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## Thursday 15 September

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FRIDAY 16 SEPTEMBER

IMAGES & MUSIC

09:00  Barbara Rappenglück
09:20  Mary Blomberg
09:40  Chanda Carey
10:00  Clea T. Waite
10:20  Angelo Adamo
10:40  Discussion
11:00  SOHIA PHOTO COMPETITION
11:20  COFFEE

ARCHAEOLOGY

11:40  A. César González-García, F. Criado Boado & B. Vilas Estevéz
12:00  Fernando Pimenta, Ricardo Soares, Andrew Smith & Fabio Silva
12:20  Vito Francesco Polcaro, A. Scuderi & I. Burgio
12:40  Discussion
13:00  LUNCH
14:00  ROUND TABLE FORUM
15:20  COFFEE
15:40  SEAC AGM

SATURDAY 17 SEPTEMBER

08:30  OPTIONAL AVEBURY TOUR
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COMMITTEES

Local Organising Committee
Co-Chairs
Nicholas Campion PhD, University of Wales Trinity Saint David
Lionel Sims PhD, University of East London

Committee
Pamela Armstrong MA, University of Wales Trinity Saint David
Bernadette Brady PhD, University of Wales Trinity Saint David
Frances Clynies PhD, University of Wales Trinity Saint David
Darrelyn Gunzburg PhD, University of Wales Trinity Saint David
Liz Henty MA, University of Wales Trinity Saint David
Frank Prendergast PhD, Dublin Institute of Technology
Fabio Silva PhD, University of Wales Trinity Saint David and University College, London

Additional Reviewing Committee
John Steele PhD, Emilia Pásztor PhD, Kim Malville PhD, Stanislaw Iwaniszewski PhD, Juan Antonio Belmonte PhD, Michael Rappenglück PhD.

Conference front desk and refreshments
Jennifer Fleming MA

Book Stall
Jennifer Zahrt PhD

Conference volunteers
Ada Blair MA, Ilaria Cristofaro, Karine Dilanyan MA, Anna Estaroth, Morag Feeney-Beaton MA, Stavroula Konstantopoulou MA, Tore Lomsdalen MA, Chris Mitchell MA, Hanne Skagen MA, Melanie Sticker, Kathleen White PGDip,

OPENING TALK: MONDAY MORNING
Nicholas Campion
Cultural Astronomy in the 21st Century

This opening talk will consider the state of Cultural Astronomy as we reach the half-century of the great era of the 1960s, when the publications of Alexander Thom and Gerald Hawkins brought the field to public attention. I will look at questions of definition and the scope of the discipline – whether narrowly defined or broad. I will report on developments in the UK in the last decade, including the growth of the MA Cultural Astronomy and Astrology, Sophia Centre research projects and publishing, including the Sophia Centre Press, and sponsored initiatives such as the INSAP conferences and sessions at the TAG (Theoretical Archaeology Group) and NAM (National Astronomy Meeting) conferences. I will end with thoughts for the future of SEAC.
PETRA REVISITED: NEW CLUES FOR THE NABATAEAN CULTIC CALENDAR
Juan Antonio Belmonte and A. César González-García
Instituto de Astrofísica de Canarias - jba@iac.es

ABSTRACT
Petra, the ancient Nabataean capital, has been one of our main research objectives since our first field campaign on site in 1996 (Belmonte, 1999). Our work on Nabataea has consisted of archaeoastronomical fieldwork where orientation data were collected and the local landscape analysed. This has been complemented by the study of the historical classical sources on Petra and other Nabataean sites and the analysis of the textual evidence (Belmonte et al. 2013). In December 2015 a new visit to the city was performed in coincidence with the Winter Solstice. Several illumination effects were once again observed and broadcast at the principal monuments of Petra and new important hierophanies, predicted in previous campaigns, were verified and contrasted at the light of the few literary and epigraphic sources and the astral symbolism. We are now convinced that the moment of the Winter Solstice was an important milestone in the Nabataean cultic calendar when a festival of the main deities of the city, the God Dushara and his partner the goddess Al Uzza, was commemorated. This probably took the form of a pilgrimage - and related cultic activities - which was ascending from the temples at the centre of the city (presumably from Qsar el Bint and the Temple of the Winger Lions) up to the Monastery (Ad-Deir) through an elaborated stone-carved processional way. The relevance of the spring and autumn equinox within the cultic calendar will also be emphasized in relationship to other sacred sites in Petra, such as the Zibb Aتuff Obelisks, and additional Nabataean sites such as the temple of Khirbet et-Tannur further north. Finally, prospects for potential future research in other Nabataean monuments, such as the tombs and sanctuaries of the southern Nabataean city of Hegra, and its - often dated - funerary inscriptions -, will be analyzed.

REFERENCES

THROUGH THE DARK VALE: INTERPRETING THE STONEHENGE PALISADE THROUGH INTER-DISCIPLINARY CONVERGENCE AND VIRTUAL MODELLING
Lionel Sims and David Fisher
University of East London - lionel.sims@btinternet.com

ABSTRACT
During the middle of the third millennium and for nearly two miles a palisade fence of oak posts 3-6 meters high stretched along the western side of the last section of the Avenue and past Stonehenge in a south-westerly direction (Durrill 2005, 55). Recent remote sensing archaeology has demonstrated that this palisade extended back towards the north-east close to but not
connecting with the Great Cursus (Gaffney et al. 2012). Four archaeological theories have variously interpreted the palisade as an exclusion fence (Pollard 2008, Pitts 2008), a settlement (Parker Pearson 2012), an obscuration device (Cleal et al. 1995) or an ancestral reversal device (Exon et al. 2000). Close interrogation of each of these models finds them to be variably internally inconsistent with the findings of site excavation and landscape archaeology. However once these models are trimmed of those components unable to withstand critique internal to archaeology, this paper demonstrates that the residual models can be integrated once adopting the methods of field archaeoastronomy and landscape phenomenology. By testing this emergent inter-disciplinary model with virtual modelling techniques (Fisher 2013) for both the Stonehenge and Avebury monument complexes this paper suggests that views prescribed by the monument architecture manipulate horizon views to create the culturally embedded sense of simulating a journey through the underworld (Sims 2009).

REFERENCES

INFERRING ALIGNMENTS: EXPLORING THE LIMITATIONS OF TWO STATISTICAL APPROACHES TO STRUCTURAL ORIENTATIONS USING MONTE CARLO SIMULATIONS
Fabio Silva
Catalan Institute of Human Paleoecology and Social Evolution (IPHES, Spain) and Sophia Centre for the Study of Cosmology in Culture (University of Wales Trinity Saint David, UK) - fabio.silva@ucl.ac.uk

ABSTRACT
Statistical inference is defined as the ‘the process of deducing properties of an underlying distribution by analysis of data’ (Upton and Cook 2008). The quantitative analysis of structural orientations in order to identify patterns that might relate to celestial or topographic patterns, certainly qualifies as statistical inference. In archaeoastronomy, the analysis of the curvigram (Ruggles 1981: 156; 2015: 418), which is the sum of the measurement’s probability distributions (SPD for short), is one approach to inference. However, the most natural approach to inferring the most likely value from a series of measurements is to simply use their mean (eg,
Taylor 1997), or more generally, their maximum likelihood estimate (the ML approach, for short).

This paper employs Monte Carlo simulations (e.g. Fishman 1995) to explore and quantify the limitations of the SPD and ML methods when inferring the most-likely targets of a set of structural orientations. A computer model was implemented that mimics the orientation of a set of structures, where parameters such as the intended celestial target and amount of uncertainty can be controlled, but the noise added to mimic that uncertainty is random. This was repeated ten thousand times for each set of parameters, always producing a different set of (simulated) orientations. The SPD and ML approaches were then employed on the simulated datasets created by the Monte Carlo algorithm, allowing one to compare the method’s inferred results with the known parameters and therefore assess the accuracy and range of validity of the methods. This was done for a single target scenario, as well as for a dual target scenario (i.e. cases where similar structures were targeting two celestial objects or events).

Results show the ML approach to be considerably more reliable and accurate than the SPD one, but also bring to the fore serious problems relating to the separation of multiple targets. In summary, if multiple targets are separated by less than twice the total uncertainty then it is impossible to distinguish between them using any statistical method, for any sample size. The relationship of this observation with the so-called Gaussian channel problem in Information Theory will be addressed (e.g Cover and Thomas 2006: 261-300). The application and implications of this to the analysis of past and future surveys is discussed with recourse to two datasets of orientations: the stone rows of Cork-Kerry, Ireland (Ruggles 1999) and the seven-stone antas of Alentejo, Portugal (Hoskin 2001).

REFERENCES

BEYOND ORIENTATION AND INTENTIONS TOWARDS MOTIVATION AND MEANING
Frank Ventura
University of Malta - frank.j.ventura@um.edu.mt

ABSTRACT
The search for a deep understanding of how the sky may have featured in the culture of a given prehistoric community can be divided into four phases: orientation, intention, motivation, and meaning, not necessarily carried out in that order. In the absence of historical and ethnographic information, the focus of attention in each phase must be on the material culture which could consist of various types of monuments in relation to their environment and the related artefacts (Ruggles, 2015). However, the purpose of the study in each phase is different and consequently the theoretical base and methodology can vary in different phases. Measurement of the orientations of the monuments and light-and-shadow phenomena are possibly carried out in the first phase and require a sound theoretical knowledge of basic astronomy as well as skill in making the necessary observations. This is followed by the need to show that the astronomically significant orientations were deliberate. This process may involve simple analyses such as showing that a significant pattern exists in the orientations or more complex statistical tests to support the view that the orientations were purposely selected to align the monuments with some particular celestial phenomenon.

So far, the necessary theoretical and methodological approaches have been informed mainly by science and less so by archaeology. The next two phases pay more attention to the human
dimension as the research seeks to understand what motivated the builders to choose the orientations and what the alignments meant for them. Consequently, attention must now turn to the socio-cultural dimension and this has to be elicited from a deeper understanding of the archaeological context and the interpretation of artefacts and motifs (Iwaniszewski, 2015). The appropriate methodology needed to explore this dimension is less clear and it may depend on the specific archaeological context in which it is to be applied. For example, the identification of the taulas of Menorca as places of healing depended on archaeology and Greek and Egyptian mythology (Hoskin, 2001). On the other hand, in a clearly socio-cultural study of 221 megalithic passage tombs in Ireland, Prendergast (2016) used social network analysis to record the relationships between tombs which faced one another and suggested explanations for siting tombs on elevated sites.

As a case study, the presentation will discuss the contrasting views on the intention of the builders when they orientated the Mnajdra South temple in Malta in ca. 3000 BC. With its declination of zero degrees, an alignment with either equinox sunrise or the rising of the Pleiades can be inferred (e.g. Lomsdalen, 2014; Ventura et al., 1993). These views can, however, be reconciled and possibly related to the decline of the temple culture (Sagona, 2015).

REFERENCES

COMPARING DIFFERENT APPROACHES TO COSMOLOGY IN ARCHAEOLOGY
Tore Lomsdalen
University of Malta - tore.lomsdalen.15@um.edu.mt

ABSTRACT
Archaeology has now moved on from the view that subjects like ritual, belief and worldviews are further up the four step Hawkes’ (1954: 161-162) ‘ladder of inference’, inaccessible and, therefore that it was imprudent for archaeology to speculate on these areas (Insoll 2001: 3). More recently, thanks to the breakthrough of post-processualism spearheaded by Hodder (1982), followed by Shanks and Tilley (1987), where archaeology seeks to transcend the tired divide between subjective and objective approaches. Today archaeology departments feature scholars and research projects dealing with topics as varied as experimental archaeology (Renfrew and Bahn 2008), cult and religion (Barrowclough and Malone 2007, Harding 2013), anthropology and the human element (Thomas 1999), phenomenology, monumentality and perception of the environment (Ingold 2000, Tilley 2004, Watson 2012), archaeology of natural places (Bradley 2000), archaeology of the senses (Skeates 2010), cosology (Darvill 1999, Harding et al. 2006, Parker Pearson 2012, Parker Pearson and Richards 1994), land- and
seascape (Grima 2001), archaeology of the cosmos (Pauketat 2013), as well as skyscape archaeology (Silva and Campion 2015).

This paper will consider the term ‘cosmology’ from an holistic perspective, how human belief systems and worldviews are an integrated part of sky and material culture. It shall critically review different approaches to cosmology in archaeology. It will locate them in their historical and academic context and then compare and contrast their usefulness at various scales of analysis within the context of artefacts, architecture, geographical location, sky and cosmos.

REFERENCES


MONDAY AFTERNOON
IMAGES & MUSIC
Chair: Darrelyn Gunzburg

THE NORTHERN ORIENTATION ASSOCIATED WITH THE VIRGIN MARY, STARS OF CURTAILED PASSAGE AND THE CONSTELLATION OF CYGNUS AT THE GOTHIC CATHEDRAL OF CHARTRES, FRANCE
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ABSTRACT
This case study investigates the medieval Gothic cathedral of Chartres and seeks to test Bernadette Brady’s claim that, ‘any northern hemisphere structure orientated toward the north east or west can be investigated for its possible involvement with a bright star’ (2015). Additionally, Brady argues that stars of curtailed passage were associated with immortal, royal and divine figures. This paper focuses on the orientation of the north rose stained glass window and the iconography of four white birds within its design, which were dedicated to the nativity of Mary following the Roman Catholic religious tradition. Mary, being a royal and divine figure fits with the ancient narrative of curtailed stars. There is a possibility that the long-necked birds depicted which are often assumed to be doves, conferring gifts of the Holy Spirit (Whatling), could also be interpreted as geese or swans, thus referring to the constellation of Cygnus, at a time and place where Deneb, its fixed alpha star was of curtailed passage. Using Stellarium software; the twilight movements of Cygnus will be explored on the main Marian festivals as promoted by Fulbert (960 -1028) whilst considering the metaphorical mind of the religious scholars with their appreciation for Dionysian divine darkness which was cultivated at Chartres (LeClercq 1987).

Within archaeoastronomy, the question of orientation to northern curtailed stars has been little explored but it touches upon the ongoing debates regarding the deviation of churches from precise east – west orientations. Peter G. Hoare and Caroline S. Sweet (2000) in a large survey of Anglo Saxon churches considered eastern equinoctial solar alignments and concluded that deviations were due to elements in the landscape which they did not go on to develop. Nonetheless they were confident that articulating ‘a liturgically correct alignment’ was the ideal. Liz Henty (2015) comparing archaeoastronomical methodologies agrees that cosmologically significant directions may express religious concepts but added that these are not necessarily precise alignments. This paper considers the conceptual orientation of the northern transept towards Deneb as a star of curtailed passage, rather than a traditional precision solar lunar alignment.

This ongoing research additionally questions how stellar orientations can be assessed by combining archaeoastronomical data with iconographic detail and then by relating the interpretation of those observations back to the historical literature. This methodology is a multi-disciplinary, skycapes approach, as advocated by Fabio Silva et al. (2015), and draws widely upon the humanities ranging from anthropological auto-ethnography (Davies 1999), reflexivity (Hufford 1995) and phenomenology (Tilley 2004) to traditional archaeological surveying, both in the field (Ruggles 1999) and virtual (Henty 2015). Whilst the sky and cathedral are considered as primary sources, the mythological and astronomical provenance of white birds within the cognitive environment of Chartres - which was Neoplatonic, theological and scholarly - are considered philosophically and historically (McCluskey 1998).
REFERENCES

THEORY AND METHOD IN THE STUDY OF THE IMAGES OF THE SUN AND THE MOON IN THE VISOKI DEČANI MONASTERY, KOSOVO

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ABSTRACT
This lecture presents research on the celestial-religious images in the Visoki Dečani monastery in Kosovo, with the focus on the images of the Sun and the Moon in the fresco The Crucifixion of Christ, which contain human figures. Other celestial elements in the Visoki Dečani monastery are also explored, including additional paintings depicting figures inside celestial bodies.

The Serbian fourteenth-century Visoki Dečani monastery was painted during the ascent of the Serbian empire, during which time it established intensive cultural interactions with neighbouring countries. The influence of the Hellenistic culture can be seen in wall paintings of the Greek philosophers Plato and Plutarch, in the neighbouring church Bogorodica Ljeviška and presumably in paintings of Saint Plato in Visoki Dečani and other Serbian fourteenth century monasteries. In the Lesnovo monastery, a painting of the Moon with a human figure inside seems to closely resemble the image of the Moon from The Crucifixion fresco. Various other frescoes of the Visoki Dečani monastery and the Bogorodica Ljeviška church also portray the Sun and the Moon containing figures.

This research study concentrates on possible explanations why the images of the Sun and the Moon in the fresco The Crucifixion of Christ, which incorporate human figures, were painted and what these images could possibly represent. The research methodology consisted, firstly, of a site visit to observe the primary sources – the images themselves. Because this is an active...
Christian Orthodox monastery, authorisation was requested from the church authorities and permission was obtained to make observations and to take the necessary photographs. A professional photographer was employed, who used a Canon Eos 6D camera for this purpose. The photographs were composed in the High Dynamic Range or HDR style in order to stress important details in the highlights and shadows, as well as the usual details from a standard exposure.

During this investigation, special attention was given to the position of the frescoes that contain celestial elements: their orientation in accordance with the four cardinal directions, but also their position in relation to other frescoes. The detailed observation of the photographs as well as the positional relationships between the frescoes formed the primary source material. This material was then compared to what other scholars had written about these images, as described in the academic literature. Finally, all these findings were compared to similar images in other Serbian medieval churches.

When compared to one another, the images of the Sun and the Moon from The Crucifixion fresco have a lot of similarities to other frescoes dating back to the same period and figures inside look like all other figures which present souls, and the only difference is that those figures have no wings and they have some clothes. The face expressions and the lines of bodies of the figures from the Sun and the Moon from The Crucifixion are very similar to those from planets from Lesnovo or souls from the Bogorodica Ljeviška church, which leads to a suggestion that they could present the souls of the Sun and the Moon.

This presentation concludes that the images with human figures from The Crucifixion of Christ fresco and other celestial images in the monastery Visoki Dečani are the product of the synergy of Serbian, Byzantine and Hellenistic cultures which resulted in the original and unusual figures.

