O. & Boye, A. 2008. The Hidden Treasures of Timbuktu: Historic City of Islamic Africa, London: Thames & Hudson. ISBN 9780500514214.

Iwaniszewski, S. 2003. The erratic ways of studying astronomy in culture. In Mary Blomberg, Peter E. Blomberg and Göran Henriksson. Calendars, Symbols and Orientations: Legacies of Astronomy in Culture (Proceedings of the 9th annual meeting of the European Society from Astronomy in Culture (SEAC), Stockholm, 27–30 August 2001. Uppsala. pp. 7–10. ISBN 91-506-1674-9.

IYUDIN, A. F., YU. V., PAKHOMOV, N. N., CHUGAI, J., GREINER, M., AXELSSON, S., LARSSON & RYABCHIKOVA, T. A. 2011. Search for broad absorption lines in spectra of stars in the field of supernova remnant RX J0852.0-4622 (Vela Jr.), Astronomy & Astrophysics, August 2011, pp.1-9.

IYUDIN, A., ASCHENBACH, B., BECKER, W., DENNERL, K & HABERL, F. 2010. XMM-Newton observations of the supernova remnant RX J0852.0-4622/GRO J0852-4642. Astronomy & Astrophysics.

Iyudin, A.F., Schönfelder,V., Bennett, K, Bloemen, H., Diehl, R., Hermsen, W., Lichti, G.G., Van Der Meulen, R.D., Ryan, J. & Winkler, C. 1998 Emission from 44Ti associated with a previously unknown Galactic supernova. Nature 396 (6707): 142 -144.

Jansen, Marius, ed. 1995. Warrior rule in Japan. Cambridge University Press

Jeffreys, M.D.W. 1952. Cowry:Ndoro. In N.A.D.A. pg. 35 - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

JUERGENS, N. 2013. The Biological Underpinnings of Namib Desert Fairy Circles,. Science 339 (6127): pp. 1618-1621. DOI: 10.1126/science.1222999

Junod H. A. 1962. The life of a South African tribe. I, Social life. New York : University Books.

Junod H. A. 1962. The Life of a South African tribe. II, Mental life. New York : University Books.

Junod H. A. 1912-1913. The life of a South African tribe. Neuchâtel : Attinger Frères.

KAUFMANIS, K. 1973. The Star of Bethlehem. Minnesota Astronomy Review 18(Fall): 3-4.

Katsuda, s.; tsunemi, h.; mori, k. 2008. The slow x-ray expansion of the northwestern rim of the supernova remnant rx j0852.0-4622. The astrophysical journal, volume 678, issue 1, pp. L35-l38.

Keen, Cecil S and Tyson, Peter D. 1973. Seasonality of South African rainfall: a note on its regional delimitation using spectral analysis. Volume 21, Numbers 2-3/June 1973. in Theoretical and Applied Climatology. Springer. Wien.

Keigwin L.D. 1996. "The Little Ice Age and Medieval Warm Period in the Sargasso Sea", Science, v.274 pp.1504-1508.

Kennedy, E. S. 1956. A Survey of Islamic Astronomical Tables, Transactions of the American Philosophical Society, (1956) 46(2), pp. 3, 39-40.

Keough,N., Nienaber,W.C., Steyn,M. 2008. Repatriation of the Mapungubwe human remains: an overview of the process and procedure (2008). UPSpace at the University of Pretoria (South Africa), http://hdl.handle.net/2263/7390

Kiage, Lawrence M & Liu, Kam-biu. 2006. Late Quaternary paleoenvironmental changes in East Africa: a review of multiproxy evidence from palynology, lake sediments, and associated records. Progress in Physical Geography 30, 5 (2006) pp. 633–658

King, David . 'The Sacred Geography of Islam'. In Koetsier, Teun; Bergmans, Luc. Mathematics and the Divine: A Historical Study (1st ed.). Amsterdam: Elsevier Science. pp. 161–178. 2005. ISBN 0-444-50328-5.

Koppeschaar, Carl. November 13, 1998. Discovery of a Young Near-By Supernova Remnant. ASTRONET. http://carlkop.home.xs4all.nl/youngsup.html Accessed 12 May 2011

Krige, E.J. and Krige J.D. 1965. The Realm of the Rain-Queen – A study of the Pattern of Lovedu Society. Oxford University Press

Krupp, E. C., ed. 1978. In Search of Ancient Astronomies. Garden City, N.Y.: Doubleday & Company, 1978 (and New York: McGraw-Hill Book Company, 1979 paperback reprint).

Krupp, E.C. 1997, Skywatchers, Shamans and Kings, John Wiley and Sons, 196-9, ISBN 0471329754

Krupp, E. C., ed. 1983. Archaeoastronomy and the Roots of Science. Washington, DC: American Association for the Advancement of Science.
Krupp, E.C. 1988. Light in the Temples, Records in Stone: Papers in Memory of Alexander Thom. 473-499, ISBN 0521333814

Krupp, E.C. 2011a. Personal Communication Thursday 16th June 2011 00h55. Dr. E.C. Krupp eckrupp@earthlink.net

Krupp, E.C. 2011b. Personal Communication Wednesday 1st June 2011 22h49 and Thursday 16th June 2011 00h55. Dr. E.C. Krupp eckrupp@earthlink.net

Krupp, E.C. 'E. C. Krupp winks at the Sphinx from Giffith Observatory in Los Angeles'. Sky & Telescope. March 2001.pg 86-88 http://www.siloam.net/denderah/marchs&t/krupp.html

Krzyzaniak, L., Kroeper, K. & M. Kobusiewicz (eds.). 2000. Recent Research Into the Stone Age of Northeastern Africa. Studies in African Archaeology 7, Poznan (Poznan Archaeological Museum): 21-31.