EDWARD BURNE-JONES’ THE PLANETS

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ABSTRACT

In 1879, Angus Holden (1833-1912), Baron of Holden and British Liberal Party politician commissioned Edward Burne-Jones and William Morris a decorative cycle of The Planets for his Victorian mansion built in 1866, called Woodlands, outside of Bradford, UK. The house was destroyed before 1935, but the cartoons have survived.

Edward Burne-Jones was fascinated with astronomy as noted in his memorials and accounts. He executed the cartoon drawings in 1879 for the artisans of the William Morris Firm and Co. to transform them into stained-glass windows. These cartoons consists of the following planets: Venus (BJ 341); Luna (BJ 345); Morning Star (BJ343); Evening Star (BJ 342); Saturn (BJ 344); Mars (BJ 346); Earth (Terra); Luna (BJ 355); Jupiter (BJ354); and Sol (BJ 353).

Today, seven of the cartoons are in the Torre Abbey Museum in Torquay, UK, while the cartoon for Mars is in the collection at Birmingham Museums, UK, and the drawing Morning Star at Lady Margaret Hall in Oxford, UK.

This paper aims to examine visually these cartoons/drawings and provide an explanation for their intricate representation of the planets and constellations. Burne-Jones’ writings account such as the records at the Fitzwilliam Museum of Art in Cambridge, UK, and the recollections of his wife, Georgiana Macdonald (G.B.J. The Memorials of Edward Burne-Jones [London: Macmillan, 1904]) assist in the understanding of the scope of his interest in astronomy. Whereas, the astronomical books that he collected and viewed in England (British Museum) and in Italy contributed to his creative quest. William Morris, for example, his closest friend and business partner, gifted him a copy of Francesco Colonna’s Hypnerotomachia Poliphili (The Dream of Poliphilo [Venice: Aldus Manutius, 1499]) for his wedding. William Lassell’s
discovery of Uranus’ moons (Ariel and Umbriel) in 1851 and the numbers cartographic maps and playing cards (Rev. Richard Bloxam’s Urania’s Mirror (London: Samuel Leigh of the Strand, 1825, and subsequent editions) further contributed to Burne-Jones’ passion for astronomical imagery, hence scientific culture provided impetus for artistic media.

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**MARCANTONIO RAIMONDI’S ZODIACAL SIBYLS AND THE LIMITS OF ICONOLOGICAL INTERPRETATION**

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**ABSTRACT**

I propose an in-depth analysis of the engraving usually called “Two Sibyls and the Zodiac” by Marcantonio Raimondi, probably modeled on an original drawing by Raphael. After a review of previous interpretations available in literature I will present further hypotheses, showing how different possible astrological meanings of the image may superpose and converge towards a single scenario related to astral divination and prophecy, an ambiguous visual strategy adopted by many painters of the Renaissance. Such scenario finds its plausible historical justification in the politics of Leo X and resonates in other contemporary works of art commissioned or inspired by the same pope, offering a fascinating example of mediatic warfare based on the science of the stars just a few years before the feared planetary conjunction of 1524, often labeled as the first mass-media event in European history. The analysis stimulates a discussion about the methods of iconological interpretation applied to astral art with reference to the general studies by Panofsky and Gombrich.

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**THE CEILING OF SENENMUT; REVISITING ALEXANDER POGO’S THOUGHTS ON DATING**

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**ABSTRACT**

The ceiling of Senenmut at Deir el Bahari (TT 353) of the eighteenth dynasty has attracted a great deal of scholarly comment, as well as popular speculation, concerning whether the ceiling contains a date within its astronomical features. The tomb is known to be constructed within the reign of Queen Hatshepsut who reigned for fifteen to twenty years in the first half of 15th century BCE. One of the earliest commentaries on the ceiling came from Alexander Pogo in 1930. Pogo proposed that the planetary names could such suggest planetary phases (Pogo 1930: 323). However, scholars exploring this idea, along with any other positional clues to the planets focused their search for the period around the believed date of construction. Varying levels of failure in this regard led Juan Belmonte and Mosalam Shaltout to dismiss the opinions on the date as too speculative, and conclude ‘that the astronomical ceiling of the tomb of Senenmut at Deir el Bahari does not represent any real astronomical event but rather a schematic celestial diagram that might have been used to previously to decorate water-clocks’ (Belmonte and Shaltout 2005). This paper, however, returns to Pogo’s suggestion and investigates the planets on the Senenmut ceiling for their potential for giving planetary phase information without being limited by the time of construction. The method employed for the research was to scan for a period of a hundred years around the possible construction date. This was achieved by building an ephemeris for the period and then scanning this data set for any planets holding a particular angular relationship to the sun. The potential dates were then checked manually by using a planetarium to observe the planets in relationship to the horizon and the sun for the dates in antiquity. Although information on the phase of a single planet is insufficient to offer
information around a date, when the three planets are set in a particular pattern of phases, matches with the real skies are quite limited. With this approach there were only three possible dates that conformed to the planetary phase data of the ceiling with only one of these dates offering a complete match. This date fell into the generally accepted period of Queen’s Hatshepsut’s birth.

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EVIDENCE FOR THE SEPTARIAN PACKAGE ALONG THE ATLANTIC FAÇADE: CONFIGURING THE LANDSCAPE WITH A METROLOGICAL SPRACHBUND
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ABSTRACT
As an introduction to the Septarian Package and how it can act to configure the landscape, we begin by recalling that a large number of cromlechs have survived in Iberia, especially in the Pyrenean zone, where 1,104 of these structures have been recorded. Most of these cromlechs are located in highland pastures and present a circular structure with diameters ranging from 1–20 m. Twenty cromlechs in this area have been excavated and dated by C-14 from the Late Bronze Age (1,300–700 BCE) and Iron Age (800 BCE to 50 CE). These structures form part of a set of well documented pastoral sociocultural practices that also include the Basque sarobeak, that is, stone octagons, irregular octagons laid out around a center stone with eight uprights on the perimeter, aligned to the cardinal and intercardinal directions. Although only a few of the sarobeak have been excavated, the oldest C-14 dating so far is 900 BCE which means that, viewed chronologically, the agro-pastoral social collectives who constructed the stone octagons are the same collectives who built stone circles nearby, regularly located in close proximity to the sarobeak. The deeply entrenched architectural design of these structures which date back to the Late Bronze Age, allowed them to survive into the 21st century while their dimensions have been specified by law for over five centuries, starting with the earliest Basque law codes. Moreover, their design is an overt expression of the utilization of septarian units of measure, standards of seven and multiples of seven, units that fit into a more encompassing Septarian Package that includes linear and surface measures as well as a septarian league and manifests itself in the architecture of the stone octagons and in the mindset of those who constructed the cromlechs adjacent to them.

All along the Atlantic façade there is evidence that similar septarian units were employed, suggesting a continuity of metrological practice and more particularly the association of the Septarian Package with agro-pastoral practices. Units of measure, based on seven and its multiples, structured the laying out of traditional landholdings not only in the Basque Country, but also in France, Normandy, Ireland, Scotland and even England. That elements from the Septarian Package have survived in these zones raises a question: are they an indication that the Septarian Package might have a much deeper time depth and, as is the case of the Basque Country, that it might be a survival from even earlier efforts to cognitively configure the landscape? When highly distinctive units belonging to a well-structured metrological system are encountered in contiguous geographical locations, this often implies the existence of a type of metrological Sprachbund, a zone in which social collectives are dependent on a particular system of communication which permits the recording, storing and sharing of information in a consistent and meaningful fashion. In short, its employment involves a tacit agreement on the part of the users in the same way that the use of a common language involves a tacit agreement on the part of speakers and confers significant communicative advantages and benefits to the social group.
REFERENCES


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THE WORLD TREE: CATEGORIZATION AND READING OF AN ARCHAIC COSMOGRAPHIC CONCEPT

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ABSTRACT
The globally widespread symbolism of the World Tree is well-known. There already exist studies based on different fields of expertise. However the concept of the World Tree is not really probed and checked in view of contemplable astronomical references. Moreover a distinct working out of varieties and similarities with respect to geographical locations, periods, ecosystems, and cultural properties is missing. The aim of this study is to catch up on that must. The methodology is interdisciplinary and mainly based on the different approaches of the science of comparative mythology (including classification and clustering), studies of rituals, survey of archaeological monuments, botanical facts, and socio-anthropological considerations. The research work deals with following topics: Core elements of the World Tree concept (crown, stem, branches, roots, fruits / zental and polar world axis, cosmic strata, centre, cardinality); the World Tree and its derivatives or equivalents (e.g. the World Mountain, a stag’s antlers, a step ladder, other plant species, etc.); the concepts of the inverted and the symmetrical doubled tree; the World Tree as Tree of Life (related to water, fire, sperm, and light); the possible relation of the World Tree to the Milky Way; multiple World Trees (trees at the cardinal points; World Trees dedicated to Sun and / or Moon; the World Tree and the raptor-reptile motive; links between World Tree, World Mountain, and World Cave; World Tree and cosmic fire; birds associated to the World Tree; the shooter and the World Tree; World Tree and primeval sacrifice; the World Tree as a symbol of power; the World tree and the changing time cycles; New Year Festivals; certain rituals connected with the World Tree concept; the destruction, in particular uprooting of the world tree and the topic of a cosmic catastrophe (e.g. mostly a flooding); the symbolism of the World Tree related to spiritual concepts.
As a result it becomes apparent that the concept of the World Tree served as an archaic and ancient, very impressive, mnemonic well-suited means for interrelating important astronomical parameters of a cosmographic framework.

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AN INVESTIGATION INTO FOLKLORE ASSOCIATED WITH BRONZE AGE STONE CIRCLES OF KERRY AND CORK, IRELAND
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ABSTRACT
This presentation will discuss the results of a case study on Axial Stone Circles (ASC) folklore. There are some hundred ASCs in Cork and Kerry that are unique in structure: they have one stone, called the recumbent stone which lies on its side, and opposite it are two portal stones. The total number of stones is always odd: half of the ASCs have five stones while the rest have seven to nineteen stones.

The building of stone circles is part of the people’s expression in the past and this vernacular architecture is thus part of folklore like written narrative, oral narrative and performances. Early-Irish and recent literature has been studied for references to ASCs. Furthermore interviews have been held with some forty persons who are close to ASCs; in a physical or mental sense. Several performances have been witnessed at ASCs, such as offerings and gatherings at solstices. Quantitative and qualitative research was used with a flexible approach, to allow for growing knowledge.

The psychotherapist Karl Jung defined knowing and perceiving as the rational types of awareness, and intuition and sensation as the irrational types of awareness. The combination of these two awareness types results in four directions: scientific, mythic, artistic and pragmatic. According to Jung and others these four directions describe the way how humans perceive the world and express their position in the world. Jung stresses that it is essential to see these four directions as complementary and not as competing. To get a rounded view of the world, the methodological approach is based on respecting these four directions.

The scientific direction is covered by studying the ASCs’ morphology, position in the landscape and skyscape. From skyline analysis it appears that the ASC builders did not prefer a specific skyline. The central axis of the ASC sometimes points sometimes to astronomical events, but that does not look significant. An initial study of the altitude - declination graphs of the ASCs’ skyline, shows though that a future investigation might be warranted relating to horizon features.
The second is the mythic direction. Interviewees think that the pagan and Christian religions used the monuments to express their world views. The Christian Church even saw the ancient temples as contested space, as they forbade or transformed them. There is a belief of superstition (piseog) around ASCs.

The fulachtaí fia, possible cooking pit, seen near some multi-stone ASCs, might have mythological links. A trench in the ground, holding a broth of meat and cereals, seemed to have been used as a bath for the to-be-inaugurated king. Irish kingship was closely linked to a divine marriage or hieros gamos with an earth goddess. Although kingship was not yet practised in Middle and Late Bronze Age, a possible hierarchical society might already have emerged as the number of stones in ASCs could be linked to the size of population groups.

An artistic direction in and around ASCs can be recognised in artistic expression on the stones or possibly though the stone's forms. Coincidently Bronze Age Class II horns are concentrated in this region. Offerings and performances at solstices have been seen by the author at several ASCs.

The pragmatic direction gives an indication how ASCs were used. Some examples mention their possible use as temples for celebrating Mass and other rituals. Quartz, in the form of monolith or veins in stones, is present at many ASCs and is possibly linked with death and sídhe (mounds) dwellings, used by Otherworldly people. Other experiences are: ASCs could be doorways to another time / space; or a person can sense a change in environment, such as temperature or sound, upon entering an ASC. Typically modern stone monuments are built to express cohesion or remembrance.

Looking in these four directions, ancient (and new) monuments achieve a symbolic meaning. Jung states that it is important not to use the same paradigm for each direction, as that would degrade the uniqueness of each direction. One might be able to explain in a scientific direction some of one’s feelings inside an ASC, but interviewees express there is more between heaven and earth. All these expressions accumulate in numinous experiences of interviewees.

The research did not recover many stories relating to ASCs and if found, the stories were very short. There might be a tendency for people to recognise folklore in Frazer’s definition ‘as a leftover of past cultures or courtly sources’, but the Bronze Age stone circles of Kerry and Cork are certainly enchanted places in the present day, as offerings and solar and lunar celebrations show. Many people recognise the Spirit of Place as expressed by their numinous feelings.
MONDAY EVENING
SOCIAL

Monday evening 6 – 7.30 pm
THE UNIVERSITY OF WALES TRINITY SAINT DAVID
invites all SEAC2016 delegates
Wine and Nibbles at the Herschel Museum of Astronomy
19 New King St, Bath BA1 2BL
THE 19-YEAR CYCLE IN THE DEAD SEA SCROLLS
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ABSTRACT
This paper is a continuation of my research on the zodiac calendars in the Aramaic Dead Sea Scrolls. It will argued, based on my 12-month reconstruction of the fragments of 4Q208-4Q209 that the calendars function according to the 19-year cycle. Earlier scholarship postulated that the Aramaic text 4Q208-4Q209 followed a three-year cycle, as is the case with the 364-day Hebrew calendrical scrolls from Qumran, as far as is known. However, the reconstruction demonstrates that the Aramaic calendars followed a different system.

The methodology is related to the calendars' reconstruction: the position of the winter solstice in the fragments indicates that a 19-year cycle is represented. Comparative and mathematically reconstructed data will be shown to demonstrate the argument.

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MYTHOLOGY OF THE PROSE EDDA INTERACTING WITH THE SKY
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ABSTRACT
It is well established in memory studies that structures, man made or natural, buildings and landscape can serve as a storehouse for memory; that people associate what they want or need to remember, such as names, poems or stories, to something physical, be it real or imaginary. By thinking oneself through these "storehouses" people can then retrieve what they want/need from the different "locations" or "shelves" – depending on how far we want to take the metaphor. When travelling in the physical world, the landscape that people pass through can thus serve as a cue for certain stories, explaining place names or narrating events that are said to have taken place there. This line of thinking has been applied to the secular part of Old Norse literature by looking at several earthly phenomena mentioned in the texts. In my paper I will look at the sky above us, which can in many ways serve as a similar aid to the memory as structures on the ground. This applies in particular to texts with cosmic dimensions such as the mythological material in the Gylfaginning of Snorri Sturlason's (1178/9-1241) Edda, written in Iceland in the early 13th century. Seen from a phenomenological perspective the sky is a gigantic dome above us, explained as Ýmir's head in the Norse mythology, where a mighty tree can be observed or at least narrated in and above the sky, and where also many named mythological locations and characters are literally to be found. In my paper I shall go through direct references to locations in the sky in Gylfaginning and put them in the context of memory technique and ethnic astronomy as it is expressed with mythological vocabulary in cultures around the globe. By explaining Snorri's mythology in light of findings in ethnic astronomy we are able to understand
why the people of Iceland could still be telling mythological stories in the 13th century, just over 200 years after the official acceptance of Christianity the country.

THE CONCEPT OF SHIRK
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ABSTRACT
In this paper, we trace the early and later history of the concept of Shirk (rhymes with French cirque, not with English shirk). It is a standard job of philological research within the history of ideas, as well as philosophical "concept clarification". We illustrate it with examples both from the time and culture when the corresponding phenomenon was indeed given that name, as well as from modern European astronomy.

The Semitic word Shirk, first known from inscriptions in Ugarit (ca. 1500 BCE), means “the act of associating”, viz. of a deceased king or hero with a star/god. As suggested by the star-shaped hieroglyph for Sumerian Dingir and Semitic El, like of the etymology of Sanskrit Deva (“radiant one”) and the meaning of Chinese Shangdi (“powers on high”), the “gods” or “heavenly hosts” simply referred to the starry sky, the physical manifestation of the pantheon. When somebody had earned fame, he became part of the collective consciousness, just like the starry sky. After his death, his fame survived him, and so he was still part of the collective consciousness, now no longer as a living presence but as a memory rendered visible through identification with a specific star. Or in theological parlance: through association with the god located in that specific star.

The Greek word Apotheosis, “elevation to godhood”, has roughly the same meaning, with the small differences being as instructive as the general similarity. Shirk is the physical form of what the poets have called Kleos Aiptiton (Greek) or Shravas Akshitam (Sanskrit), “undying fame”. While Semitic polytheism is long dead and practically forgotten, ancient and early modern European astronomy give some well-known examples, as does Hindu astronomy. However, after Islam condemned the worship of the stars as the common form of polytheism, in the Bible, star worship is still explicitly allowed for the non-Israelites, in the Qur'an it is universally forbidden. Within monotheistic theology, it had come to mean “association of a creature with the Creator”. This way, Shirk evolved from a near-universal practice of connecting the stars with the collective consciousness, to the sin par excellence against monotheism. Which didn't prevent the Islamic world from developing its own very successful form of stargazing.

NEW POETICS OF THE COSMOS: ASTRONOMY IN FICTION
2000-2015
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ABSTRACT
While literary Science-Fiction related to Space continues its decline in sales performance if not in terms of quality and popularity, astronomy and cosmology are slowly spreading in mainstream fiction in this beginning of the XXI century. In fact historical recreations and fictional biographies of astronomers of the past increase in numbers, ever more astrophysicists become writers and at the same time cosmic and heavenly metaphors invade novels and short stories in a long time sought for process of assimilation of scientific culture. In this brief critical review I will illustrate this trend for the last fifteen years, especially in the anglo-american
market, yet above all I will discuss the increasing relevance of storytelling in and for the scientific discourse both from the perspective of literary theory (as aptly suggested by Hallyn, 1987) and from the point of view of science communication (as recently attempted by Trench, 2015).

MONOTHEISM VS PLANETS: THOUSAND-YEAR WAR ON ASTRONOMY

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ABSTRACT

Once the conquistadors consolidated their grip on the Maya, native codices were consigned to flames by Spanish clerics because they contained “lies of the devil” (Clendinnen, 2003). The thousand-year old writing system of the Maya was wiped from memory and had to be painstakingly deciphered, mostly in the last century. What devilish content did those books hold? One of the few Maya codices that survived – the Dresden Codex – tells of the movements of the Moon, of Venus, of Mars, and of the 365-day circuit of the Sun (Tedlock, 2010). Since the Wanderers in the sky were considered gods in polytheistic Maya cosmology, such heretical knowledge had to be eradicated. This was not the first time that polytheistic astronomical knowledge faced destruction. When monotheism came to power in the Roman Empire, edicts of Theodosius (c. AD 391) and his successors shut down ‘pagan’ temples and forbade the performance of ancient rituals under pain of death (Pharr, 1952). Those rites had embodied astronomical knowledge for a thousand years: “It is clear that astronomy did play a crucial role in Greek religion and cult practices. The nocturnal character of some Greek religious festivals (e.g., the Aethephoria, the Eleusinian Mysteries, the Thesmophoria)… suggests the importance of the celestial dome… integrating the sky in the cult experience.” (Boutsikas, Ruggles, 2011). Once the Theodosian edicts went into effect, religious zealotry spread across the Empire: “The burning of books was part of the advent and imposition of Christianity. Malalas, the Antiochene chronicler, describes another scene, under Justinian and in the capital of the Empire, which had numerous parallels: ‘… in the month of June of the same indication, several Greeks [that is, pagans] were arrested and taken forcibly from place to place, and their books were burned in the Kynegion and so were the images and statues of their miserable gods’… The Kynegion was the place where the corpses of those condemned to death were flung.” (Canfora, 1990). From the book burnings at the end of the Roman Empire to the book burnings in Mesoamerica, the war on astronomical knowledge lasted more than a millennium. In Europe, Copernicus was afraid to publish his central work until just before his death in 1542. With good reason, it turned out, as Giordano Bruno was burned at the stake in Rome in 1600, mostly for his belief in the multiplicity of worlds (Martinez, 2014) – like the exoplanets that are now being discovered with space telescopes. And the Inquisition condemned Galileo to house arrest until his death in 1642, for deductions that supported the heliocentric hypothesis of Copernicus and observations of the multiple satellites of Jupiter, king of the pagan gods. The methodology is an examination of texts that survived, as well as traces of texts that did not.
SURREALISM, ASTRONOMY AND ASTROLOGY: THE ESOTERIC ART OF XUL SOLAR
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ABSTRACT
In an interview in 1968 André Breton, the author of the Surrealist Manifesto, reported that ‘The surrealists generally took a lively interest in astrology, seeing it from a poetic perspective, without going very deeply into it’. He added, ‘What I've always valued enormously in astrology is not so much the lyrical game to which it lends itself, as the multi-layered logical game which is a necessary part of it and on which it is founded’. This paper will explore the work of the Argentinian painter Oscar Agustín Alejandro Schulz Solari (1887–1963), who adopted the esoteric pseudonym Xul Solar. Solar is a national hero in Argentina (his museum in Buenos Aires is a regular destination for organised school outings), but is little known outside his native country. He visited Europe in 1916 and stayed for some years, becoming friends with Aleister Crowley and exhibiting in Paris in 1924, the year in which Breton published the first Surrealist Manifesto; although he returned to Argentina later that year, his work should be considered as a major part of the surrealist current in early twentieth century painting. Solar was a practising astrologer and a number of his paintings contain overtly astrological themes, featuring idiosyncratic portrayals of the zodiac signs and planets. This paper will examine the astronomical features in Solar’s work and will consider the wider implications of the role of occult and esoteric stands in twentieth-century art for our understanding of the nature of modernity.

THE SKYSCAPE PLANETARIUM
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ABSTRACT
Communicating scientific topics in state of the art exhibitions frequently involves the creation of impressive visual installations. In the exhibition “STONEHENGE–Hidden Landscape” in the MAMUZ museum in Mistelbach, Lower Austria (MAMUZ, n.d.), LBI ArchPro presents recent research results from the Stonehenge Hidden Landscape Project (e.g. Gaffney et al., 2012). A central element of the exhibition which extends over two floors connected with open staircases is an assembly of original-sized replica of several stones of the central trilithon horseshoe which is seen from both floors. In the upper floor, visitors are at eye level with the lintels, and on a huge curved projection screen of 25x4m size which extends along the long wall of the hall they can experience the look out over the sarsen circle into the surrounding landscape.

Our latest improvements to the open-source desktop planetarium program Stellarium (Stellarium, n.d.) allow its use in this setup best described as “Skyscape Planetarium”. The projection, configured with 5 projectors, is limited to the horizon area, but shifting the horizon up or down as required allows the display of celestial objects in a maximum altitude of about 30 degrees, which is however enough for simulating many typical views in both prehistoric and
contemporary skyscapes. In the context of the exhibition, we can present panoramic vistas of the landscape evolving over several millennia, highlighting important phases in the history of, and visiting important sites in the landscape around, Stonehenge in an automated tour. While most of the panoramic vistas are not related to astronomical events, of course views like the iconic summer solstice sunrise over the Heel Stone can be presented in all its glory, using high-quality panorama renderings of virtual reconstructions of Stonehenge and related sites in several phases in their reconstructed landscapes.

In contrast to presenting only a pre-produced panoramic movie, using Stellarium offers the benefit of providing a full astronomical simulation environment. This allows us, for example, to experience and demonstrate the slow shift of the solstice rising points due to changes in ecliptic obliquity. On special occasions, the regular show can be switched off, and an operator can control the application using a new web browser interface on a tablet computer.

The experience of a starry virtual nightscape that fills the field of view on a big wall, first seen a few days before submission, is stunning. The exhibition opened on March 20 2016, and we are going to gather some more experience with this installation in the months to follow, also during “flashlight tours” especially suited for the younger visitors.

REFERENCES


SKYSCAPES OF SACRED SPACES – SITE NON-SITE EXPLORATION THROUGH STELLARIUM
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ABSTRACT
Skyscapes are a combination of landscape, sky, and people in the context of a full place experience (Silva 2015). To achieve a deep place experience emotional attachment is needed. The theoretical framework thorough which a viewer enters the dialogue with place and experiences skyscape through watching is outlined by Daniel Brown 2015a. This experience has been captured and used to create skyscape experiences within Stellarium. However, the viewer will now only engage with a recreation of a skyscape. This challenge offers an interesting field for further investigation.

Skyscapes are encountered and engaged with in a multitude of approaches as demonstrated by Rumbi Mukundu et al. (2016). In this follow-on project we intend to analyse sacred sites and their skyscapes through a comparative approach. We will investigate how the planetarium software Stellarium can evoke and engage a viewer with a skyscape experience that could be described as sacred following examples based upon Land Art practitioners such as James Turrell and Robert Smithson (Brown 2016).

This project proposes the multidisciplinary approach towards skyscape through deeper engagement with place, architecture, landscapes and Land Art in close collaboration between two students from very different research. As methods a phenomenological approach as well as a method described by Goethe as delicate empiricism (Seamon & Zajonc, 1998) will be applied while truly engaging with the skyscape at night and day. This will ensure remaining within the explored phenomenon as required by Goethe.
Impressions and experiences will be implemented into the planetarium software Stellarium creating a non-site experience. We will then explore how viewers phenomenologically engage with this non-site to recreate the site experience. Thereby, we will be exploring the non-site site dialectic outlined by Smithson indicating the benefits of such an approach in light of removing the viewer from the direct site experience.

The scientific astronomical approach to the project will engage with the sites through several observations using astronomical equipment on site including gathering realistic panoramas of the sites for implementation into Stellarium (Brown 2015b). Light pollution surveys will be undertaken around each site to allow the scientist’s path of entering into a site engagement. Scientific astronomical knowledge of observable objects and constellations will be contextualized to the site of interest.

The creative practitioners approach will focus upon phenomenology (Mearleau-Ponty 2002) to engaging with the site, gathering qualitative data through the use of creative practice. The emphasis will be to observe the site through perceptual experience and translate this into creative works (Harty 2015). This work will contribute to the creative and artistic expressions implemented within Stellarium. The phenomenon of the Stellarium output itself will the allow to reflect upon the non-site as introduced by Robert Smithson (Brown 2016).
ARCHAEOASTRONOMY AND CULTURAL ASTRONOMY AS SCIENTIFIC DISCIPLINES: THE IMPORTANCE OF PHOTO DOCUMENTATION
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ABSTRACT
Archaeoastronomy is a discipline born at the intersection of cultural anthropology and the science of astronomy. As such, practitioners apply a variety of approaches. It is agreed, however, that casual naked-eye observation is not enough to convincingly assert the significance of prehistoric structures, alignments, and symbols. Although they can be equally creative, science differs from literary fiction in its preference for hypotheses that can be tested by reproducible evidence.

Digital photography offers the essential tool that bridges the gap between observation and essential documentation. A RAW digital file yields both an achievable image and also embedded and unalterable time/date metadata. We will present examples of the utility of digital photography in our studies of archaeoastronomy in the southwestern United States featuring Chimney Rock Pueblo, Yucca House Pueblo, Yellow Jacket Pueblo, Cliff Palace at Mesa Verde National Park, and Fajada Butte in Chaco Canyon.

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ESTIMATING THE RELIABILITY OF THE DIGITAL DATA ACQUISITION IN CULTURAL ASTRONOMY. THE CASE OF ROMAN NORTH AFRICA
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ABSTRACT
The use of digital geographical systems such as Google Earth, Geographical Information Systems (GIS) or Digital Elevation Models is increasingly common in Cultural Astronomy. Through the use of these techniques we are able to obtain data of the orientation of structures in cases in which is not possible to move to the studied places, or when the horizon is blocked. But, how precise are those data? What is the estimated error that those methods introduce? Are these always the same? And, can we rely on what they tell us?
In the present work we try to estimate how reliable are those techniques. To do so, we have compared a number of data measured in situ in the Iberian Peninsula and the same data obtained by different digital techniques. From the comparison of both data, measured in fieldwork and those acquired by digital techniques, we can estimate the error introduced by using these tools and implement them in following works. These digital techniques include measures of azimuth and angular altitude of the horizon, obtained by ortophotography or by reconstruction of the terrain with CAD software, for example. Bearing in mind all these we can calibrate approximately the precision of the measurements with digital techniques in Cultural Astronomy. This would enable us to use them properly since the errors are better determined.

The results of this preliminary study have been applied in the study of Roman sites in North Africa. Several Roman cities in modern-day Morocco, Libya and Tunisia were measured in previous fieldwork campaigns conducted by members of our group. In addition, data from Roman cities in Algeria were obtained by digital methods since it was not advisable to travel to that country due to the current political climate. The error estimated for these data is based on the results from the former analysis about digital data acquisition. Furthermore, we have compared the results in North Africa with those obtained in other regions of the Empire, as Hispania or Syria. From all these we can broaden our knowledge about Roman urban planning and better understand the way they expanded through different lands, as well as how their culture evolved.

MODELING THE LUNAR EXTREMES
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ABSTRACT
Thom (1978), MacKie (1977) and recently Gough (2013), have claimed that some single standing stones and short stone rows are aligned on distant horizon features which allow high precision alignments on the Sun and the Moon dating from about 1,700BC. This period approximately coincides with the time when large scale monument complexes with relatively low precision alignments, such as Stonehenge and Avebury, cease to be used. If this contrast is correct then it predisposes interpretation to see the claimed high precision monuments as a completely different class of monuments. It predicts that later high precision monuments requiring little labour inputs displace earlier low precision monuments which required enormous labour inputs. If correct then this discontinuity would similarly require interpretive models separate from those for preceding low precision monuments that could account for these differences.

This paper discusses a range of tests to evaluate the validity of this claimed distinction. Site archaeology, the celestial mechanics of horizon alignments, the landscape context, prehistoric environment, the archaeology context found from excavation projects and other researcher’s findings are all considered by 3-D computer modeling (Fisher 2013) and simulations of lunar horizon azimuths during standstills (Sims 2007). The emerging consensus seems to be one of general continuity, not discontinuity, of cosmology from the Neolithic to the late Bronze Age. Where alignments on the major and minor standstills of the Moon, the solstice Sun and some asterisms are found only low precision is feasible and all seem to be part of a long term symbolism displayed in megalithic monuments in NW European prehistory.

REFERENCES
A THEORETICAL MODEL OF MOON AND MILKY WAY AT ANCIENT MEETING PLACES
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ABSTRACT
Insufficient attention is devoted to the Milky Way in archaeoastronomical research, even though it is the third most important object in the sky after the sun and moon. Before the rise of agriculture and sedentism, when roving bands had no fixed landmarks on the horizon by which to judge the solstices, the two arrivals of the full moon at the Milky Way may have served to mark the halves of the year. Based on fits of the computed horizon intersections of the Milky Way to experimental survey, it is proposed that these arrivals were major events in the year. In particular these groups may have had central meeting places, festival celebrations in the days as the lunar phase advanced, and culmination with the Milky Way leading to the full moon high on the southern meridian.

Ceremonial observation of the Milky Way provides an explanation for the purpose of the numerous North American sites with alignments that aim within the regions of the northern and southern horizons where the sun and moon can never appear. Four examples will be discussed. The first in Canton Massachusetts has sightlines to the southern landings of the Milky Way which fit the moon on the southern meridian around 1000 BC, consistent with a nearby Terminal Archaic site. It is the genesis of this model because its date is early enough that the solstices do not fit well, thereby enabling discrimination between solar and lunar models. The Fairgrounds Circle at Newark Ohio is interpreted as the pivot for similar southern observations from the Observatory Circle, Octagon, and Cherry Mound in 1 AD, at the start of Hopewell culture. A polar graph of mound directions at the Lizard Mound site in Wisconsin contains the same two southern directions at a date of 1100 AD, consistent with the era of effigy mound culture. Finally a major alignment of the Yellowjacket Ruin in Colorado, otherwise unexplained, appears to point to the zenith passage of the summer Milky Way also at 1100AD, consistent with the era of Ancestral Pueblo culture.

It can be argued that these sites celebrate the jumping-off point in the Path of Souls myth, where the soul jumps over the ocean at the edge of a flat world and reaches the white path into the sky. This belief exists in the Eastern Woodlands traditions, is thought to be of great antiquity, and to have a Eurasian origin. Possibly it was transmitted in the same package as the bear ceremonialism of Siberia, which also has a North American and Siberian distribution. Similar ideas that may have had the same Eurasian origin include the importance of the intersections of the Milky Way with the ecliptic, which are indeed found in Greek myth as the Gates of Heaven, and the existence of festivals and pilgrimages ending at the full moon.
INVESTIGATION OF SOLSTICE HORIZON INTERACTIONS AT CHACOAN MONUMENTAL ARCHITECTURE
Andrew Munro, Tony Hull, J. McKim Malville, F. Joan Mathien and Cherilynn Morrow
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ABSTRACT
Multiple monumental structures built during the 9th through 12th centuries CE at Chaco Canyon, NM are in locations where solstice sunrise or sunset visually interacts with horizon foresights. The earliest Chacoan structures known to be so located are Casa del Rio, and the “Great Kiva” (29SJ 1253) at Marcia’s Rincon.

We report on the results of compass and theodolite field surveys, as well as photo-confirmation of solstice foresight interactions at six Great Houses. These include two “Early Bonito phase” (850-1040 CE) sites. A June Solstice Sunset (JSSS) horizon marker is visible from Pueblo Bonito, including early (9th century) portions of the structure. December Solstice Sunrise (DSSR) interacts with a foresight visible from Hungo Pavi kiva A, adjacent to the center of the first phase, early 10th century room block. We also confirm solstice horizon foresights at five additional likely “Late Bonito phase” (1100-1140 CE) Great Houses. These include DSSR at Kin Sabe, DSSR at the Pecos Blanco McElmo unit, DSSR at the proposed Chetro Ketl McElmo unit, DSSR at Hillside Ruin, and June Solstice Sunrise (JSSR) at Rabbit Ruin. Hillside Ruin and Rabbit Ruin also participate in inter-site alignments to the cardinal directions.

Integration of this data with previous temporal analyses further highlights contrast in cultural intent between periods. A minority of Early and Classic Bonito Phase Great Houses (850-1100 CE) are known to have been built at solstice foresight observing locations. During the Late Bonito phase, nine of twelve (75%) of newly-built Great Houses are at such locations. Four of twelve (33%) participate in inter-site alignments to the cardinal directions. Two of the twelve (Rabbit Ruin and Hillside Ruin) participate in both the inter-site alignment and solstice observing patterns. One, Roberts Small Pueblo, does not participate directly in either pattern, but is 125m from a confirmed workable solstice observing location.

The Late Bonito building program completed inter-site alignments to the cardinal directions, and constructed Great Houses where people could observe solstice sunrise or sunset interacting with a notable horizon feature. This is direct evidence of common social intent, and of growing importance for cosmology and solar events. These structures may indicate an interest in theophanies, i.e. conjoining the sacred sun at solstice with prominent features of the sacred landscape. They may also indicate centralized leadership by an astronomically adept Late Bonito elite, or a religious revival among the Chacoan people after the great drought of the 1090s CE.
THE ROLE OF SOLAR DEITIES IN IRISH MEGALITHIC MONUMENTS
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ABSTRACT
As the builders of the great neolithic monuments of Ireland left no written records, modern scholars can speculate but never be sure of why they were built and what meaning they held for the people of the time. The only clues we have about how these monuments were viewed, come from the great body of myths that became part of an oral tradition and would, much later, be documented and preserved. Each of four cycles of Irish mythology tell of sun gods and solar heroes and, in every cycle, associations can be found between these solar deities and the monuments, particularly Newgrange, the most well-known monument in the large complex of passage tombs in the valley of the Boyne River, that today is known as the World Heritage Site, Brú na Bóinne. In all four cycles, from the Tuatha De Danaan of the Mythological Cycle to kings of Tara in the Historical Cycle, repeated mention is made of Brú na Bóinne, which was the home of the Sun gods Dagda and Lugh, and the place of the conception and birth of the warrior hero Cú Chulainn.