Kuniyoshi, Utagawa. 1835 – 1836. Illustrated Abridged Biography of Kôsô (Nichiren). Published by Ise-ya Rihei (Kinjudo). Japan.

Lan, David. Guns & Rain : Guerrillas & Spirit Mediums in Zimbabwe. James Currey London and University of California Press Berkeley and Los Angeles 1987.

LANDAU, B. 2010. Revelation of the Magi [RM]: The lost tale of the wise Men's journey to Bethlehem. New York, Harper Collins.

Latham, C.K.J. 'Mwari and the divine heroes : guardians of the Shona : pan Shona religion as an inspiration for nationality'. (M.A. Thesis Rhodes University, Grahamstown 1986).

Leakey, M. 1983. African's Vanishing Art: the Rock Painting of Tanzania. New York: Doubleday and Comp

Le Roux, Magdel. The Lemba: A lost Tribe of Israel in Southern Africa? University of South Africa Press 2003.

LE ROUX, M. 2010. 'The Bhuba: A paternally inherited Jewish priesthood in southern Africa? Ekklesiastikos Pharos 92 N.S. 21: 286-304.

Lewicki,T. 1974. 'Arabic External Sources For The History of Africa To The South Of Sahara'. Polska Akademia Nauk - Oddzial W Krakowie. Prace Komisji Orientalistycznej Nr 9. London - Curzon Press, Lagos - Pilgrim Books (1974)

LEWIN, D.I. 1997. Barking up the Lemba family tree with DNA polymorphisms. Journal of NIH Research.

Lewis-Williams, David. 2002. The Mind in the Cave. Thames & Hudson, London.

Lewis-Williams, David & Pearce, David. 2005. Inside the Neolithic Mind. Thames & Hudson Ltd, London. Page 149.

Lewis-Williams, J.D. 2003. Review - Shamanism and the Ancient Mind: A Cognitive Approach to Archaeology. In Journal of Anthropological Research. Vol 59, No 1 (Spring 2003) pp 93-95. University of Mexico

Lockyer, J.N. and Penrose, F.C. 1901. An attempt to ascertain the date of the original construction of Stonehenge. Proceedings of the Royal Society of London, 69, 1901, pp. 137-147

LOWE, D.J. 2008. Polynesian settlement of New Zealand and the impacts of volcanism on early Maori society: an update. In Lowe, D.J. (Ed.) Guidebook for Pre-conference North Island Field Trip A1 'Ashes and Issues' (28-30 November, 2008). Australian and New Zealand 4th Joint Soils Conference, Massey University, Palmerston North (1-5 Dec. 2008), New Zealand Society of Soil Science, pp.142-147.

Lynch, B.M. 1978. The Namoratunga Cemetery and Rock Art Sites of North-Western Kenya: A Study Of Early Pastoralist Social Organization. Unpublished Ph.D. Thesis, Michigan State University, Michigan.

Lynch, B.M. & Robbins, L.H. 1978. Namoratunga: The First Archaeoastronomical Evidence in Sub-Saharan Africa. Science 200: 766-768.

Lynch, B. M., Robbins, L. H., 1983. " Namoratungu: The first archaeoastronomical evidence in sub-saharan Africa", in Blacks in Science: Ancient and Modern, Van Sertima, I., New Brunswich, N.J.: Transaction Books, New Brunswich, NJ, 1983.

MacIver, R.D. 1906. Medieval Rhodesia. London, Macmillan, pp. 74 plate XXV, Plan drawn and surveyed by Franklin White.

MacKie, E. 1977. Science and Society in Prehistoric Britain, St Martin's Press, 1977, ISBN 023640041X

Magnuson J. et al.2000. "Historical Trends in Lake and River Ice Cover in the Northern Hemisphere", Science, v.289, p.1743, 8 Sept 2000

Major, R. H. 1868. Life of Prince Henry the Navigator, London.

Malville, J.M., Wendorf, F., Mazar, A.A., & Schild, R. 1998. Megaliths and Neolithic astronomy in southern Egypt. Nature 392: 488.

Mann, M.E.; Zhang, Z., Hughes, M.K., Bradley, R.S., Miller, S.K., Rutherford, S. and Ni, F. 2008. "Proxy-based reconstructions of hemispheric and global surface temperature variations over the past two millennia". Proc. Natl. Acad. Sci. U.S.A. 105 (36): 13252–7. Bibcode2008PNAS..10513252M.doi:10.1073/pnas.0805721105. PMC 2527990.PMID 18765811.

Marshack, A. The Roots of Civilization. London: Thames & Hudson 1972.

Masse, W. Bruce and Michael J. Masse. 2007. Myth and catastrophic reality: using myth to identify cosmic impacts and massive Plinian eruptions in Holocene South America. In Myth and Geology, edited by L. Piccardi and W.B. Masse, Geological Society, London, Special Publications, 273

Masse, W. Bruce, Elizabeth Wayland Barber, Luigi Piccardi and Paul T. Barber. 2007. Exploring the nature of myth and its role in science. In Myth and Geology, edited by L. Piccardi and W.B. Masse, Geological Society, London, Special Publications 273

Matenga, Edward. Soapstone Birds of Great Zimbabwe: Symbols of a Nation. (Harare: African Publishing Group 2008) ISBN 978-1779011350.