This presentation investigates the roles the monuments play in the myths and their strong association with mythological solar figures, in order to gain some understanding on the meaning the monuments held for people from different periods of time. The methodology used in the research is that of textual analysis. The texts analysed include scholarship on the archaeology and archaeoastronomy of the monuments and primary and secondary literature on the four cycles of Irish mythology.

HERMENEUTICS OF THE CELESTIAL PHENOMENA: THE SIGNS OF PROVIDENTIAL MISSION OF TSAR IVAN IV GROZNY AND UNDERSTANDING OF HISTORICAL DOCUMENTS
Karine Dilanian
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ABSTRACT
Ivan Semenovich Peresvetov (born in the 16th century, Russia) is an early Russian social critic and one of the major publicists of Russian history of the times of Tsar Ivan IV Grozny (1530-1584). His works are considered outstanding publicistic monuments of XVI Century. He was born to a family of the lower nobility in the Grand Duchy of Lithuania, lived and served in Poland, Hungary and Moldavia during the 1520s-1530s. According to his words, he arrived in Russia in 1538 or 1539.

A collection of Peresvetov’s writings include works of various genres ranging from petitions to the Tsar containing predictions made by ‘Greek Philosophers and Latin Doctors’ to plans for the reorganization of the Russian state, conquest of alien lands and moralizing legends about rulers of Greece, Constantinople and Turkey. He analyzes the nature and structure of the Muscovite
political system, speaks about the destiny of Tsar Ivan IV Grozny and future arrangement of the Russian state. Peresvetov wrote many of his pamphlets in the form of prophetical revelation and prediction.

Though these works are the focus of attention of many historians for a long period, scholars have quite various views concerning their interpretation. They include identification of the author of these papers (some scholars argue that Ivan Peresvetov never existed and the author of these texts was Ivan Grozny himself) and periodization of these works (some scholars consider them written after the events took place) up to the interpretation and understanding of the essence of Peresvetov’s texts. One of Peresvetov’s most enigmatic writings ‘Predictions of Greek philosophers and Latin doctors’ speaks about the Muscovite political system, social-political reforms and destiny of Ivan Grozny in terms of predictions made by the Western wise men, who studied celestial signs at the birth of Ivan IV. A. Zimin, Ya. Lurie and R. Simonov point out to the fact that Peresvetov possibly used some astrological materials, almanacs, predictions about the future of the Russian Tsar or horoscopes that could circulate in the West. These texts have no corresponding astronomical/astrological evidence.

However, the horoscope of Ivan IV Grozny was found in the volume published by Iohannis Garciaei Astrologiaemethodus, in qua secundumdoctrinam Ptolomaei … in Basel in 1576 during the life of Ivan IV. This evidence sheds new light on Peresvetov’s texts and allows considering them from a different perspective.

This study examines Peresvetov’s texts using astrological and astronomical knowledge as a hermeneutic tool for deciphering prophetical and providential statements. Methodology includes analysis based on the astrological delineation contained in the texts available in Europe at this period and comparative study of the corresponding practice of horoscope analysis of the glorified persons of the past and present that became an integral accessory of historical compositions in XVI Century.

NEO-PANBABYLONIANISM: A COSMOLOGICAL INTERPRETATION OF HOMER’S ODYSSEY
Safari F. Grey
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ABSTRACT
In 1794 Charles F. Dupuis ‘came to the conclusions that all sagas of all peoples go back to the creation-myth’. That is, that all ancient literature boils down to a cosmological or cosmogonical myth concerning the structure of our universe. Decades later Edward Stucken argued that the histories of Biblical figures embodied motifs which derived from astronomical bodies, and were spread all around the world as mythical or quasi-historical characters. In short, both these academics believed that ancient religion was encoded within astral myths. Stucken’s student Hugo Winckler adopted the theory of his predecessor and constructed a universal theory from which he could analyse ancient myth and religion. He called this theoretical approach ‘pan-Babylonianism’. The basic tenet of pan-Babylonianism was that most ancient religions are built on astral myths which were borrowed from Babylonia ‘the home of astronomy and astrology’. The flaw of pan-Babylonianism however, – which ultimately brought about its discredit – was that it extrapolated some accepted tenets and affirmed that all religious myths and customs of India, Persia, China, Babylon and beyond are related in some way to astral phenomena.

The unfortunate aftermath of pan-Babylonianism’s collapse has led to decades of academic aversion to astronomical interpretations of ancient texts, especially those from the Near East and Archaic Greece. However, that is not to say that the spirit of the pan-Babylonian school is fundamentally incorrect, merely that the sweeping conclusions drawn by its practitioners are fallible. With this in mind, this paper aims to revive a ‘Neo-panBabylonian’ theory by reading Homer’s Odyssey with a sensitivity to Homeric portrayals of the cosmos, and more importantly,
examine how the characters’ interactions within this cosmos helps provide insight into beliefs about the astronomical nature of the soul in the ancient world.

PLATO’S COSMOS: MISREAD OR DISTORTED?
Sepp Rothwangl and George Latura
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ABSTRACT
In ‘Astrology and Cosmology in the World’s Religions’ (2012), Campion writes that of Plato’s works “two contain explicitly cosmological material: The ‘Timaeus’ includes his cosmogony, and the ‘Republic’ details the soul’s origin in, and return to, the stars.” Cicero held a similar view: he translated a portion of ‘Timaeus’ – the part where the Demiurge creates two intersecting cosmic circles – and he reinterpreted Plato’s Vision of Er at the end of ‘Republic’ as his Dream of Scipio at the end of ‘On The Republic.’ Through the theoretical framework posited by Campion, divergent views of Plato’s cosmology are explored. In Plato’s Vision, departed souls arrive at a pillar of light in the sky while in Cicero’s Dream, Scipio meets his adoptive ancestors in the Milky Way. The Galaxy was seen as the heavenly abode by Heraclides of Pontus (a pupil of Plato, c. 300 BC), by the Neoplatonist Porphyry (c. AD 280), by Martianus Capella (c. AD 400), and by Macrobius (c. AD 400) who, in his ‘Commentary on Cicero’s Dream of Scipio,’ located the gates of the afterlife at the intersections of the Milky Way and the zodiac, the constellations along the ecliptic – the path of the seven Wanderers. This Neoplatonist cosmology is traced back from Macrobius to Cicero and thence to Plato himself. Yet Aristotle, Plato’s pupil, wrote about the Milky Way not in ‘On The Heavens,’ but in ‘Meteorologica,’ ascribing the ‘galaxias kyklos’ to atmospheric phenomena and thus removing it from the heavens. By the Middle Ages, Aristotle’s view was predominant and Michael Scotus would claim that the Milky Way was the abode of the ‘demon meridianus’ that mortals should fear. Through a comparative examination of relevant texts, we examine how and why such different cosmological views emerged.
TUESDAY EVENING
PUBLIC LECTURE

‘Exploring the Monuments and Cosmology of the Boyne Valley. What’s the Bigger Picture?’

Frank Prendergast, Dublin Institute of Technology

7.30 pm Tuesday 13th September 2016
Bath Royal Literary and Scientific Society,
16-18 Queen Square, Bath, Avon BA1 2HN
Entry Free: All Welcome

The Boyne Valley in East Meath, Ireland, is characterised by a low limestone ridge formed by glacial processes during the last Ice Age. South of this ridge and close to where the river enters the Irish Sea, the so-called "Bend of the Boyne" is where the river defines a distinctive U-shape as it traverses the wide flood-plain. Here, the soil is alluvial and highly suitable for grazing and tillage. By about 3200 BC, and several hundred years after the beginning of the Neolithic in Ireland, organised communities were farming in the Boyne Valley. More significantly, they were constructing enormous burial chambers, depositing characteristic grave-goods and embellishing many of the structural stones with elaborate incised art. The landscape siting and axial orientations of the tombs are additionally thought to reflect societal concerns with hierarchy, religious beliefs and a cosmology. This talk will consider these issues in a regional and broader European context.
WEDNESDAY MORNING
ARCHAEOLOGY
Chair: César González-García

RETHINKING NAUALAC, IZTACCIHUATL, MEXICO: FROM ANIMISM TO ANALOGISM IN MESOAMERICAN ARCHAEOASTRONOMY
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ABSTRACT
The site of Nahualac (3890-3920 m asl) is situated on the western slopes of Iztaccihuatl, a well-known volcano in Central Mexico. It consists of a rectangular stone sanctuary located within the seasonally active small lagoon, and the distinct area where multiple deposits of ritual pottery were found. The piles of stone situated on the borders of the lagoon produce alignments towards the nearby and distant landforms offering broad vistas towards the brilliant white peaks of Iztaccihuatl in the East and restricting the visibility towards the West. The site belongs to the category of high-mountain cult places functioning during the Epiclassic and Postclassic periods (AD 600 - 1521) and is associated with the central Mexican cult of fertility, mountain, and rain.

Though the site was both archaeologically and archaeoastronomically studied in the 1980s, another research project that is commencing this year will enable us to evidence new details. The ritual and worldview meanings of this site will be taken together to discuss the concept of circular causality, the all-encompassing idea of organizing the relationships between the different components of the human world in the Postclassic Mesoamerica. After examining its logical components, I will extend the analysis to discuss the notions of animism and analogism in archaeoastronomy. Using the layout of Nahualac and its astronomical alignments, I will show that it exhibited cultural configurations that can be classified as characterizing analogism rather than animism. My theoretical background is based on Ingold, Descola, Lopez Austin and Martínez-González.

REFERENCES
SAYHUITE, AN INCA SACRED SPACE: A CODED ASTRONOMICAL SYMBOLISM IN THE ANDES
Silvia Motta
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ABSTRACT
In this paper we outline the results of the archaeoastronomical analysis of a center of religious worship Inca; we investigate the presence and the variety of temple orientation trends.

Sayhuite or, Saywite, is an archaeological site located in the Abancay Province, in the Apurímac Region of Peru; it is some 100 km west of Cusco. Sayhuite is regarded as a centre of “sacred space” focusing on the cult of water. It harbours countless architectural remains: terraces, warehouses, fountains, channels, carved stones, a double-jamb doorway, and a platform. The complex is divided into some sectors, but it seems to be organized into two main districts: the upper district and the lower district. In the upper area the Concacha hilltop, where a large platform contains the Sayhuite monolith, a rock with more than 200 geometric and zoomorphic figures, overlooks the valley below. The lower district includes carved stones, a cardinally-oriented platform, and east of it is the Third Stone or Pumalike Stone, called Intihuatana, that is suggested to have astronomical purposes. The paper summarizes the results of a recently accomplished systematic study of orientations in this Inca site, taking in account the ritual, central Inca calendar used for the administration of the Inca Empire. The data have been collected in situ, in summer 2011 and summer 2012, by the authors, and they have been analyzed, obtaining notable results. Subsequently an appropriate statistical study was carried out in order to check their astronomical consistency.

The statistical analysis was performed using the most recent techniques belonging to the theory of the Circular Data that was demonstrated to be the most suitable way in the archaeoastronomical data processing. These techniques have several advantages with respect to the traditional data processing and the results obtained were remarkable. Statistical test have been applied to verify the confidence level of the results obtained. We have focused our attention on the Inca Sacred symbolism during the analysis of the monuments in the Sayhuite area and the archaeoastronomical analysis of the Third Stone was carried out with special care trying to find the real symbolic meaning and using of the carved stone. We would suggest that there could be a correlation between the orientation of some structures and the position of celestial bodies in the sky, as the sun, the moon and the stars.

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WATER, THE SUN, AND LIVING ROCK: THE RITUAL FUNCTIONS OF WATER IN PERU
J. McKim Malville and Kenneth R. Wright
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ABSTRACT
In the search for meaning in the cultures of Peru, one often encounters a convergence of the disciplines archaeoastronomy and paleohydrology. In this paper we introduce the field of paleohydrology into the family of approaches that can contribute to our understanding of the thinking underlying ancient Andean skyscapes. In places such Moray, Machu Picchu, Ollantaytambo, and Tipon, the Inca treated the land with respect and reverence, incorporating natural features of the landscape in their structures, demonstrating thereby an awareness of the natural contours of the landscape that led to skillful hydrologic engineering. These terraced hillsides and their accompanying irrigation networks reveal the genius of the Inca for spatial visualization, which has resulted in their aesthetic terracing and water channeling with optimum slopes and flow rates.

This paper combines the methodology of “reverse” hydraulic engineering with that of archaeoastronomy, and explores the meaning of flowing water at Inca huacas as well as in certain pre-Inca sites. The recent work of the Wright Paleohydrological Institute has documented the ritual functions of water in Moray, Tipon, Machu Picchu, and, most recently, Ollantaytambo and its water temple of Incamisana. We describe the hydrology of the Incamisana with its carefully engineered water channels and fountains. This water temple lies beneath a 320 long cliff, which has been extensively modified with platforms, non-functional steps, horizontal gnomons, niches, as well as the ritual carving of a paqcha. The carving of the rock, illumination by the sun, and the flowing of water were understood as animating the landscape through the process known as camay. We also describe the ritual power of water at the Torreon of Machu Picchu, the Intiwatana of Tipon, the terraces of Moray, the carved rock and fountains of Sahuite, and the ritual baths Choquequirao and Llactapata. Pre-Inca examples hydrological engineering with ritual intent include the re-routing of the Wachequsa River at Chavin de Huantar and the extensive water channeling of the Akapana Temple of Tiwanaku.

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EVIDENCE FOR SOLSTICIAL ALIGNMENTS IN WESTERN SCOTLAND IN THE EARLY BRONZE AGE

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ABSTRACT

Alexander Thom believed that he had found four long alignments (c. 30km.) in the Argyll region which could identify the day of the solstice (Thom 1971: 36-44). Two of these, Kintraw and Ballochroy, are discussed. Doubts have been expressed regarding the possible use of these, mainly because refraction variation would be expected to be greater than the very small daily movement of the sun near the solstice.

An easier method of determining the day of the solstice is the method of ‘halving the difference’. Given a suitable foresight feature, a backsight can be arranged so that a limb of the sun just grazes the feature a few days before/after the solstice. The sun’s daily movement a few days from the solstice is about three minutes of arc, an amount easily observed. Halving the difference then identifies the day of the solstice. Four such sites, which appear to have been set up for this purpose, exist in the region – Brainport in Argyll, Ardnsacross and Gruline on the island of Mull and Scanistle on Islay. Brainport was identified by Euan MacKie; the remaining three by the present author.

There is evidence that a prehistoric calendar existed (MacKie 2009; Gough 2013). By using the sun’s horizon movement and counting days from the solstices the half-way point, identifies the ‘prehistoric’ equinox. Halving twice more would give 16 divisions of 22 or 23 days, or ‘months’ (Thom 1967: 107-117). On both Mull and Islay there are a number of alignments which appear to mark these ‘months’. However since there is not an exact number of days in the year the alignments after a few years would no longer identify the correct day. The only fixed points in the annual solar motion are the solstices. Knowledge of the day of the solstices would therefore enable regulation of a solar calendar.

It is less clear why such a calendar would have been wanted. Identification of the times of the year for farming activities do not require a sophisticated calendar. One possibility relates to eclipse prediction. It is known that there is an eclipse ‘danger period’ of about 20 days at intervals of 173 days (Thom 1971: 15-27). The danger period can in principle be identified during the time of the maximum of the 18.6 year lunar cycle. A moderately accurate calendar would have enabled the 173 day intervals to be followed during the next 18 years.

REFERENCES


CAVES, Liminality, and the Sun in the Inca World
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ABSTRACT
Caves were liminal features of the Inca sacred landscape, connecting this world with the underworld. They were places for making contact with ancestors and the power of creation. Some contain carved steps, which would have been symbolic of movement between worlds. Caves are important elements in the creation mythology of the Inca. In that creation myth the creator god made human beings from rock in the vicinity of Lake Titicaca and sent them through underground tunnels to emerge from caves, springs, and rivers in different places in the Andes. The ancestors of the Incas emerged from the centermost of three caves at a place called Pacariqambo, “The Inn of Dawn”. Every cave may have regarded symbolically as a place of origin.

The Inca considered the remains of deceased to be like seeds (called malki, “seedlings”) to be planted in caves, sometimes intended as offerings for the Earth Mother, Pachamama, as well, apparently, to affirm the non-duality of the living and dead. In their search for riches, the Spanish destroyed the tombs and burials that they could locate and burned royal mummies. Fortunately, they missed some 100 caves discovered by Bingham in Machu Picchu with burials in them. The caves were modest, sometimes only rock alcoves and the burials were not of royalty.

In this study we have investigated all the caves in the Cusco basin associated with known huacas as well as the major caves associated with huacas in the Sacred Valley and Machu Picchu. The number of these natural structures associated with huacas that have orientations to either the solstices or equinox is somewhat surprising. It appears that in the selection of caves to be huacas some preference were given to those with solar orientations. The significance of the passage of the Sun into the dark interior of these caves is not explicated in Inca Origin Myths. The phenomenon may be understood in terms of empowerment and animation of interior spaces, such as is suggested in double-jamb doorways and windows at Machu Picchu and Llactapata.

REFERENCES

THE SOLAR DISCOURSE OF THE WELSH CISTERCIANS
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ABSTRACT
This paper reports on the continuing research of the Welsh Monastic Skyscape Project which considers how the union of sun, landscape, and architecture can produce a theologically charged environment. This paper takes a detailed focus of all extant Welsh Cistercian Abbeys and their theological relationship to sunlight. In 1994, Janet Burton (1994: 159,161) claimed that Cistercian Abbeys supported the theological agenda of saving each individual monk’s soul, and by extension, that this would produce the salvation of the world. Later in 2001, Megan Cassidy-Welch (2001:164) described the Cistercians’ desire to build “the earthly manifestation of
heavenly space, a site that was suffused with celestial longing’. This paper considers these Welsh Cistercian monastic sites and rather than utilizing a statistical approach, as recommended in 2015 by Stephen McCluskey (2015:1709) we drew instead on the approach suggested by Hugh Benson in 1957 (1957:205-213). Our methodology was interdisciplinary, drawing together the fields of anthropology, archaeoastronomy, art history, and medieval architecture. This methodology took into account the orientation of the abbey, the altitude of any extant windows of the east and west ends, and how the structure made use of the local topography to emphasise the sun’s light. We then placed these discovered orientations into a cultural context by considering them within the framework of the Cistercian theology and philosophy of sun light.

REFERENCES
WHAT'S THE POINT? THE BASICS OF COORDINATE REFERENCE SYSTEMS, MAP PROJECTIONS & COORDINATE CONVERSION
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Do you know the difference between the World Geodetic System WGS84 and the European Reference System ETRS89? Are the differences significant for fieldwork in archaeoastronomy? Where a site’s coordinates are recorded in a UTM Zone, what does this mean? How do I convert from a position quoted in UTM metres to WGS84 degrees-minutes-seconds? What settings should I check when using a hand-held GNSS (GPS) unit?

This session will address these questions as well as briefly describing the range of surveying instrumentation suitable for measuring position, horizon altitude and orientation.

SKYLINE, AZIMUTH AND ALTITUDE TOOLS
Victor Reijs
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During this presentation Victor Reijs will provide his experiences in trialing and developing programs that provide the skyline profile at a certain location (for instance for use in Stellarium). Furthermore, the experiences with mobile apps to determine the azimuth and altitude at one’s location will also be discussed. The discussion will focus around the evaluation of precision, accuracy, different implementations and usability for archaeoastronomy.

THE STATE OF VIRTUAL ARCHAEOASTRONOMY WITH STELLARIUM
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Stellarium provides the user with a highly realistic simulation of the sky. Many people think that everything in this simulation displayed on the computer screen is correct. But how accurate is it currently for the simulation of historical sky vistas? How accurate is the 3D simulation of foreground landscapes, and how large can they become?
STRUCTURAL CHANGES IN A SYSTEM OF KNOWLEDGE: YORUBA CONCEPTS AND LOGIC FROM PEOPLE’S CONCEPTION OF THE SKY (WEST AFRICA)
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ABSTRACT
For the Yoruba (West Africa), the House of the Sky is the domain of the Supreme God, ‘Olorun’ (Owner Sky). The Earth is the domain of the Goddess ‘Onilè’ (Owner Earth). Between Sky Owner and Earth Goddess are secondary deities sent to Earth by the Supreme God. The Yoruba communicate with the Supreme God through the secondary intermediary deities, the Orisha. Dualistic concept of “twoness” generated sacred logical number values at the origin of Yoruba traditional numeration system. In this paper, we try to make clearer, using foundational archaeology of concepts taken from Yoruba cosmology and number theory, the dynamism of African traditional thought and the accuracy of the stock of knowledge. We demonstrate that the evolution of number concept development - the move from the base five to the base twenty - is cosmology based, is deliberate, psychologically, culturally, and logically conditioned.

AN EXPLORATION OF THE ROLE THE NIGHT SKY PLAYS IN THE LIVES OF THE DARK SKY ISLAND COMMUNITY OF SARK
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ABSTRACT
This research project explores the role the night sky plays in the lives of the Dark Sky island community of Sark in the Channel Islands using the qualitative method of intuitive inquiry. The fields of ecopsychology and environmental psychology look at how encounters with nature may be beneficial and transformative but focus on ‘green’/grounded nature rather than encounters with the sky. Also, Dark Sky supporters claim dark skies enhance wellbeing but do not cite any supporting research. The research question was addressed through exploring the following themes: the human desire to see the night sky, the commercialisation of this desire through astronomical tourism, the nature of nature, fear of the dark, and nature and wellbeing. Data was gathered in March 2014 through a series of eight semi-structured interviews and a focus group on Sark, and e-mail comments from three further participants. In addition, relevant entries from the researcher’s reflexive journal kept during the research process are included. Research findings show a high level of enjoyment and value placed on observing the night sky with others and this facilitating family/community connection, the transmission of sky stories to others, the widespread belief that observing the night sky spontaneously or intentionally results in positive (and sometimes transformative) feelings, the common experience of the night sky evoking childhood sky memories, a universal fearlessness of the dark and a sense that as there is often no visible horizon, there is no differentiation between sky and land and sky and land appear as one. The research therefore has begun to address the missing sky factor within the fields of ecopsychology and health and environmental psychology. The findings can potentially
be used to strengthen the Dark Skies movement’s claims that dark night skies can impact positively on wellbeing.

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THE INTERNET-CONNECTION BETWEEN ROCK FORMATIONS ORIENTED OR ALIGNED TO THE SUMMER SOLSTICES SUNSET AS A EUROPEAN PHENOMENON
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ABSTRACT
Misused by the Nazi regime, archaeoastronomy as well as Summer solstice celebrations were condemned in German and Austria after 1945. But, in 2012 a group of hobby-archaeoastronomers from these two countries established an Internet interconnection between rock formations oriented or aligned to the setting sun at summer solstices. All involved rock formations were mooted to have been sacred sites of a prehistoric sun cult. Could this event have been a revival of a long forgotten sun cult or even of Nazi-traditions?

This presentation explores the motivation of the organisers and participants of one of the following virtual interconnections at the Summer solstice 2014 from an ethnographic and anthropological perspective. Surprisingly, the organisers and participants of this Internet connection between rock formations and mooted prehistoric sacred sites were mainly interested in archaeoastronomy and local history, and not in ideological, spiritual, or religious ideas. Most surprisingly, they felt connected to an assumed Pan-European sun cult which could have been ubiquitous at a time when borders between the European countries did not exist.

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EVOLUTION OF ARABIC ASTRONOMY IN RELATION WITH THE TRANSLATION MOVEMENT IN THE EARLY ABBASID ERA
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ABSTRACT
The so called Arabic or Islamic Culture in the period from the 7th until the 11th century adapted quickly to the cultural environment formed by its surrounding and preceding cultures. This adaptation was in a large extent intentional. First steps included gathering of information via translation and adapting them to the accepted political and/or religious form, to serve the various needs of the political and religious dialogue of the period. This process formed a distinguish style in literature and arts, that came to be known as Islamic or Arabic.

The study of the translation movement that grew with the Abbasiid period and showed its height in the 9th century AD is a way of understanding the tendencies of this period, as the translations had apart from the scientific importance also a fundamental political and religious role in the society of the time. The study of the translation movement focuses firstly on the selected works for translations, that shifted from medicinal treatises to philosophical and scientific works, as this transition is an incite to the priorities and the necessities of cultural thought and political agendas of the period.

An interesting aspect of the translation movement is the translation methodology followed, that illustrates the difficulty of expressing complicated terms in the Arabic language which did not yet contain the necessary vocabulary. The search for adequate verbiage shows similarities with the same process that took place in other cultures. For this issue different solutions where
followed in the translations performed mainly from the Hunayn ibn Ishaq school and the so-called Harran school, where Thabit ibn Qurra is the most notable figure.

Another interesting aspect of the literature of this period is the graduate acceptance of foreign systems that replaced preexisting Arabic ones. This will be shown in the case of Astronomy, as Greek Iconography of the asterisms prevailed and replaced the preexisting Arabic names that derived from their pre-Islamic period. Also the solar aspect of Astrology, and the importance of the Zodiac replaced partially the importance of the “Lunar Mansions” (Anwa). This phenomenon is also linked with contemporary political tendencies, most notably the vision of the Abbasids and the continuation of the Sassanid astrological ideology. There are also religious reasons, as the Anwa systems where deeply rooted in the folk culture of the desert nomads, and with a history of their veneration, which linked them with heathen practices. This polemic against the star worship and the Anwa is also evident in the Islamic religious texts.

The transition period is shown in the case of an almost unknown astronomer, Ibn Qutayba, whose work was influential for the better known Arabic manuscripts in the West, such as the works of Al-Sufi. The importance of Ibn Qutayba is the testimony of this transition between the two astronomical styles, the pre-Islamic and the Greek, as he writes within one generation after the translation of the Ptolemy’s Almagest. Stylistic analysis of his writings as well as the content is a precious gateway into understanding the developments of this period.

ARCHAEOASTRONOMY: “STILL RUNNING AROUND THE SAME CIRCLES” OR BRANCHING OUT?

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ABSTRACT

The theme of this paper is to look at developments within archaeoastronomy and archaeology since Clive Ruggles presented his “30 years on” paper at the Oxford IX conference in Lima. From his opening remarks, Ruggles not only situated archaeoastronomy in the wider field of cultural astronomy but placed it into the social sciences alongside archaeology. Yet, he was concerned that archaeoastronomers were “running round in the same circles” rather than pushing back the frontiers of the ‘interdiscipline’. Nevertheless he believed that archaeoastronomy’s increased emphasis on cognitive factors had allowed it to enter the archaeological mainstream. Ruggles was referring to the inclusion of his relatively short description of archaeoastronomy that appeared in Renfrew and Bahn’s Archaeology: the Key Concepts, published in 2005.

His paper has prompted me to ask two important questions: firstly has archaeoastronomy entered the archaeological mainstream? To answer this I conducted a survey to assess the attitudes of archaeologists. Questionnaires were handed out at the 2012 and 2013 Theoretical Archaeology Group conferences and resulted in 62 responses. To obtain larger numbers I used an online version of the questionnaire using Google Drive which I posted on relevant archaeology Facebook pages. Together with the conference responses I got a total of 195 completed questionnaires. This paper will look at my results and see if the attitudes of archaeologists have softened since the acrimonious debates of the 1970’s and 1980’s about Alexander Thom’s work. It will also look at the results of a similar survey of archaeoastronomers conducted both at SEAC in Malta and online.

The second question is, are we still running around the same circles or are we branching out? Have there been any developments since Ruggles’ 2011 paper? This paper will look at the UK initiatives of the Skyscapes sessions at both the Theoretical Archaeology Group conferences and the National Astronomy meetings and their ensuing publications. Additionally there is the Sophia Centre’s archaeoastronomy module at the University of Wales Trinity Saint David (TSD), now renamed “Skyscape, Cosmology and Archaeology”. In conjunction with TSD’s five
year research strategy, ‘Landscapes, Seascapes and Skyscapes’, a first year BA optional module in the archaeology degree was launched in the academic year 2013-2014. Another development is the launch of the Journal of Skyscape Archaeology aimed to progress a methodological approach to archaeoastronomy which thoroughly incorporates archaeology. The implications of this research for archaeoastronomy, based on my ongoing PhD studies, will be discussed.

**REFERENCES**


AN ARCHAEOASTRONOMICAL INVESTIGATION ON THE TEMPLAR CHURCHES BUILT IN PIEDMONT, IN THE NORTH WEST OF ITALY

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ABSTRACT

The focus of this work is to define the methodology of planning and of construction of the Templar churches built in Piedmont, in the North West of Italy, in order to define the criteria of the astronomical orientations and of the geometry used by the “masters of work” of the Templar order in the drafting of the project.

The Poor Knights of Christ and of the Temple of Solomon (Pauperes commilitones Christi templique Salomonis), a religious military order of knighthood, was founded in 1119 A.D. to protect Christian pilgrims travelling towards the Holy Land and subsequently the order assumed greater military duties during the 12th century. During the Council of Vienne in 1312, Pope Clement V issued a series of papal bulls, including “Vox in excelsis”, which officially suppressed the Order, and “Ad providam”, which turned over the most Templar assets to the Hospitallers.

One of the most important roads travelled by the pilgrims coming from the Northern Europe to Rome, was the “Via Francigena or Romea”, that connected the main places of spirituality of the time, and that consisted of a bundle of routes. A branch descended from the Great St. Bernard, passed through Aosta, Ivrea, Santhia, Vercelli and continued to Pavia and the centers of central Italy, to reach Rome. The “Via Liburnasca” was a connection that linked Turin, and hence the “Passi” of the Val Susa (Moncenisio and Monginevro) with Vercelli, a town crossed by the most well-known branch of the Via Francigena.

In this work we present the results of our statistical analysis of the architectural alignments of a group of Templar churches located in Piedmont, someone lying along the “Via Liburnasca”, measured “in situ” by the authors in the spring and summer 2015. Subsequently an appropriate statistical study was carried out in order to infer their distribution function with the aim to perform an appropriate archaeoastronomical analysis.

Several statistical methods have been employed. Basic tests have been performed with automatic data classification, in order to find natural clusters. The K-means and the Circular K-means (CK-means), have been tested. We have used the Kolmogorov-Smirnov test to analyze the orientation data distributions.

The architectural alignments that we measured in a number of Templar churches, applying a rigorous methodology, reveal that the use of astronomical references at the horizon represents the most viable rationale and outlines the existence of orientation patterns that the Templar Knights used for planning their churches, which is connectable with the “Equinoctial Cycle” religious calendar, and the “Solstice Cycle” religious calendar. At present the research is still in progress.

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ABSTRACT
The presumable importance of celestial orientations for Roman city planning in Italy and Hispania has been examined in recent years whereas in contrast to this much less attention has been drawn towards the orientation of Roman temples. This is especially true for the provinces where Roman culture met indigenous cultures. Augusta Raurica was a provincial Roman veterans colony in the tribal homeland of the Gaulish Raurici and is situated near the city of Basel in northern Switzerland. One of its most interesting features is its large sacred precinct, consisting of both Gallo-Roman and Roman style temples, most of which coexisted within the same time period. The predominant view is to interpret the temples within the area of tension between increasing importance of the Roman imperial cult and traditional worship of local Gaulish deities. To this day however, additional possibilities of understanding offered by a holistic analysis of the temples within the context of their surrounding landscape and skyscape have not been explored, a gap that this study sought to close. A twofold approach was chosen, consisting of an archaeoastronomical examination of the temples’ orientations, and an examination of toponymic folktales which, as is argued, not only support the archaeoastronomical findings but also help to gain much deeper insight into the cosmology of this Gallo-Roman society. Results of this study show that four of the temples, displaying two otherwise unrelated orientations are linked by the skyscape. Indeed, the findings suggest that it was the heliacal rising and morning setting of the Pleiades and the constellation Orion that became decisive for these temples’ orientations. What is more, the Pleiades’ setting point, as observed from Augusta Raurica, is marked by the mountain Planché des Belles Filles, a place name associated with two groups of folktales, elements of which bear resemblance to the mythical chase of the Pleiades by the hunter Orion as told by Greek and Roman writers. The findings of this study thus point to an overall importance of the two constellations not only in a calendaric but also in a ritual context.

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ANALYSIS OF THE ASTRONOMICAL ALIGNMENTS OF THE PALEO-CHRISTIAN BASILICAS IN ROMANIA
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ABSTRACT
Many of the paleo-Christian basilicas are known to exhibit an East-West alignment of the apsis due to various reasons including Christian or pagan religious dogma. The pagan influence can come directly through traditions borrowed by Christianity or indirectly by conversions of former temples to Christian basilicas. In Romania we can find numerous paleo-Christian basilicas especially in the region of Dobrogea between the river Danube and the Black Sea. They are placed in Roman castra and civilian settlements and date back to the IV-VI century AD. While they have been excavated and analyzed from an architectural and historical point of view, little has been done to study their astronomical orientation. The orientation can point out many interesting aspects such as the patron saint or whether or not the basilica was (possibly) influenced by pagan cults dedicated to celestial objects other than the Sun. A solar orientation does not necessarily imply a Sun cult but can rather be used to identify the patron saint of the church by matching the solar azimuth at sunrise with the day in the year it occurs in, hence possibly indicating the saint’s birthdate. Furthermore, since the Moon’s extreme points at the major standstill are outside of the solar arc they can indicate a previous pagan indirect influence if the basilica was in fact a converted temple. This is true for alignments with the heliacal risings of stars positioned outside the solar arc. In these cases such an orientation can motivate further excavations beneath the basilica’s layers.

These sorts of connections have been previously made for temples and basilicas found in Greece and Italy for instance. However, the question is left open for paleo-Christian basilicas found in Romania. In fact, little astronomical investigations have been made on any structures and the archaeoastronomical aspect is often left out. In this work we focus on 19 paleo-Christian basilicas and leave out pagan temples which were not converted. The basilicas are located in Adainelea, Argamum, Calatis, Capidava, Dinogetia, Halmyris, Histria, Niculitel, Sucidava, and Troesmis. Their location is close to the Danube or the Black Sea and with one exception (i.e., Sucidava) all are placed south of the river Danube in present day region of Dobrogea. Our methodology is focused on statistical analysis by relying on the basilicas’ azimuths. The measurements are taken in situ or through the help of Google Earth where access to the site was restricted due to restorations. We also refer to case studies on Greek temples since most Roman castra and towns were built on older Greek or Greek influenced (e.g., native Getae tribes) colonies and settlements. Our analysis has taken into account the azimuth at sunrise in 300 AD and has compared our measurements with the azimuths of the sunrise during equinoxes and solstices at that date. Given the lack of precise instruments (e.g., theodolites) we have relied on measurements taken using digital and magnetic compasses for cross validation. This was acceptable since in the ancient world such precise instruments were non-existing. An average error of 0.5 degrees was taken into consideration.