Mathivha, M.E.R. The Basena / Vamwenye / Balemba. Morenster. Published by Prof. M E R Mathivha Copyright © 1992 First Edition/ First impression 1992 Morester Printers (01521) 931831 South Africa.

Mayor, A., 2000. The First Fossil Hunters: Paleontology in Greek and Roman Times. Princeton University Press.

Mayor, A. 2005. Fossil Legends of the First Americans. Princeton University Press.

McCluskey, S. C. 2005. Different Astronomies, Different Cultures, and the Question of Cultural Relativism, in John Fountain and Rolf Sinclair, eds., Current Studies in Archaeoastronomy: Conversations across Time and Space. Woodbourne. USA

Menzies Gavin. 2002. 1421, The Year China discovered the world. Bantam Press, London.

Meyer, A. 1998. The Archaeological Sites of Greefswald: Stratigraphy and Chronology of the Sites and a History of Investigations. Pretoria: University of Pretoria.

Meyer, A. 2000. K2 and Mapungubwe. The South African Goodwin Series 8: 4-13.

Michanowsky, George. 1977. The Once and Future Star. Hawthorn Books Inc, New York.

Miller, G. H., et al. 2012. Abrupt onset of the Little Ice Age triggered by volcanism and sustained by sea-ice/ocean feedbacks. Geophys. Res. Lett., doi:10.1029/2011GL050168,

Millroth B. 1965. Lyuba. Uppsala. P 128

McCosh, F.W.J. 1979. The African Sky. NADA 12: 30-44. The Southern Rhodesia Native Affairs Department Annual, See page 34. Edited by A. B. D. Spicer. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

MOODLEY, E.J. 2008. Shembe, ancestors and Christ: A Christological inquiry with missiological implications. Eugene, Oregon, Pickwick.

MOSLEY, J. 1981. Common Errors in "Star of Bethlehem" Planetarium Shows, Planetarian Third Quarter: 4-7.

MOTOLLA, E. 1999. Zion Christian Church spokesperson Emmanuel Motolla's testimony before the Truth and Reconciliation Commission, East London, South Africa 19 November 1999

Muhlanga, Samuel. (Contributed by Elaine M. Lloyd). 1926. Mbava and Others. In N.A.D.A. pg. 91 - 92 - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. Edited by Guy A. Taylor. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

MULLAN, J.E. 1969. The Arab builders of Zimbabwe. Umtali [Mutare], Rhodesia Mission Press.

MÜLLER, K. 2000. The Great Zimbabwe Supernova. Article in the Sunday Dispatches section of The Sunday Independent Newspaper, South Africa, Sunday 3 September 2000: 13. Johannesburg, South Africa, Independent Newspapers Holdings Ltd

MÜLLER, R. 2011. African pilgrimage: Ritual travel in South Africa's Christianity of Zion. Farnham, Surrey, Ashgate.

Muller, Karl. 25 September 2004. Rainmaking, the stars, and a song of sacrifice. . The Star Newspaper (South Africa). http://www.thestar.co.za Rainmaking, the stars, and a song of sacrifice

Murdock, G. P. 1959. Africa: Its People and Their Culture History. New York: McGraw-Hill. See Southern Cushites pg. 193 and Ancient Azanians pages 204-211. and again page 222 in Lynch, B. Mark. 1978. The Namoratunga Cemetery and Rock Art Sites of North-Western Kenya: A Study Of Early Pastoralist Social Organization. Ph.D. Dept. Anthropology at Michigan State University.

Nasir al-Din al-Tusi, Zij-i Ilkhani, British Museum, MS Or.7464.
Neumann, J., 1975: Great Historical Events That Were Significantly Affected By the Weather: I. the Mongol Invasions of Japan. Bull. Amer. Meteor. Soc., 56, 1167– 1171.

Neumann, J., 1975: Great Historical Events That Were Significantly Affected By the Weather: I. the Mongol Invasions of Japan. Bull. Amer. Meteor. Soc., 56, 1167– 1171.

N.H.W. 1926. Note on Darwin Ritual Murder. In N.A.D.A. - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. pg. 61 - 62. Edited by Guy A. Taylor. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

NORRIS, R. P. & HAMACHER, D.W. 2009. The Astronomy of Aboriginal Australia. In D. Valls-Gabaud, D. & Boksenberg, A. (Eds.) The Role of Astronomy in Society and Culture. Proceedings of IAU Symposium No. 260, Paris, France, 19-23 January 2009.

NORRIS, R.P. & HAMACHER, D.W. 2011. Astronomical symbolism in Australian Aboriginal rock art. Rock Art Research 28(1): 99-106.

NORRIS, R.P., NORRIS, P.M., HAMACHER, D.W. & ABRAHAMS, R. 2013. Wurdi Youang: an Australian Aboriginal stone arrangement with possible solar indications. Rock Art Research 30(1): 55-65.

ORCHISTON, W. 2002. Southern Hemisphere Observations. In Rickman, H. (Ed.) Highlights of Astronomy, Vol. 12. San Francisco, Astronomical Society of the Pacific, pp. 322–325.

Orchiston, Wayne 2000. A Polynesian Astronomical Perspective: The Maori of New Zealand. In Astronomy Across Cultures: A History of Non-Western Astronomy, edited by Helaine Selin, pp. 161–196. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Pankenier, D. 2006. Notes on translations of the East Asian records relating to the Supernova of AD 1054. Journal of Astronomical History and Heritage 9.1 (2006): 77-82.