Results show an obvious tendency to for an east-west orientation with some measurements pointing to the summer solstice, major lunar standstill (at Argamum) and possibly the heliacal rising of the star Castor (at Dinogetia). Such a large concentration inside the solar arc is with high statistical probability not a coincidence. No alignments with the winter solstice sunrise have been identified. The motive behind the lunar and star alignments remain however a mystery with results pointing out some interesting scenarios especially since the basilicas in question are built on settlements known to predate the Roman occupation. It is known that Greeks and Thracians worshipped the moon goddess Bendis but no evidence of her cult at Argamum has been found. In addition to these findings we also correlate the azimuths with the birthdates of the main saints of the time. This final analysis is currently ongoing.
Wednesday evening
6 pm
The SOPHIA CENTRE PRESS
invites you to a reception with drinks and finger food at BRLSI
to celebrate the launch of three new key texts in Cultural Astronomy


THURSDAY MORNING
EXCURSIONS

Thursday 15th September
Bath Abbey with Jon Cannon

Thursday 15th September
Stonehenge with Lionel Sims
ABSTRACT
Theoretical framework: When monotheism gained control of the Roman Empire, ancient polytheistic beliefs and their astronomical connections had to be eradicated lest they tempt souls to heresy and damnation. The Wanderers in the sky had been Olympian gods (Jupiter, Sol, Venus, Luna, Mars, etc.), while the Milky Way was the heavenly abode according to Cicero, Manilius, Porphyry, Martianus Capella, etc. Macrobius wrote that at the intersection of the Milky Way and the zodiac (the path of the Planets) stood the gates of heaven where souls dwelt between incarnations (Commentary on Cicero’s Dream of Scipio). Though much heavenly symbolism in writing was lost, a more durable primary source survived: ancient coins. On Greek and Roman coins, the symbol of the Cornucopia – the Horn of Plenty – appears often, promising abundance and wealth to all who accepted the money. Where did this symbol originate? Roman coins show the she-goat Amalthaea carrying the baby Jupiter on her back, as he grasps one of her horns. The nymph Amalthaea had been entrusted with the care and suckling of the infant. Perhaps the young god did not know his own strength, because somehow one of her horns broke off. Once Jupiter claimed his throne as king of the gods, he placed Amalthaea in the heavens as the star Capella that stands right by the Milky Way. Aratus (Phenomena) and Ovid (Fasti) both wrote of the legendary nurse and her milk in the night sky. A parallel myth tells of an outraged Hera who awoke to find the infant Herakles at her breast, since he needed her milk to become immortal. Hermes had placed him there and when she flung the child away, the spurt of milk became the Milky Way. Long before Neoplatonists embraced the immortal milk of the Galaxy, silver coins of Augustus show his personal zodiacal symbol Capricorn accompanied by the heavenly cornucopia and a celestial globe with intersecting paths (Seaby, 1989: 133) – the zodiac and the Milky Way. Similar coins, from the Seleucid Greek era to the end of the polytheistic Empire, bear the Horn of Plenty as a symbol of heavenly abundance. The methodology involves the iconographic examination of ancient coins, along with an investigation of surviving texts and relevant commentaries.

TIME, SPACE AND SPAN OF CONTROL: HOW COULD A VICTORIAN ASTRONOMER LOCATE A PERSONAL GOD IN AN EXPANDING UNIVERSE?
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ABSTRACT
This paper will argue that historians have failed to appreciate the depth of the significant theological motivations for many nineteenth-century publications which took as their themes contemporary ideas of cosmology and astrophysics. Historiography has now moved far from traditional characterisations of a supposed conflict between Victorian science and religion and towards a much more nuanced discourse of the political, metaphysical and religious contexts in which many books, papers and lectures which we would now broadly term ‘scientific’ were constructed. But, as Stephen Wykstra has pointed out, modern minds tend to be blinkered when we approach such artefacts. We typically commit one of two interpretive errors; either what to
us appears as inductive or metaphysical argument should in fact be read as an underlying (and intended) theological position or that statements which we see as merely formulaic pieties, inserted as an intellectual genuflection, are actually symptoms of a much deeper religious conviction. In the light of Wykstra’s critique, it is important to re-read texts which overtly appear to discuss debates of an astronomical nature in order to determine what theological and metaphysical points are also being advanced and to assess the extent to which these more subjective themes are related to concurrent changes which affected the lives of their authors. One aspect of the private convictions of astronomers that historians have been particularly reluctant to address is the impact that traumatic life events, such as severe illness or bereavement, which preceded or accompanied the creation of theodicies and cosmodiecs, undoubtedly had on changes in patterns of thought.

This paper will explore the nineteenth-century debate about the possible existence of life on other planets and, in the process, will uncover a number of such perspective-altering crises, asking both how historians can approach their impact, and why there has been such reluctance to build them into historical interpretations. In two such instances (Thomas Chalmers, William Whewell) it will be demonstrated that the authors of some seminal tracts on this topic used their persuasive writing and oratorical skills to promote their personal religious positions. Applying this suggested mode of interpretation to nineteenth-century astronomy, and scientific developments in general, we shall be enabled to achieve a greater understanding of the underlying motivations which drove the intellectual history of that era.

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**FRAGMENTARY STAR GROUPS IN THE CONSTELLATIONS DESCRIBED AND IDENTIFIED IN G.J. TOOMER’S TRANSLATION OF PTOLEMY’S ALMAGEST**

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**ABSTRACT**

The paper that is proposed depends on images, on the disposition of Ptolemy’s star catalogue identified among objects mapped onto ecliptic coordinates for epoch +138. Forty-eight constellations and 1022 stars are described and identified in C.J. Toomer’s annotated translation of Ptolemy’s Almagest. The stars are identified by their position on or next to imaginary figures, mostly anthropomorphic and zoomorphic figures related to mythology. In a European and Middle Eastern tradition that is assumed to have begun before the Farnese Atlas of the 2nd century AD these figures have been given a pictorial representation on globes, on astrolabes and more recently in printed atlases.

A pictorial representation can be contrasted with a ‘ball and link’ representation of constellations used in China over a similar period. With a few exceptions the star groupings identified in Ptolemy and now expanded into the 88 constellations in modern scientific use are quite unlike the constellation groupings developed in China, but in the twentieth century the convention of representing constellations by ball and link has been applied to the constellation system in modern scientific use.

In Ptolemy’s description some stars are located as single objects related to the overall imaginary figure. Others are linked together in the text, often described within a numbered group of two, three, or four stars, in some cases merely describing a pair of stars located close together, but in other cases described as forming lines and in a few cases as forming geometric figures. Many of these groupings are integrated into the imaginary figures and with their accoutrements such as staffs, shields, and (in the case of Pisces) fishing-lines. A few stand outside the figures and constitute miniature and separate constellations.

When Ptolemy’s constellations are represented as ball and link figures all the linked groupings identified by number and geometric figure can be broken out as discrete fragments.
within and between constellations. A number of these fragmentary star-groups are found close to the ecliptic pole. Others lie close to the path of the ecliptic. When the constellations are mapped onto ecliptic coordinates for the epoch +138, corresponding to the period of Ptolemy’s catalogue, it can be seen that some of these fragmentary star groups lie close the first points of Aries, Cancer, Libra, and Capricorn in period.

The rule of Tutmosis III dated by the appearance of comet Encke in 1460 BC

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ABSTRACT
During the second half of December 1461 BC and January 1460 BC the southern sky in Egypt was dominated by Comet Encke and on 28 January its magnitude was –6.3 with a very long tail. A remarkable celestial phenomenon is mentioned on a stele at the temple of Amon in Gebel Barkal in Nubia, to the south of Egypt. The terrified Egyptians described it as "an arrow shooting against them from the south". The stele was according to the inscription written in year 47 of Pharaoh Tutmosis III. The text was written as a "royal hymn" to glorify Tutmosis III, and his important victories at Megiddo, in year 33, and Mittani, in year 23, were first pointed out. That the text also mentions a celestial phenomenon during his 47th year, described, as "something similar has never been witnessed", means that it had a great significance for him.

This celestial phenomenon has been considered as a meteorite, but the verbs used suggest a slow evolution, according to Dr. Patrick Wallin, at the Institute of Egyptology at the University of Uppsala, who has studied the original text and made a linguistically analysis. We and some other investigators have come to the conclusion that the text fits best as a description of a bright comet. Comet Halley has earlier been the only candidate, but this hypothesis must now be abandoned, as no certain observations of Comet Halley are known before 240 BC.

In my opinion the description fits very good for Comet Encke. There exist three alternative chronologies for Tutmosis III, and the 47th years of rule dates the text to 1458, 1444 or 1432 BC. However, it is only the appearance of Comet Encke in 1460 BC that fits the description in the text and it supports the high chronology with 1504 BC as the first year of Tutmosis III, and the beginning of the 18th dynasty in Egypt. The high chronology for the end of the 18th dynasty and the beginning of the 19th was supported in Henriksson (2007).

After the impressive appearance in the southern sky above Tutmosis III, Comet Encke moved to the north, and on 8 February 1460 BC it was depicted on the Swedish rock-carvings at Järrestad in the southern province of Scania and at Lökeberget in the western province of Bohuslän. This part of Encke’s orbit is very well defined from 8 passages 1662-1355 BC depicted on Swedish rock-carvings.

During the 1990th the author studied the Swedish rock-carvings from the Bronze Age and found that some motives could be depictions of total solar eclipses, a bright supernova and the appearance of bright comets (Henriksson 1999 and 2005). By comparing the position of the symbol for the eclipsed sun in relation to ships it was possible to establish a series of six different types of ships along the ecliptic. In one case there was a sword pointing towards to the image of the sun during the total solar eclipse in 1596 BC. It was quite obvious that the sword was a depiction of a comet. From the orientation of the swords in relation to the ships it became clear that the orbital inclination was about 10° and the most likely candidate among the known comets was Encke with a mean inclination of 11°. Comet Encke was very bright during the Bronze Age, but today it is scarcely visible to the naked eye. In 1994 the author asked the experts, from the Comet Group in Uppsala, to calculate the orbit for Comet Encke from all available observations since 1786, but without non-gravitational forces. Because the inclination
is so low the author realized that the component of the non-gravitational force in latitude is negligible and a model with one component in longitude is enough. This corresponds to a time shift along the orbit.

A computer program developed by the author has performed the calculations of the corrected orbit of Comet Encke. It has mainly been calibrated from depictions on Swedish rock-carvings and Chinese texts and gives useful results at least back to 2654 BC.

REFERENCES


"INTRODUCTIO AD GEOGRAPHIAM ET SPHAERAM": 300 YEARS ON
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ABSTRACT
This year we celebrate 300 years since Hrisant Nottara’s book “Introductio ad Geographiam et sphaeram” was first published in Paris. The book has already been translated into English by Greek colleagues in order to help contemporary readers get an insight into the scientific knowledge of that time and discover the scientific contributions of a priest who by the end of his career had become the Patriarch of Jerusalem.

The authors aim to portray Nottara starting with the time when he was the private tutor of the Wallachian prince C. Brancoveanu's sons, then working with Cassini I, until his final years when he became the leader of the church. A number of chapters of the book will be analysed in order to shed more light on the advances in science at the time, particularly in astronomy, trigonometry and geography.
ASTRONOMICAL TIME VERSUS SOCIAL TIME: A CASE STUDY FROM ANCIENT EGYPT
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ABSTRACT
The excavation context of a recently unearthed sundial from the Egyptian Valley of the Kings suggests that the object has been used to arrange the labour times of the workmen who were engaged in building tombs. During their work shifts these workmen stayed in stone huts close to the place of their work whereas the actual living quarters were further away certain, in the village called Deir el-Medina nowadays. An analysis of the sundial enables us to derive its potential precision and the fundamental theory behind it. Therefore, we can derive information on aspects of astronomical time in Egypt around 1200 BCE. On the other hand, preserved administrative texts found at the same place and the same time provide us with a multitude of information about everyday life of the workmen and thus with aspects of social time. I will present an analysis of the sundial, the results of an investigation of the before-mentioned texts with focus on schedules (work-shifts, days off, feasts) and how aspects of astronomical and social time match around 1200 BCE Egypt.

ASTRONOMICAL CEILING-DECORATIONS OF ROYAL TOMBS AT THE VALLEY OF THE KINGS IN THE THEBAN NECROPOLIS, EGYPT
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ABSTRACT
There are sixty-four registered rock-cut tombs, including twenty-four royal tombs (KV 1 to KV 64) in the Valley of the Kings, Wadi al-Muluk, in the Theban Necropolis, Egypt. Queen Hatshepsut is the first pharaoh, who started to use this Valley for the royal burial place as far as we know today. She constructed the royal tomb KV 20 for her burial with her father, Tuthmosis I. Since then, the Valley of the Kings was used as the place for royal burials continuously until the reign of Ramesses IX, except for the Amarna Period. Among these tombs, the first appearance of the astronomical ceiling over the burial chamber of the royal tomb was the tomb of Sethos I (KV 17) in the 19th dynasty. Not all the tombs have the astronomical ceiling; for example, the royal tomb of Horemheb (KV 57) has the similar plan as KV 17; however, it has no astronomical ceiling in its burial chamber. The condition of the inner decorations of the tomb (KV7) of Ramesses II who was the crown prince of Sethos I is very poor, and we could not recognize the astronomical ceiling of the burial chamber of KV 7. On the other hand, the funerary temple of Ramesses II, the Ramesseum, has the astronomical figures and texts. There are seven royal tombs with astronomical ceilings, the tomb of Merenptah (KV 8), the tomb of Tawosret (KV 14), the tomb of Ramesses IV (KV 2), the tomb of Ramesses VI (KV 9), the tomb of Ramesses VII (KV 1) and the tomb of Ramesses IX (KV 6) in the Valley of the Kings. The images of the northern constellations, represented in these royal tombs are mirror images just like images we see on celestial globe, except for the image of the northern constellations of KV 17. In other words, they are not drawn from the viewpoint of humans on the earth looking up at the sky, but from the viewpoint of something that is beyond the stars looking down over
the stars. I would like to discuss the development of the astronomical ceilings of royal tombs in the Valley of the Kings in comparison with the first and most precise astronomical ceiling of the tomb of Senenmut (TT 358) in the 18th dynasty and the water clock of Amenhotep III and other examples.

ORIENTATIONS OF LONG CAIRNS OF COASTAL FINLAND FROM THE LATE NEOLITHIC TO THE BRONZE AGE
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ABSTRACT
In the late Neolithic (ca. 3000-1800 BCE), Ostrobothnia in Finland saw an unprecedented increase of monumentality (e.g., Okkonen 2003). The large villages that had appeared in the Middle Neolithic in the archipelago and along the rivers continued to flourish. The economy of the period was based mainly on marine resources, most importantly the seal. Agriculture was known (Vuorela 1999), but grains did not form a substantial part of the diet; the use of grain products may have been related to rituals. Trade relations were extensive (Koivunen 1996).

In the very last phase of the period, the sizes of the houses increased to tens of metres, and they were built on solitary locations on the exposed tips of capes and islands (Mökkönen 2011). At the same time, the so-called Giants’ Churches (the GCs) appeared. They were large (ca. 25-75 m long), rectangular stone enclosures, with several opening symmetrically placed in the walls. The present term, a Giant’s Church, derives from folktales, and the original function of the GCs is unknown. The smallest ones may have been very large buildings, while the largest ones bear a definite resemblance to other large enclosures built in Europe in the Neolithic (Rädderstad 2016). Around the GCs, large circular cairns and conical rakka pits were built, sometimes in dozens. Cairn sites are also known from around the dwelling sites. The GC sites and the villages also often had a large, anthropomorphic standing stone in a central place.

Towards the end of the Neolithic, the climate in Finland started to get colder (Solantie 2005). Simultaneously, the post-glacial rebound caused the shoreline to recede, leaving the former villages in inland. The new coastline had fewer islands and fewer favourable habitats for seals, which increased competition on the resources (Vaneckhout 2008). The situation eventually started a cultural decline. During the very last phase of the Neolithic, ca. 1800 BCE, the GCs were gradually abandoned and a new type of monuments, the long cairns, started to be built on the seashores (Okkonen 2003: 240). The cairn building in Ostrobothnia then continued to the Bronze Age and Iron Age, while the typical outer appearances of the cairns seem to have varied.

In Southern Finland, the late Neolithic was the period of the Corded Ware (CW) culture. It practised agriculture and apparently brought milk in the diet in Finland for the first time (Cramp et al. 2014). The CW people did not build cairns. Towards the start of the Bronze Age, however, the CW was replaced by or transformed into the Kukainen culture and subsequently the Scandinavian Bronze Age cultural horizon, which included cairn building. Cairns of all shapes were then built until the end of the Iron Age.

In this study, the orientations of the late Neolithic and Bronze Age long cairns located on coastal Finland have been measured. The dating of the cairns was based on the height of the sites from the present sea level, a well-known method that is supported by the dates obtained by radio-carbon dating on several late Neolithic and Bronze Age sites. It turns out that the long cairns can be divided into several different classes based on their shape, probable age, location and material, and that the orientation distributions obtained for these classes differ from each other. Based on the results, a number of new hypotheses for the cultural development of coastal Finland in the late Neolithic and early Bronze Age can be presented.
REFERENCES

BALNUARAN OF CLAVA: MIDWINTER SUNSET AND THE MINOR LUNAR LIMIT
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ABSTRACT
The Clava cairns at Balnuaran of Clava are the best preserved Early Bronze Age Monuments of this type and the only cairns exhibiting a tested midwinter sunset alignment, as described by A. S. Henshall and J.N.G. Ritchie (1988). This paper explores the study of these singular monuments from a phenomenological perspective, using the method of measuring windows of visibility as advocated by Fabio Silva (2014) in his exploration of Portuguese tombs. Skyscape archaeology fieldwork started with winter solstice measurements, when the setting sun shone into the two passage-graves. Measured declination windows for Balnuaran Northeast and Southwest passages confirmed the experience, matching Clive Ruggles’ (1999) declination of winter solstice sun’s centre for 2000 BCE. Richard Bradley (2000) suggested a probable construction period from 2200 to 2000 BCE, based on radio-carbon dating from his 1990’s excavations. Ruggles commented that many Clava cairns are lunar orientated, but Bradley stated that lunar alignments at Balnuaran of Clava are imprecise, although the group probably encapsulated more symbolism than other Clava sites. Lunar standstills are defined by Lionel Sims (2006) as the declination measure of the moon’s geocentric extremes, allowing for parallax and refraction. The study found that the Central ring-cairn has rays aligned with northern moonrise and moonset during minor standstill years and orthostats which potentially align with the southern minor lunar limit moonset. This double alignment appears to confirm Sims’ considerations regarding Stonehenge where he concluded that the combination of midwinter sunset and midwinter new moon, during minor standstill years, was significant. Contemplating the longest and darkest night of the year Sims (Jun 2006) suggested it would have been appropriate for darkness ceremonies and was perhaps why the builders phase-locked their economic and ritual routines to lunar rhythms. The unique nature of Balnuaran Central ring-cairn and its special orientation to summer solstice sunrise, as noted by Bradley, generated further research questions regarding the significance of all Clava ring-cairns.
and whether they have greater meaning as life-affirming structures, rather than purely burial monuments.

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THE SPHAERA OF THE SALVATOR MUNDI BETWEEN COSMOGRAPHY AND THEOLOGY
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ABSTRACT
The Salvator Mundi is a topic popular in the religious art of the 15th and 16th century. Its iconography is characterized by Christ mostly shown in front side, blessing with his right hand while holding an orb in his left. This sphere represents the world. While early examples refer e.g. to the traditional concept of so-called T-maps, the preferred depiction chosen in the late 15th and 16th century is a crystal-clear glassy sphere. Sometimes a landscape is embedded, other variants show a glassy sphere with inscribed other glassy spheres, a glassy sphere with the mirroring of a window, a sphere with inscribed celestial bodies, a terrestrial globe etc.