Pearce, Fred. 2010. The Climate Files: The Battle for the Truth About Global Warming, Random House UK, ISBN 0-85265-229-1

Pásztor, E. 'Retracing Ancient Cosmologies in Bronze Age Central Europe: a Prehistoric Puzzle'. Journal of Cosmology. Vol 9 (2010). Online, Open Access.

Pásztor, E. and Priskin, A. 'Celestial symbols revisited. Palaeolithic sky lore: fiction or fact?' Interdisciplinaria Archaeologica – Natural Sciences in Archaeology (2011) (IA NSA)

Papathanassoglou, D. A. , Georgouli, CH. A. 2009. The 'frying pans' of the Early Bronze Age Aegean: an experimental approach to their possible use as liquid mirrors, Archaeometry, vol. 51, no. 4 (August 2009), pp.658–671.

Pearson, J.L. 2002. Shamanism and the Ancient Mind: A Cognitive Approach to Archaeology. Walnut Creek, California: Altamira Press.

Pouwels, Randall L. The African and Middle Eastern World, 600-1500. Oxford University Press. 2005. pp. 130–1. ISBN 9780195176735.

Ralushai, N.M.N. 2002 January. A preliminary Report on the Oral History of Mapungubwe: Mapungubwe Oral History Project - Commissioned by the Dept of Environmental Affairs & Tourism South Africa and NORAD

Ralushai, N.M.N. 2003 February. Additional Information on the Oral History of Mapungubwe: Mapungubwe Oral History Project - Commissioned by the Dept of Environmental Affairs & Tourism South Africa and NORAD.

Rambach, Jörg. 2000. Kykladen I. Die frühe Bronzezeit – Grab- und Siedlungsbefunde. Habelt, Bonn 2000, ISBN 3-7749-2831-2, p. 144 Tbl. 80.

Rappenglück, A. M. A 'Paleolithic Planetarium Underground – the Cave of Lascaux' Migration & Diffusion, Volume 5, Issue Number 19, p. 6–47. (Odyssee-Verlag-Wien 2004).

Robinson, Judy. 'Not counting on Marshack: a reassessment of the work of Alexander Marshack on notation in the Upper Palaeolithic'. Journal of Mediterranean Studies vol 2, no.1, pp 1-16 1992.

Rogers, J. H. 'Origin of the ancient constellations: I. The Mediterranean traditions'. Journal of the British Astronomical Association vol 108 no 2 pp 79-89 1998.

Rossano, M. J. 'Making Friends, Making Tools, and Making Symbols' Current Anthropology Volume 51, Supplement 1, June. S89-S97 (2010).

Roy, A.E. 'The origin of the constellations'. Vistas in Astronomy vol 27, pp 171–197, 1984.

Ruggles, C. 1987. The Borana Calendar: Some Observations. Archeaoastronomy Supplement II, pg 35, 1987

Ruggles, C.L.N. 2005. Ancient Astronomy. ABC-Clio. ISBN 1-85109-477-6.

Ruggles, Clive. 2000. The General and the Specific: Dealing with Cultural Diversity. In Archaeoastronomy. Vol 15, 151-177(Texas Press).

Ruggles, C.L.N. 1999. Astronomy in Prehistoric Britain and Ireland. Yale University Press. ISBN 0-300-07814-5.

Ruggles. C.L.N. 2000. Ancient Astronomies - Ancient Worlds. Archaeoastronomy:Supplement to the Journal for the History of Astronomy 25 (31): S65–S76.

Ruggles, C.L.N. & Saunders, N.J. 1993. The Study of Cultural Astronomy, in Ruggles, Clive L.N. and Saunders, Nicholas J.: Astronomies and Cultures. University Press of Colorado, 1-31.

Ruggles, C.L.N. 1993. Archaeoastronomy in the 1990s, Group D Publications. 1993, ix, ISBN 1874152012

Ruther, Heinz ; Held, Christoph ; Schroeder, Ralph ; Bhurtha, Roshan ; Wessels, Stephen ; Neeser, Rudolph. 2008. ALUKA. Great Zimbabwe, Great Enclosure, University of Cape Town, Geomatics Department Position Latitude: 20 dg 16' 8" South Longitude: 30 dg 56' 17" East (WGS84) http://www.aluka.org/action/showMetadata?doi=10.5555/AL.CH.DOCUMENT.UCTZIM0001486

Sekerere, G.T. & Mavindidze, A. 1975. The Shona Calendar. Unpublished MS. Gweru Teachers' College, Gweru.

Schaefer, B.E. 1999. Astronomy in Historical Studies in Archaeoastronomy: The Journal of Astronomy in Culture. Edited by J. B. Carlson. XIV,I University of Texas Press (Spring/Summer 1999).

Schaefer, B.E., 1993. Astronomy and the limits of vision. Vistas in Astronomy, 36(4), 311-361.

SCHAEFER, B.E. 2013. The Star of Bethlehem is not the Nova DO Aquilae (nor any other nova, supernova, or comet). The Observatory 133: 227-231.

Schaefer, B.E., 1995. 'Supernova' 185 is really a Nova plus Comet P/Swift-Tuttle. Astronomical Journal, 110, 1793-1795.

Schaefer, B.E., 1996. The Peak Brightness of SN 1937C in IC 4182 and the Hubble Constant: Comments on Pierce & Jacoby [AJ, 110, 2885 (1995)]. Astronomical Journal, 111, 1668-1674.

Schawinski, K.; et al. 2008. Supernova Shock Breakout from a Red Supergiant. Science 321 (5886): 223–226. Bibcode 2008Sci...321..223S.

Schmidt, Mark 'Von Hüten, Kegeln und Kalendern oder Das blendende Licht des Orients', Ethnographisch-Archäologische Zeitschrift. Berlin 43.2002, p. 499-541. ISSN 0012-7477

Schoeman, A, Delius, P & Maggs, T. 2014. Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment, Wits University Press

Schofield, J.E 1926. Zimbabwe: a critical examination of the building styles employed. South African Journal of Science 23:971-86.

Schoonraad, M. 1968 August.. The Discovery of Mapungubwe. The South African Archaeological Bulletin, Vol. 23, No. **90** (Aug., 1968), pp. 52-53 Published by: South African Archaeological Society Stable URL: http://www.jstor.org/stable/3887758

Scotland, W.H.D. February 1956. Length Of Gestation Of East African Women. BJOG: An International Journal of Obstetrics and Gynaecology 63 (1), 120–123.

Singer, R. & Wymer, J., The Middle Stone Age at Klasies River Mouth in South Africa. (Chicago: University of Chicago Press 1982).

SELAMOLELA (BHUBA), M.G. 2008. Bhuba to le Roux. Private communication, Pretoria, South Africa.

Severin, Tim. The Sinbad Voyage. (Hutchinson, London, England 1982).

Snedegar, K. 1995. Stars and Seasons in Southern Africa. Vistas in Astronomy, vol. 39, Issue 4, pp.529-538

Snedegar, Keith. 1999. Sub-Saharan Africa: Cultural Astronomy's Heart of Darkness. Essays from Archaeoastronomy & Ethnoastronomy News, The Quarterly Bulletin Of The Center For Archaeoastronomy and ISAAC. Number 32 June Solstice 1999.

Springer, Tobias. 'The Golden Cone of Ezelsdorf-Buch: A Masterpiece of the Goldsmith's Art from the Bronze Age', in: Gods and Heroes of Bronze Age Europe, Strasbourg 2000; p. 176-181

SPURDLE, A.B. & JENKINS, T. 1996.The Origins of the Lemba "Black Jews" of Southern Africa: Evidence from p12F2 and Other Y-Chromosome Markers. The American Journal of Human Genetics 59 (5): pp. 1126.

Stayt, H.A.. 'Notes on the Balemba'. The Journal of the Royal Anthropological Institute of Great Britain and Ireland, Vol. 61 (Jan. - Jun., 1931), pp. 231-238. Page 232.

Stayt , H.A. 1968. The Bavenda. London: Frank Cass & Co. Ltd. (Cass Library of African Studies - General Studies - No 58)

Stenger, Richard. Thursday, December 5, 2002 Posted: 3:01 PM EST (2001 GMT). “Star Sheds Light on African Stonehenge”. CNN.com
http://www.cnn.com/2002/TECH/space/12/05/zimbabwe.observatory/index.html

Stephenson, F. Richard., and David A. Green 2002 Historical Supernovae and Their Remnants. Oxford University Press, Oxford.

Steyn, M 2007, 'The Mapungubwe gold graves revisited', South African Archaeological Bulletin, vol. 62, no. 186, pp. 140-146. [http://www.archaeology.org.za]

Stigand, C.H.1913. The Land of Zinj. pp. 29 to 102

Sullivan, Brian. 6th August 1974. Stanford Artificial Intelligence Laboratory Dump And Restore Technique. SAILDART corpus 1998 - from 229 reels of tape - as is 2002 http://www.saildart.org/ accessed 12 May 2011

Summers, R. 1971. Ancient Ruins and Vanished Civilizations of Southern Africa. T.V. Bulpin.

Summers, R. 1961. Excavations in the Great Enclosure. Occasional Papers of the National Museums of Southern Rhodesia 3(23A): 236-88.

Summers, R. & A. Whitty. 1961. The development of the Great Enclosure. Occasional Papers of the National Museums of Southern Rhodesia 3(23A): 306-25.

Summers, R., K. Robinson & A. Whitty. 1961. Zimbabwe excavations. Occasional Papers of the National Museums of Rhodesia 3(23A): 15-332.

SUNDKLER, B. 1976. Zulu Zion and some Swazi Zionists. London, Oxford University Press.

SUNDKLER, B. & STEED, C. 2000. A history of the church in Africa. Cambridge, Cambridge University Press.

Sutton, D.G. (ed.) 1992. The Origins of the First New Zealander. Auckland: Auckland University Press.

Svensmark H. 1998. Influence of Cosmic Rays on Earth's Climate. Physical Review Letters, v.81, no.22, p.5027, 30 Nov 1998

Swan, R.M.W. in Chapter 5 p 147 - ‘On the Orientation and Measurements of Zimbabwe Ruins’ in Bent, T. 1893. Ruined Cities of Mashonaland. London. (Rhodesiana Reprint Library. Volume Five facsimile reproduction of the third edition).. Books of Rhodesia, Bulawayo.1969- pages 141 - 178).

Swan, R.M.W.1892a. Notes on the Geography and Meteorology of Mashonaland. Proceedings of the Royal Geographical Society and Monthly Record of Geography (New Monthly Series). 14 (5):299-302

Swan, R.M.W.1892b. The Orientation of the buildings at Zimbabwe. Proceedings of the Royal Geographical Society and Monthly Record of Geography (New Monthly Series). 14 (5):306-309

Swan, R.M.W.1892c.Some Features of the Ruined Temples of Mashonaland. The Scottish Geographical Magazine. 8:539-544.

Swan, R.M.W.1892d. On the Orientation and Measurements of Zimbabwe Ruins. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 120-149. London: Longmans, Green & Co.