The concepts of depicting the orb of the Salvator Mundi are related to the cosmographical concepts debated at the respective time. New geographical and astronomical discoveries of the 15th and 16th century required adaptions of the cosmographical models which had also to comply with the doctrines of Christian theology. Questions of concern were e.g.: How are the elements water and earth allocated? Which is the nature of the outermost shell of the cosmos? Do celestial spheres exist or not? Does a void exist beyond the cosmos? Is non-material or three-dimensional space beyond the cosmos? The answers to such questions were inextricably linked to theological issues: How the answers could be harmonized with details reported in the Bible which was the obligatory guideline? Cosmographical concepts affected e.g. the doctrine of salvation or the doctrine of the omnipresence and omnipotence of God.

This presentation will center at the Salvator Mundi’s sphere and the variants of its depiction as a mirror of cosmographical and theological questions of the respective time. Iconography as well as history of natural sciences and history of theology with their apparatus of text interpretation will contribute the methodology.

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MINOAN CELESTIAL ICONOGRAPHY – THE MISSING EVIDENCE
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ABSTRACT
Before archaeoastronomical methods were used in researching the Bronze Age of Crete, it could still be assumed that the earliest inhabitants of that island, the Minoans, had developed knowledge of astronomy. We know that they had frequent contact with Egypt and Babylonia from at least the middle of the third millennium BCE and the impressive archaeological remains
of the Minoans indicate that their culture was on the same level as these neighbors. The Minoans probably also had an impressive written tradition, but the writing material seems to have been primarily parchment and the remains are too few and too restricted in content to have permitted deciphering. We have only a few inscriptions on small stone libation bowls or temporary economic notes on raw clay tablets that were burnt in fires caused by accidents or warfare. In contrast we have copious remains of texts and art objects from the Egyptians and the Babylonians and these demonstrate that considerable inroads in astronomy had been made by them. Thus it is reasonable to suppose that the Minoan also had made advances in astronomy.

When we began the first systematic archaeoastronomical investigations of monuments in Crete, we discovered a consistent relationship of all the Minoan buildings in our project, 19, to horizon appearances of the sun, the moon and bright stars at the times of the year that permitted the construction and collating of a lunar and solar calendar as well as a farmers’ almanac. In addition, we discovered a system for the study of the relative positions of the stars to permit navigation during the night that was similar to the one described in Aratos’s Phaenomena.

We have now decided to see if there were a Minoan celestial iconography that pictured the sun, the moon, the stars and the constellations in Minoan art. Were they shown as sacred or revered objects or as parts of the natural and imaginary worlds? We used the art historical method of iconographic analysis for interpreting Minoan art, which consists of fragments of frescoes, small sculpture, engraved stone vases, painted pottery, jewelry, engraved seals and their impressions. Care was taken to sift the Minoan material from the later Mycenaean, which is often taken as Minoan and has caused some confusion. It is possible that there are celestial motifs, such as constellations, that we have not recognized.

After a search for representations of celestial objects, the results were surprising. We were struck by their infrequent appearance and the difficulty in interpreting them. We were reminded of a similar problem in Minoan iconography, that of the missing ruler. Although very surprising when that lack was presented after a careful analysis of previously identified depictions of rulers or priest-kings, it is now accepted by many Minoan researchers.

What can it and the possible lack of representations of celestial objects tell us about Minoan culture and its history? A possible explanation will be offered.
ART, ASTRONOMY, AND THE CELESTIAL POLES: LITA ALBUQUERQUE’S “STELLAR AXIS”
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ABSTRACT
During the Summer Solstice of 2006, renowned Contemporary artist Lita Albuquerque completed an installation and performance on Antarctica’s Ross Ice Shelf titled, “Stellar Axis: Antarctica”. Her temporary installation mirrored the 99 brightest stars above the pole at noon on December 22nd with sculptural equivalents on the surface of the ice. In collaboration with astronomer Simon Balm, photographer Jean de Pommereau and filmmaker Sophie Pegrum, “Stellar Axis: Antarctica” was the first major work of Contemporary art to take place on Antarctica, supported by a National Science Foundation Grant for Artists and Writers.

The sculptural installation of ultramarine blue spheres used the size of each sphere to indicate the brightness of each star, creating a reverse image of the sky. Dark spheres on the white ground were the visual opposite of the bright of stars in the night sky. The performance involved 51 volunteers walking the course of an Archimedean spiral, one of Albuquerque’s key symbolic forms. One year later, Albuquerque completed the “Stellar Axis” project, with a companion piece titled “Ninety Degrees North”. Travelling on a Russian icebreaker, Albuquerque and her team installed 99 ultramarine blue spheres in an ephemeral piece of land art, repeating the performance of the spiral.

Albuquerque’s spiritually inspired approach to art focuses on the phenomenological relationship between space and human experience through the application of scientific methods of observation. Her intent with “Stellar Axis” was to create artwork emphasizing the stellar axis of the celestial poles through ephemeral works of art. Conceptually, “Stellar Axis” represents the axis of the earth as a shaft of starlight connecting the poles thorough artistic intervention and astronomical timing.

This paper argues the importance of archeoastronomy, alchemy, and religion to Contemporary art via the scientific framework of Albuquerque’s project. Using phenomenological methods to analyze images and textual accounts of the installation, performance, and its documents, this study demonstrates the relationship of Albuquerque’s prior work emphasizing astronomy and ritual to the tacit spiritual dimensions of Stellar Axis. This study relies on interviews and selected examples of her work inspired by religion, sacred geometry, and cultural astronomy from around the world to trace the movement of cultural astronomy form the sphere of religion and esotericism into Contemporary art.

Materializing the alchemical maxim “As Above, So Below” in her art, Albuquerque’s body of work consistently attends to the importance of stellar astronomy as a source of connection between humans and the universe. Albuquerque’s emphasis on space, time, and the human body highlights the key dimensions of phenomenology as a method of attuning aesthetic attention on the astronomic

THE MOON AS SUBJECT AND FORM
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ABSTRACT
By means of a deep, aesthetic experience, audiences develop a personal relationship with a subject. They become continually sensitized to it, engaging with it keenly. This paper presents a series of cinematic artworks by the author that take the Moon as their subject and their form. These collected works coalesce a Wunderkammersq archive that investigates our epistemological, ontological, and poetic knowledge of the universe with the Moon as a central theme. In these works, the Moon comes alive with exploration, history, and poetry – a
FRIDAY MORNING – IMAGES & MUSIC

The nature of love, madness, the unknown, and our capacity for the sublime are amongst the intellectual passions that have crystallized around this mysterious object. The subjective and the impassive Moon coexist in these films as a series of poetic narratives formed from collected fragments of songs, films, poems, accounts, and scientific data; the artifacts of humanity’s scientific and allegorical relationship with the Moon.

The first of the series is MOONWALK (2007-10), an immersive, experimental film that characterizes our placid heavenly neighbor as a living, scintillating force. Stemming from the countless photos which comprise lunar atlases, the Moon shatters into pieces and then rebuilds itself. It evolves from its familiar pregnant blackness into a lambent, jittering hive of voices and sounds. Filling an immersive dome, MOONWALK reminds us of the Moon's ubiquity, compelling us to reconstruct our own personal history of our moon. The film reaches beyond the idealized childhood daydreams of the heavens, past the familiar Apollo footage, and into the tender roots of culture weaving throughout our daily personal lives.

METABOOK: THE BOOK OF LUNA (2014), takes the form of an expanded cinema installation, an electronic cabinet of curiosities. A participatory artwork combining the experiential qualities of text, sculpture, interactive media, and cinema, THE BOOK OF LUNA narrates a poetic essay about the Moon’s place in the historical imagination. It follows the tendrils of lunar influences in both the sciences and literature that have Kepler and Galileo at their center, forwards and backwards through time. Science, politics, theology, and the arts intertwine in this investigation. Within the object, stunning orbital film recordings made by the Apollo and Kaguya/Selene missions, archival space-flight footage, and fantasy characters from the lunar stories, combine into an interactive, 3D collage while the craters whisper accounts told by their namesakes as we pass them.

PERICYNTHION (2014) takes its title from the point at which a spacecraft launched from Earth into a lunar orbit is nearest the Moon. Early on in the space program, NASA's original lunar orbiter images were transmitted back to Earth as monochrome strips of information. These were printed, sliced, and taped together by scientists on the ground. The resulting images have an extraordinary texture from this mix of electronic, mechanical, and hand assembly. Likewise, images from the Russian probes of the same period were transmitted back as ghostly video stills of vague shadows. PERICYNTHION emulates the transmission of these first close-ups of the Moon in a remix of these photos, unraveling them so as to reconstruct them over time, layering them into a patchwork orb that is displayed on a spherical screen. The most recent work, BIG MOON HONG KONG (2016), evokes the power, presence, and emotional gravity our Moon commands as a tangible moon unfolding on Hong Kong’s skyline. Created from lunar photographs and archival space chatter, this piece includes views we can’t ever see from Earth, vistas seen only by probes and the astronauts – and perhaps the greater galaxy.

THE NUMERICAL UNIVERSE OF KARL HEINZ STOCKHAUSEN

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ABSTRACT

In 1975 the famous German composer wrote "Tierkreis" (in English "Zodiac"), a cycle of twelve compositions dedicated to the ecliptic constellations. On several occasions he declared that for this as well as for other works ("Sternklang", "Sirius", "Ylem", "Licht", "Cosmic Pulses") he was inspired by theories developed in astrophysics environment and, in particular, he cited the cosmological model of the Big Bang and the article on the origin of chemical elements published in 1948 by Alpher, Bethe and Gamow. Taking up the cosmological theories "in vogue" at the time and by means of a careful mathematical analysis of the score of "Tierkreis", I found evidences of such astrophysical influences in the musical "translation" that Stockhausen...
has given of what he perceived about the lively cosmological debate of those years. In our opinion, the interesting point is that he succeeded in being melodic although he designed those twelve constellations thinking of them as little, rigid in rules and closed cosmic realizations, reflecting a precise order between point-notes and strict mathematical proportions between different and often cyclic times.

Therefore, besides giving a more precise vision of the work of this XX century master, who I’ve regarded only as an intellectual without a specific astrophysical knowledge, the present work intends to provide an idea of how the vivid cosmological debate enriched, among others, by the theories of Hubble, Hoyle and the discovery of the CMB, had entered the cultural atmosphere of those years. Moreover, I’d like to show how artists and, more in general, very informed persons have “breathed” this innovative cultural breeze.
SOPHIA PHOTO COMPETITION

Eva Young

Sophia Centre’s First Student Photo Competition
Adventures in Time and Place

We are proud to present ‘Adventures in Time and Place’, the exhibition based on the Sophia Centre's First Student Photo Competition. The competition was conceived by Eva Young, who had already achieved recognition by winning the University of Wales Trinity Saint David’s INSPIRE photography competition, and organised by Eva and Janet Carroll.

The idea was to create a forum for sharing and discussing our participation in visual culture, sharing personal experiences and exchanging ideas regarding skyscapes and places in time and space. All students back to 2014 were entitled to submit and vote. The superb range of qualities from entrants, from urban to rural, in sea-, land- and skyscapes and with a spectacular variety of aesthetic or reportage styles made voting difficult!

Many thanks go out to the following participating photographers from the MA in Cultural Astronomy & Astrology:


Congratulations from the University of Wales Trinity Saint David to the winners

1st place: Grace Cassar (Planet Pebble in the Sand, below left); £100 Amazon Gift Card

2nd place: Madeleine Marchand (Caballitos de Totora Appointment with Sunset, below centre); £60 Amazon Gift Card

3rd place: Ingrid O’Donnell (Moonset over the Llewyn Peninsular, below right); £40 Amazon Gift Card
ABSTRACT
Megalithic Astronomy has for a long time focused in analyzing the null hypothesis –do the megalithic monuments of a given area share a similar orientation pattern?-. Such was a needed work to break the resistance existing among the archaeological community and it showed that the orientation of megalithic monuments in particular areas and belonging to a similar cultural horizon tend to be coherent. In several instances, the simplest explanation for those trends is the orientation towards a heavenly body, perhaps in connection with particular topographic features. However, these data-driven analyses are restricted in nature as they do not ask about the intent of megalith builders in using such orientations. In order to answer this question, we must include those results within a number of other cultural and social elements of the megalithic builders.

A number of previous works, both from the field of landscape archaeology and from archaeoastronomy, have highlighted the different relations of the megaliths with either moving strategies and/or visibility (see e.g. Criado-Boado & Villoch Vázquez 1996) or the search for areas where prominent topographic features are spotted or interesting astronomical alignments occur (Ruggles & Martlew 1992). A number of more recent works try to complement these early works to examine the connections of the landscape to the sky (see e.g. Higgingbottom 2015).

Our approach in the last years has been to systematically analyze the visual features of megalithic mounds together with the scenery effects and features including the skyscape. To do so we try to embed the possible astronomical relations within other spatial analysis including not only the orientation of the chambers but the visibility of one monument from the others and the orientation towards those defining the skyline horizon or towards prominent topographic features. This also includes the illumination effects at particular times of the year occurring both inside and outside of the chambers, perhaps indicating a moment for the dead.

In this communication we present the results of our analysis of two prominent megalithic groups in Galicia and in two singular monuments. The first analysis concerns the Barbanza necropolis (Coruña county). This includes in a small area (c. 3 Km2) 28 megalithic mounds, several of them still including extant megalithic chambers. The second area is the necropolis of Leboreiro (Ourense county and borderland with Portugal), where in a slightly larger area we could verify the existence of over a hundred mounds. The strategies in both areas are necessarily different but the results are complementary. The two singular monuments are, first the dolmen of Dombate (Baio, Coruña county), perhaps the largest megalithic chamber in Galicia (or at least the most investigated and well-known) that houses an elaborate decorative program with engravings and paintings, and the second is Forno dos Mouros (Bocelo mountains, Coruña county), also housing paintings and belonging to a bigger groups aligned along an historical path following the mountain ridge. Both chambers house interesting illumination effects.

We find that apart from chamber orientation, location and spatial relations of the monuments within the landscape incorporate skyscape associations that complemented and dialoged with that of the chamber orientations. Besides, if the particular directions that we find are related to the movements of the sun and/or moon they may indicate the appropriate ritual time for the dead. Of course, skyscape is not the only or main factor to explain the location of the mounds within the necropolis but are part of a complex system of making those monuments part of a
cultural landscape. When taking all factors into consideration a complex picture emerges where we can envisage the ways of construction of the social time and space in the megalithic epoch.

LANDSCAPE ORIENTATION OF THE MENHIRS FROM VILA DO BISPO AND FROM THE INTERFLUVIAL BASIN OF LAGOS
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ABSTRACT
The menhirs from Vila do Bispo and from the interfluvial basin of Lagos, in southwest Algarve, Portugal, are located in areas where occupancy attributable to the Early Neolithic at the middle of VIth millennium BC present some characteristics absent in the neighbouring Alentejo region, like the presence of remains of domestic animals.

The archaeological data indicates an intense occupation of the fertile ground for agriculture, the use of endemic plants, presence of domestic animals and of marine biotypes that, in all, could sustain a sedentary population. Different patterns seem to exist between Vila do Bispo, with apparently peripheral settlements around a high density menhir area, and the interfluvial basin of Lagos, with a small number of menhirs situated around the settlements. The funerary practices and the votive artefacts of these populations are not known.

In Vila do Bispo over 250 menhirs survived until today in an area of about 42 km2, although very decontextualized. This is a significant sample with high material, morphological and decorative consistency, but the fact that most of these menhirs are overturned, fragmented and removed from their original locations limits their study. In Lagos about 30 menhirs in an area of 24 km2 present a better preservation status in a more contextualized situation. In both areas the shape and type of decorations are quite similar. Resembling sculptures of phalluses with a “glans”, their size and weight may vary considerably. Symbols that decorate the stones are consistently from four different types: half-ellipses below the “glans”, longitudinal ellipses, wave patterns and cupmarks. With the exception of cupmarks that may appear in menhirs with longitudinal ellipses, each menhir presents only one type of symbol.

Under the present research project - Archaeoastronomy in the Megalithic Landscapes of Vila do Bispo and Lagos - a statistical methodology has been applied to the distribution and landscape orientation of the current menhir locations. The methodology was divided into three analyses: spatial point pattern and alignments; local topography (elevation, slope and aspect); horizon topography (direction to the highest distant peaks, distance to the horizon and distribution of horizon features, potentially used as markers). The same methodology was applied to the area of Vila do Bispo, to the area of Lagos and to random sets of points located in the same areas; their respective results compared using different statistical tests.

The results revealed similar patterns between the areas of Vila do Bispo and Lagos and no correlation with the random sets, indicating a selection strategy for the places where the menhirs were erected. This raises important points on the discussion of whether valid inferences can be made from a sample of highly destroyed archaeological sites, such as those of Vila do Bispo. Based on orientation patterns and on the identified horizon markers a possible symbolic association with the Equinoctial Full Moons will be discussed, particularly between the Spring Full Moon and the menhirs engraved with longitudinal ellipses or cupmarks and between the Autumn Full Moon and the menhirs engraved with half ellipses or wave patterns.

REFERENCES
THE POLYPHEMUS CAVE: AN ARCHAEOASTRONOMICAL SITE IN WESTERN SICILY

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ABSTRACT

The so-called “Grotta di Polifemo” (“Polyphemus Cave”, 38°03’56.63” N, 12°34’59.76”E) is located near the city of Trapani, on the coast of the territory of Erice, right next to the most famous and easily accessible prehistoric site of the Emiliana Cave, at a height of about fifty meters above sea level. The Cave of Polyphemus is divided in two major rooms, separated from each other by a stalagmite, connected to the ceiling as a pillar. Various and diverse rock formations are present in its interior. Many rocks of different typologies, probably the result of landslides occurred during the millennia, are present at the entrance. The raised space constituted by the left half of the cave, about seven meters deep, has a sloping bottom and a fairly low ceiling. On it, at a height of 1.30 m, is a pictogram in red ocher, representing a sort of labyrinth, discovered in 1986 and dated by the archaeologist Sebastiano Tusa to 3000 B.C. (Tusa, 1992). It consists of six concentric and roughly elliptical volutes, for a maximum diameter of 30 cm (Rigoglioso, 1988). Immediately to the side of the labyrinth - despite the sharp deterioration of the color - an anthropomorphic figure, still in red, can be guessed. It seems to be composed of a stylized head, two raised arms, and a long bell-shaped tunic. With its left hand it seems to hold something like a horn. On the ceiling rock, not far from the labyrinth and the possible human figure, one can recognize the faded traces of other figures and several more red spots that some scholars have speculated to be stars or constellations (Pavat, 2013).