Swan, R.M.W.1892e. Appendix A: Notes on the Geography and Meteorology of Mashonaland. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 347-354. London: Longmans, Green & Co.

Swan, R.M.W.1892f. Appendix B: List of Stations in Mashonaland astronomically observed, with altitude. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 355-357. London: Longmans, Green & Co.

Swan, R.M.W.1892g. Appendix C: Addenda to Chapter V. In The Ruined Cities of Mashonaland: Being a Record of the Excavation and Exploration in Bent, J.T. 1891 (ed.) 358-361. London: Longmans, Green & Co.

Swan, R.M.W.1893a. The Orientation and Architectural Features of the Ruined Temples of Mashonaland. Report of the British Association for the Advancement of Science – 1892. 62:816.

Swan, R.M.W.1893b. The Geography and Ethnology of Mashonaland, with a Brief Account of the Ruins Zimbabwe. Proceedings of the Philosophical Society of Glasgow. 24:29-50.

Swan, R.M.W.1893c. The Ruins of Mashonaland. The Geographical Journal. 1: 275-276

Swan, R.M.W.1893d. The Ruins of Mashonaland. The Geographical Journal. 1: 465.

Swan, R.M.W.1896. Some Notes on the Ruined Temples in Mashonaland. The Journal of the Royal Anthropological Institute. 26:2-13

Swan, R.M.W.1897. Some Notes on the Ruined Temples in Mashonaland. The Journal of the Royal Anthropological Institute of Great Britain and Ireland. 26:2-13

Tanabe, George. 2002. Writings of Nichiren Shonin: Doctrine 2. University of Hawaii Press, ISBN 978-0824825515, Page 357.

Tanabe, George J. Jr. & Tanabe, Wilma Jane eds. 1989. The Lotus Sutra in Japanese Culture. University of Hawaii Press, Honolulu

Than, Ker 2006 (June 6th) CNN.. CNN.com - Ancient rock art may depict exploding star - Jun 5, 2006. Retrieved May 23, 2010

Thackeray, F. & Knox-Shaw, P. 1992. Astronomical and Entoptic Phenomena. Monthly Notes of the Astronomical Society of Southern Africa (MNASSA). Vol 51 (1/2). Pp 6-12.

Thackeray, J.F. 1988. Comets, Meteors and Trance: Were these conceptually associated in southern African pre-history? Monthly Notes of the Astronomical Society of Southern Africa (MNASSA). Vol 47 (5/6). Pp 49-52.

Theal, G. McG.1898-1903. Records of South Eastern Africa. Cape Town: Government Printers. 9vols. Vol. VII, p.197

Theal, G.M. 1886. Kaffir Folk-Lore: a Selection From the Traditional Tales Current Among the People Living on the Eastern Border of the Cape Colony with Copious Explanatory Notes. Swan Sonnenschein. Le Bas and Lowry. London 226pp.

Thomas, M.G, Parfitt, T, Weiss, D.A, Skorecki, K, Le Roux, M, Bradman, N & Goldstein, D.B. 1999. 'Y- Chromosomes Travelling South: The Cohen Modal Haplotype and the Origins of the Lemba - The "Black Jews of Southern Africa"'. University College of London - Dept. of Biology. American Journal of Human Genetics vol 66 no 2, 2000, pp 674-686.

Thompson G.D 'Critique of Clyde Hostetter's Ideas on Mesopotamian Bronze Age Astronomy'. accessed Saturday, April 5, 2014, 2.00 am http://members.westnet.com.au/gary-david-thompson/page9n.html

Thompson L.C. 1942. The BaLemba of Southern Rhodesia. NADA. Vol 19. Pp 76 – 86.

Tierney, J. 1983. Scholar without a School. Science'83. Volume 4, No.2. March Pg 46.

Tiley, Sian & Webster, Roger (ed) The 2004 Mapungubwe Calendar. Editorial. In Mapungubwe Museum. Mapungubwe Archive, Pretoria University. Pretoria University Press 2004. .

TIPLER, F.J. 2005. The Star of Bethlehem: a Type Ia/Ic Supernova in the Andromeda Galaxy. Department of Mathematics and Department of Physics, Tulane University, New Orleans, LA 70118. http://www.math.tulane.edu/~tipler/starofbethlehem.pdf (accessed 22 August 2013).

Tolmacheva, Marina; Weiler, Dagmar (translator). 2005. The Pate Chronicle: Edited and Translated from Mss 177, 321, 344, and 358 of the Library of the University of Dar Es Salaam (African Historical Sources) ISBN 0-87013-336-5

Trotter, A.P. 1927. Stonehenge as an Astronomical Instrument, Antiquity Vol 1:1, 1927, 42-53

Tsikritsis, M, Moussas, X, Tsikritsis, D. 2015. Astronomical and Mathematical Knowledge and Calendars During the Early Helladic Era in Aegean "Frying Pan" Vessels. Mediterranean. Archaeology and Archaeometry. Pp xx - xx (In Press MAA). As well as Proceedings of the 21st SEAC Conference

Tsountas, CH., 1898, Cycladic I, ArchEph, 137-212.

Tsountas, Ch., 1899 Cycladic II, ArchEph, 73-134.