Having been informed by local scholars that around the summer solstice spectacular lighting effects occurred in the cave, we obtained on-field instrumental measurements of the cave entrance orientation. Measurements were performed by a Silva laser compass. Being the entrance to the cave oriented towards the sea horizon, the azimuth only is enough to define its orientation. Data were corrected for the magnetic declination by measuring the magnetic azimuth of a vertical ranging rod shadow placed 10 m away from the observer at local noon: a magnetic declination of 2° 40’E ±20’ was measured, in good agreement with the NOAO WMM model value (2° 42’). As an average of 10 measurements, a geographic azimuth of 301°±0.5°
was obtained for the line of sight from the labyrinth to the western edge of the cave entrance, just below a rocky outcrop that juts out into the distant shoreline.

Because of this orientation, in the days around the summer solstice the rays of the Sun penetrate into the cave with spectacular effects. In fact, the inside of the left part of the cave (where there are the labyrinth and other pictograms) is illuminated at the sunset by yellow sunlight for several weeks before and after the solstice. However, only during the three days at the turn of the summer solstice the Sun, just before setting, can slightly exceed the low rocky outcrop in the background. At this time, the rays of the Sun, now red and next to touch the sea, illuminate with garnet-colored light the inside of the cave, with striking effects, and touch figures. This spectacular was surely noticed by the ancient inhabitants of the area, who gave a sacred value to the Cave of Polyphemus, and after having painted the image of the labyrinth, the human figure (perhaps a Mother Goddess) and other symbolic figures, performed there their solar rites at the summer solstice.

Similar hierophanies have been recorded in European sacred cave dated to Paleolithic (e.g. Esteban & Tortosa, 2001), Neolithic and Chalcolithic (e.g. Stoev & Maglova, 2014) and Bronze Age (e.g. Campbell, 2013), proving that the significance of the solstitial directions is often cosmological rather than practical/calendrical, although the two are not mutually exclusive (Ruggles, 2005).

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FRIDAY AFTERNOON
ROUND TABLE
Chair: Fabio Silva

THEORY & METHOD IN CULTURAL ASTRONOMY

Discussants:
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Darrelyn Gunzburg (University of Wales Trinity Saint David - d.gunzburg@uwtsd.ac.uk)
Kim Malville (University of Colorado - kимальville@hotmail.com)
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ABSTRACT
The Bush and Clandon Barrow gold Lozenges discovered in burial grounds, respectively near Stonehenge and Mount Pleasant in southern England, were most frequently thought to be ornamental breastplates designed to show the high level political or religious status of the wearers. Archibald Thom has proposed a calendrical interpretation of them, based on their alignments, incorporating Alexander Thom’s assumptions around the division of the solar year into 16 parts.

The author of this paper proposes a new method of interpretation of the Bush and Clandon Lozenges, which could be extended to other objects or devices; he prefers to consider that the precision required to observe the solar, lunar and planetary cycles must first be based on a strict count of the number of days, not just on the observation of astronomical conjunctions or eventually of certain specific alignments which may determine their exact duration.

Counting the lines and interpreting the patterns on both breastplates have led to the proposal to consider these objects to be counting tools for the number of days of the cycle of Venus, based on multiples of 36 or 24, but also for those of Mars, the Moon and the solar year. The Bush Barrow breastplate may represent one cycle of Venus, while the Clandon Barrow Lozenge could possibly represent 4 cycles of Venus. He latter could also illustrate the equivalent of 3 cycles of Mars, or 79 lunar months. Five cycles of this sort, symbolized by the five gold covered spheres of the mace-head discovered alongside the Clandon Barrow breastplate, could represent a Meta cycle of 32 years whose origin and final points would be defined by the conjunction of the Moon, the Sun, Venus and Mars.

This interpretation opens new perspectives for the interpretation of other objects including the wooden circles of Mount Pleasant and Woodhenge. These structures may also have been designed to enable the counting of the days of the lunar, solar and planetary cycles. In ethnological terms, the lozenge shape appears highly symbolic at all times and in all the cultural areas of ancient Europe (Gimbutas, 2005). Venus, appearing alternately in the East and in the West, is an essential symbol of life and rebirth. So, within the funerary context of the culture of Wessex, the Bush Barrow and Clandon Barrow Lozenges containing this cycle take up a perfect place.

REFERENCES
ABSTRACT
Hawkins (1964) concluded that Stonehenge (TPQ 3000 BC) was a “Neolithic Computer” designed to time eclipse danger periods. His conclusion was based on both analogue lunisolar horizon alignments and digital astro-architectural numerical artifacts, viz.: 19 Bluestone(s) Horseshoe; 29.5 Sarsen Circle uprights; 29Z & 30Y Holes, 56 Aubrey Holes; and 59 Bluestone(s) Circle. This paper examines each spatial-time artifact in the light of ancient Greek astro-calendrical science and proposes another, viz.: that the 5:12 Station Stone Rectangle – its sides oriented to the lunisolar extrema for its latitude – was selected from among all possible quadrilaterals because each component 5:12:13 Pythagorean triangle uniquely delineates the Area (30 Ratio Units²) and Perimeter (30 Ratio Units) corresponding to the integer time period of the Synodic Period of the Moon (29.531 days).

This paper also bridges the interdisciplinary void between Celestial Mechanics and Cultural Anthropology by using Starry Night Pro Plus-6 planetarium software to replicate eclipse cycles observable at Stonehenge, 3000–1500 BC. The resulting simulations visually confirm a maximum efficacy of five total lunar eclipse predictions based on midwinter Heel Stone moonrises every 18+19+19 = 56 years as extracted from Espenak’s (2014) Six Millennium Catalog of Lunar Eclipses; e.g.: -1991 Dec 22; -1972 Dec 22; -1954 Jan 13; -1935 Jan 13; and -1917 Jan 24. Thus, the 56/3 =18.67 spatial-time approximation links the 18.59-year Regression of the Lunar Nodes and 56 Aubrey Holes with Plutarch’s “56-sided polygon said to belong to Typhon [the Greek daemon-god whose blood-red shadow eclipses the moon], as Eudoxus has reported.”

REFERENCES

LUCIFERA RISING: ANCIENT PRE-DAWN RITUAL ASTROMONY
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ABSTRACT
In ‘Natural History’ (Book 2, vi: 36), Pliny relates that “below the sun revolves a very large star named Venus… when in advance and rising before dawn it receives the name of Lucifer…” (trans. Rackham, 1938/1991: 191). Cicero gives a similar explanation in ‘On The Nature of the Gods’ (Book 2, xx: 53); “Lowest of the five planets and nearest to the earth is the star of Venus, called in Greek ‘Phosphoros’ (the light-bringer) and in Latin Lucifer when it precedes the sun,
but when it follows it ‘Hesperos’… (trans. Rackham, 1933/1951: 175). Along with Venus, the Moon also shared the Luciferic title, as told by Cicero: “Diana in her manifestation as Lucifera (the light-bringer) among the Greeks…” (Rackham, 1933/1951: 191). Lucifer has come down to us as the name of a devil but, as Cicero and Pliny demonstrate, Light-Bringer was once a divine title shared by astronomical phenomena that heralded the sunrise, whether as Venus Lucifera (Morning Star) or as Luna Lucifera. Roman imperial silver coins proclaimed the celestial glory of Luna Lucifera (Seaby, 1969: 56) and Diana Lucifera (Seaby, 1969: 53). In the northern hemisphere, the New Moon is found shortly after sunset – that is Hesperos according to Cicero. Two weeks later, the waning moon that appears a few hours before sunrise is Luna Lucifera, herald of the dawn. The ancient rites that best align with the waning moon are the Mysteries of Eleusis (Latura, 2014) whose all-night vigil (‘pannychis’) took place in the later part of the lunar month Boedromion, as related by Euripides in astronomical detail: “…the all-night torch of the twentieth day when the star-gleaming heaven of Zeus strikes up the dance and the moon dances…” (‘Ion,’ 1075; trans. Kovacs, 1999: 449). An overlooked aspect of the Mysteries hosted by Athens is the coinage that advertised her connection to the waning moon – the Old Style tetradrachm where above the owl of Athena sits a waning crescent moon (Jenkins, 1990: 46). The waning crescent of the Moon could also be found on coins of the Roman Republic (Seaby, 1952/1989: 44) that inherited the polytheistic cosmology of the Greeks that was fated to extinction once monotheism took hold of the Roman Empire. The edicts of Theodosius (c. AD 391) and the Theodosian Code collected under Theodosius II, spelled the doom of polytheistic beliefs under pain of death. The methodology is by necessity cross-disciplinary, embracing the few surviving texts both primary and secondary, and a wide range of artworks (reliefs, mosaics, coins, etc.) that support the hypothesis of astronomical ritual festivals before sunrise in the ancient world.

WHICH CAME FIRST, THE CHICKEN OR THE EGG? WHICH COME FIRST, SCIENCE OR NARRATION?

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ABSTRACT

The recent return of the theory about the existence of Planet X (or IX ...) provides a wonderful opportunity to ask a question that might be relevant: is the scientific thought an “a priori” with respect to the ability to process narratives? Or rather, is it the opposite? Namely, I mean that, before applying a proper empirical analysis, probably we need to include ideas in a narrative structures, useful to define and enrich with different meanings the context in which the proper scientific analysis will be carried out.

This research is the development of an idea already introduced in “Planets among notes,” a book I've presented in Venice, during INSAP VI Congress. In it, I’ve proposed a quasi-analytical diagram of the distribution of the narratives of any kind, from myth and romance to science fiction, as a function of the distance from the Sun.

To develop this research, I have carried out a historical study on the origin of "another planet of the solar system" concept, in order to try to understand whether this idea should be still considered in a narrative phase or whether it is something already belonging to the scientific thought. The initial question, perhaps less important, finally comes to the more essential one: “what is science?”, an epistemological problem to which I’ll give my personal contribution on the basis of what emerges from this study.
HOMER THE ASTRONOMER
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ABSTRACT
From ancient times there have been persistent threads that the poet Homer (c. 750-650 BC) was not only a colossus of oral literature, but also a learned astronomer. Heraclitus (c. 535 BC – 475 BC), for instance, declared him to be ‘an astronomer and wisest of all Greeks’. There are no existing historic accounts of the extent of his learning or of how such knowledge was passed down through the generations when the Bronze Age Greeks did not have a writing system.

Nevertheless, Homer’s epics do record that the pre-literate Greeks were accomplished in various fields including shipbuilding, navigation, metallurgy, agriculture, social organisation, warfare and complex oral poetry. Our study of The Odyssey is based on the hypothesis that Homeric epic was the vehicle for preserving essential knowledge of astronomy and calendar-making as literary metaphor. It is a continuation of substantial primary research by the late Edna F Leigh, MSc. Our current study continues to require repeated readings of Homer’s Odyssey to identify elements with potential astronomical content. It is proposed, inter alia, that:

The rhythm of 12 of Odysseus’s adventures after the Fall of Troy provide the structure and detail of a 12-month luni-solar calendar.
The time-span of the Iliad and Odyssey identifies knowledge of a 19-year luni-solar cycle.
Odysseus’s time with Circe to the climax of the epic takes place during an 8-year luni-solar cycle.

A key element of our study concerns analysis of extensive numerical data embedded in the Odyssey, a field not previously recognised in terms of astronomy and calendar-making.

THE UNIVERSE IN OUR HEADS
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ABSTRACT
We have all seen a brain. Chop one up and you will be left with a meaningless mush. Scan our brains with fMRI or an EEG and it is clear that something is going on. Brain specialist attempt to interpret this enigmatic data and many years of study has supplied significant information but they are struggling because they have no map.

Brains communicate using symbols, images, metaphor and story. I am communicating right now using these procedures. My words are symbolic, they trigger images in your brain and the result is information that summarizes what my brain is attempting to convey.

Could it be possible that our brains explain themselves using this same modus operandi? Modern methodology, qualitative or quantitative, is not up to studying this enigmatic sophisticated software. If we are to interpret what brains are attempting to convey we need a compatible methodology.

The subject astrology has been ridiculed since Kepler presented a mathematical explanation for the elliptical orbit of Mars. Court astrologer to Rudolf II, he expressed his concern in a letter to his tutor: ‘I hope they do not throw out the bathwater’. Kepler, so-called father of modern science, was convinced that stories of ancient gods and goddesses, personifications of the planetary gravitational and electromagnetic energy in our surrounding phenomenological field, carry significant information.

May years ago I stumbled upon a map of the brain using this rich symbolic language. Since the methodology I have utilised is no longer awarded respect my discovery has been ignored, but I have had many years to study this map and I am convinced that the authorities who decide what
is truth and what is fiction are wrong. Software, we now understand, is a real phenomenon, and our brain’s use of imaginative symbolism is our route to understanding cosmic software acting through the physical brain that we automatically identify as real. The Ambient, Soul, Unus Mundus, Dao, Phenomenological Field, surrounding heavens, call this masterpiece what you will, supplies us with our gravitational electromagnetic environment - how can it not be relevant?
SATURDAY EXCURSION

Saturday 17th September
Avebury with Lionel Sims
RECENT KEY TEXTS ON CULTURAL ASTRONOMY BY SOPHIA CENTRE STAFF, GRADUATES AND COLLEAGUES

Archaeoastronomy
Fabio Silva and Nicholas Campion (eds), Skyscapes – The Role and Importance of the Sky in Archaeology (Oxford: Oxbow, 2015).


Michael Rappenglück, Barbara Rappenglück, Nicholas Campion and Fabio Silva (eds), Astronomy and Power: How Worlds are Structured (Oxford, British Archaeology Reports, 2016).

Lomsdalen, Tore, Sky and Purpose in Prehistoric Malta: Sun, Moon and Stars at the Temples of Mnajdra (Lampeter, Sophia Centre Press, 2014).

Astronomy and Culture


Astrology and Culture
Bernadette Brady, Cosmos, Chaosmos and Astrology: rethinking the nature of astrology (Lampeter: Sophia Centre Press 2014).


Classical Studies

Journal of Skyscape Archaeology

Call for Papers

The Journal of Skyscape Archaeology (JSA) is concerned with the role and importance of the sky in the interpretation of the material record. Currently, elements of this study can be found separately in the disciplines of archaeoastronomy, archaeology, cultural astronomy, anthropology and history. JSA brings them together under the aegis of a new academic journal in order to promote cross-fertilization towards an understanding of the cosmologies of the societies who constructed and used the rich archaeological heritage we study today. Consequently JSA encourages articles that consider the relationship between material culture, the sky and society, from a wide range of disciplines. By bringing together current worldwide research, regardless of period or culture, JSA provides a shared interdisciplinary forum for skyscape archaeology.

Our Summer Solstice 2015, Volume 1.1 has recently been published and we are now soliciting submissions for future issues. Articles which address the relationship between material culture and the sky whether this be the practice of relating the heavenly bodies and celestial phenomena to lives and events on earth as evidenced through material monuments and artefacts or the wider landscape will be considered. Approaches can be from many disciplinary viewpoints, for example, archaeoastronomical, archaeological, anthropological, historical and ethnographic and we are interested in obtaining as many voices as possible as long as they reference the sky.

JSA is a peer-reviewed international journal which publishes a variety of articles. These include regular Research Articles which are research question or case-study driven and can run up to 8,000 words in length. Theory & Methods Articles dealing with methodological and theoretical aspects of the discipline and which should generally run to about 5,000 words in length. Forums are composed of a series of 2-3,000 word responses to a previously circulated question for debate; and Reprints of key papers in the discipline’s history with new commentaries of up to 4,000 words by modern authorities. Book and Conference Reviews of 1-2,000 words in length will also be published and potential reviewers should contact the Editors prior to submitting a review. The editors are open to ideas for Forums, Reprints, Book and Conference Reviews.

With our online system papers can be submitted any time and authors will be notified as soon as possible of the acceptability of their submissions.

Full instructions for submission and Author Guidelines can be found on the JSA website http://www.equinoxpub.com/JSA.

Queries should be addressed to the editors, Dr Fabio Silva fabio.silva@ae.d.ac.uk and Liz Henty lizhenty@f2x.com
Culture and Cosmos has pioneered the study of cultural astronomy and astrology for almost twenty years since 1997. Bringing together scholars from across the world, its range of published papers is unique, from art to literature, ethnography to history and sociology to philosophy, across cultures and from the ancient world to the modern. It is the only academic journal which deals with the human relationship with the sky through meaning, creativity and the imagination. It has carried work by artists, scientists and scholars from across the humanities. Its scope spans the world and it has included papers on astronomy and cinema, Australian aboriginal art, Renaissance iconography, UFOs, magic and divination, modern belief in astrology and temple alignments in India.

From 2017 the journal will be published online (with options to buy bound volumes), and we are now putting the entire back catalogue online.

First to go online are Volume 10, papers from the conference on the Worship of the Stars in Japanese Religious Practice, held at the School of Oriental and African Studies, and Volume 16, proceedings of the seventh conference on the Inspiration of Astronomical Phenomena.

Highlights from Volume 10 include:
- Hayashi Makoto, The Tokugawa Shoguns and Yin-yang knowledge (onmyōdō).
- John Breen, Inside Tokugawa religion: stars, planets and the calendar-as-method.
- Mark Teeuwen, The imperial shrines of Ise: an ancient star cult?
- Lilla Russell-Smith, Stars and Planets in Chinese and Central Asian Buddhist Art from the Ninth to the Fifteenth Centuries.

Highlights from Volume 16 include:
- Patricia Aakhus, Astral Magic and Adelard of Bath’s Liber Preistigiorum; or Why Werewolves Change at the Full Moon.
- David Pankenier, Astrology for an Empire: The ‘Treatise on the Celestial Offices’ (ca. 100 BCE).
- Emily Urban, Depicting the Heavens: The Use of Astrology in the Frescoes of Rome.