Turton, D. and Ruggles, C.L.N. 1978. Agreeing to Disagree: The Measurement of Duration in a Southwestern Ethiopian Community, Current Anthropology Vol. 19.3, 1978, 585-600

Ṭūsī, Naṣīr al-Dīn Muḥammad ibn Muḥammad; Badakchani, S. J. (2005), Paradise of Submission: A Medieval Treatise on Ismaili Thought, Ismaili Texts and Translations **5**, London: I.B. Tauris in association with Institute of Ismaili Studies, pp. 2–3, ISBN 1-86064-436-8

Van Binsbergen, W.M.J., 1996, 'Transregional and historical connections of four-tablet divination in Southern Africa', Journal of Religion in Africa, 26, 1: 2-29

Tyson, P.D. et al. 2000. The Little Ice Age and Medieval Warming in South Africa. South African Journal of Science, v96. p.121-126, 2000

van Binsbergen, W.M.J., 1996, 'The astrological origin of Islamic geomancy', paper read at The SSIPS/ SAGP 1996, 15th Annual Conference: 'Global and Multicultural Dimensions of Ancient and Medieval Philosophy and Social Thought: Africana, Christian, Greek, Islamic, Jewish, Indigenous and Asian Traditions', Binghamton University, Department of Philosophy/ Center for Medieval and Renaissance studies (CEMERS), October 1996 (PDF)

van Binsbergen, W.M.J., 2004. Cupmarks, stellar maps, and mankala board-games: An archaeoastronomical and Africanist excursion into Palaeolithic world-views.

van Binsbergen, W.M.J., 'Transregional and historical connections of four-tablet divination in Southern Africa', Journal of Religion in Africa, vol 26, no 1 (1996) pp 2-29

van Binsbergen, W.M.J., 'The astrological origin of Islamic geomancy', paper read at The SSIPS/ SAGP 1996, 15th Annual Conference: 'Global and Multicultural Dimensions of Ancient and Medieval Philosophy and Social Thought: Africana, Christian, Greek, Islamic, Jewish, Indigenous and Asian Traditions', Binghamton University, Department of Philosophy/ Center for Medieval and Renaissance studies (CEMERS), October 1996 (PDF)

Van Heerden, Pieter. 1959. Die Bouvalle van Vendaland. Bantoe 11. Page 3-20

Van Warmelo, N.J. (ed.) 1940. The Copper Miners of Musina and the Early History of the Zoutpansberg: Vernacular accounts by S.M. Dzivhani, M.F. Mamadi, M.M. Motenda,, E. Mudau. Pretoria: Government Printer. (Ethnological Publications Vol. VIII).

Van Warmelo. 1944. The Copper Miners of Musina and the Early History of the Zoutpansberg: Vernacular accounts by S.M. Dzivhani, M.F. Mamadi, M.M. Motenda,, E. Mudau in Ethnological Publications Vol. VIII Edited and supplemented by other material by N. J. VAN WARMELO Government Ethnologist - Department of Native Affairs. Printed in the Union of South Africa by the Government Printer, Pretoria 1940 (G.P.S. 1843-1940-800).

Varisco, D. M. 1987. The Rain Periods in Pre-Islamic Arabia. Arabica, Tome xxxiv, Pages 251 -256.

Varisco, D. M. 1989. The Anwã' Stars According to Abu Ishãq al-Zajjãj. In Zeitschrift Für Geschichte Der Arabisch-Islamischen Wissenschaften. Band 5. Johann Wolfgang Goethe-Universität, Frankfurt am Main.

Varisco, D. 'The Origin of the Anwâ' in Arab Tradition'. Studia Islamica, vol 74, 1991, pp 5-28.

Varisco, D. M. 1985. The Production of Sorghum (Dhurah) in Highland Yemen. Arabian Studies (Cambridge). 7:53-88.

Varoucha Irini. 1925-26. "Kykladikoi taphoi tēs Parou (Κυκλαδικοί τάφοι της Πάρου)" Ephēmeris archaiologikē 1925-1926, pp. 98–114 (Digitised: p. 99, 107 Ill. 9).

Vértes, L. '"Lunar Calendar" from the Hungarian Upper Paleolithic'. Science vol. 149. 20 August 1965. pp. 855–856.

Verschuren D. Laird K. R. and Cumming B. F. et al .2000. Rainfall and drought in equatorial east Africa during the past 1,100 years. Nature 2000, vol.403, No 6768, pp. 410-414

Villalba, R. 1990. Climatic fluctuations in Northern Patagonian during the last 1000 years as inferred from tree-rings records. Quaternary Research 34 (3): 346–60.Bibcode:1990QuRes..34..346V. doi:10.1016/0033-5894(90)90046-N

Villalba, R.1994. Tree-ring and Glacial Evidence for the Medieval Warm Epoch and the Little Ice Age in Southern South America. Climate Change, 26: 183-197.

Villiers, A. Sons of Sinbad. (Charles Scribner's Sons. New York 1969).

Vitaliano, D. B., 1968, Geomythology, Journal of the Folklore Institute, Vol. 5, No. 1 (June 1968), 11.

Vitaliano, D.B., 1973, Legends of the Earth: Bloomington, Indiana University Press, 305 p.

VOGEL, J.C. 1998. Radiocarbon dating of the Iron Age sites on Greefswald (appendix). In Meyer, A. (Ed.) The Archaeological Sites of Greefswald – Stratigraphy and Chronology of the Sites and a History of Investigations. Pretoria, V & R Printing Works.

VOGEL, J.C. & HUFFMAN, T.N. 1991. The chronology of Great Zimbabwe. South African Archaeological Bulletin 46: 61-70.

Volman, T., 'Early prehistory of southern Africa'. In (R. Klein, ed.) Southern African prehistory and palaeoenvironments, pp. 169–220. (Rotterdam: Balkema 1984).

Von Sicard, H. 1966. Karanga Stars. NADA 9: 45. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Von Sicard, Harald. 1951.The Origin of the Tribes in the Belingwe Reserve. In N.A.D.A. pg. 17 - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Von Sicard, Harald. 1953. Reply to Jeffreys – Occam's Razor. In N.A.D.A. pg. 53 - The Southern Rhodesia Native Affairs Department Annual, No. 4, December 1926. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Wade, R.P. 2007a. Some Astronomical Aspects of Great Zimbabwe. Prehistory Society of Zimbabwe. Newsletter 133 and 134. Page 5. edited by Paul Hubbard. Harare.

Wade, R.P. 2007b. Archaeoastronomy Of The Great Zimbabwe Cultural Complex. Journal of the Prehistory Society of Zimbabwe. edited by Paul Hubbard. Harare.

Wade, R. P & Broodryk, N. L. 2010. Systematics of interpreting cosmic references in sub Saharan Africa. http://www.communicatingastronomy.org/cap2010/posters.html PDF (1.80MB)

Wade R.P, Eriksson P.G, Duncan G.A and deW. Rautenbach C.J. 2014. Southern African cosmogenic geomythology ("following a star") of the Zion Christian Church. Transactions of the Royal Society of South Africa. Volume 69, Issue 2. Taylor & Francis. UK. www.tandfonline.com DOI:10.1080/0035919X.2014.905880.

Wade, R.P. 2007 Jan/Feb. Mapungubwe and Tshimedzi Moon. In the Voyage of the Planet. Issue #2.pages 38-42. JCA Archaeological Foundation for Research JCA Management Services. South Africa. ISSN 1991-5039

Wade, R P. 2009. A Systematics for Interpreting Past Structures with Possible Cosmic References in Sub-Saharan Africa. MSc Thesis. University of Pretoria. http://upetd.up.ac.za/thesis/available/etd-05052009-174557/

Wade, R.P. & Eriksson P.G. 2015. Cosmogenic Geomythology of Great Zimbabwe: A Southern African Postulate of the Vela Junior Supernova Remnant. Journal of Skyscape Archaeology (Peer Review)

Wade, R.P. 2015. Hymnal Record of a Missionary Structure at Thabantšho (Gerlachshoop) of the Bakopa of Kgoši Boleu. Studia Historiae Ecclesiasticae. (Peer Review)

Wade, R.P. 2015. Southern African Trade Era Astronomical Knowledge Systems. Nordic Journal of African Studies. (Peer Review)

Wade, R.P. 2015. Codification of the Venus Synodic Period in the Great Zimbabwe Cultural Complex. Journal Culture and Cosmos. (Peer Review)

Wade, R.P., et al. 2015. Summary of Southern African cosmogenic geomythology ("following a star") of the Zion Christian Church. WGN - Journal of the IMO (International Meteoritical Society)

Wade, R.P. 2015. Astronomical Observations and Computer Simulations for the Great Enclosure of Great Zimbabwe in the Medieval Trade Network Era. Astronomy and Computing (Peer Review)

Watson, Burton. 1993. The Lotus Sutra. Columbia University Press. New York. http://www.nichirenlibrary.org/en/wnd-1/Content/23 Accessed 5 May 2015
The Letter of Petition from Yorimoto http://www.nichirenlibrary.org/en/wnd-1/Content/97 Accessed 5 May 2015
The Actions of the Votary of the Lotus Sutra (page 269) http://www.nichirenlibrary.org/en/wnd-1/Content/93 Accessed 5 May 2015
The Opening of the Eyes (I) http://www.nichirenlibrary.org/en/wnd-1/Content/30 Accessed 5 May 2015
The Letter of Petition from Yorimoto http://www.nichirenlibrary.org/en/wnd-1/Content/97 Accessed 5 May 2015

Watanabe, O. et al. 1997. A preliminary study of ice core chronology at Dome Fuji station, Antarctica. in Proc. NIPR Symp. Polar Meteorol. Glaciol. 11 (eds. Watanabe, O. et al.) 9–13 (National Institute of Polar Research, Tokyo, 1997).

Wendt, W.E., 'Art mobilier aus der Apollo 11 Grotte in Südwest-Afrika'.Acta Praehistorica et Archaeologica, vol 5, 1974, pp 1–42.

Wilk, S.R. Medusa: Solving the mystery of the Gorgon. (Oxford 2000).

Wilson, Agnes. 1931. The Human Sacrifice. In N.A.D.A. - The Southern Rhodesia Native Affairs Department Annual, No. 9, 1931. pg. 6 - 10. Edited by A. B. D. Spicer. Published by the Southern Rhodesia Native Affairs Department. Facsimile published 1972 by Books of Rhodesia Publishing Company. Mardon Printers.

Zaslavsky, Claudia: 'Women as the First Mathematicians', International Study Group on Ethnomathematics Newsletter, Volume 7 Number 1, January 1992.

Zeilik, M. 1985. The Ethnoastronomy of the Historic Pueblos, I: Calendrical Sun Watching, Archaeoastronomy No. 8 (Supplement to the Journal for the History of Astronomy), 1985, pp. S1-S24; The Ethnoastronomy of the Historic Pueblos, II: Moon Watching, Archaeoastronomy No. 10 (Supplement to the Journal for the History of Astronomy), 1986, pp. S1-S22.

ZULUAGA, J.I. & FERRIN, I. 2013. A preliminary reconstruction of the orbit of the Chelyabinsk Meteoroid. Instituto de Fısica - FCEN, Universidad de Antioquia, Calle 67 No. 53-108, Medellın, Colombia 21 Feb 2013 arXiv:1302.5377v1 [astro-ph.EP]

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