



PRIFYSGOL CYMRU

Y Drindod Dewi Sant

UNIVERSITY OF WALES

Trinity Saint David

**SOPHIA CENTRE FOR THE STUDY OF COSMOLOGY IN CULTURE
MA in CULTURAL ASTRONOMY and ASTROLOGY**

SKYSCAPES, COSMOLOGY AND ARCHAEOLOGY HPCA7009

Module Tutors: Fabio Silva, Kim Malville, Bernadette Brady

2019

THE MODULE

Skyscape Archaeology explores the relationship between the archaeological record and celestial objects. It includes, but goes beyond, the incorporation of celestial orientation, alignments or symbolism in monuments and architecture, which is often referred to as archaeoastronomy. You will study the development of the field and have a chance to pursue a practical research project.

We investigate the development of the field, including astronomical claims and theories from the early surveys of Stonehenge by Inigo Jones, John Aubrey and William Stukeley, to the ideas of Alexander Thom and Gerald Hawkins in the late twentieth century, and down to the present day, when research has expanded to cover sites around the world. We examine current research in sites and regions such as Stonehenge, the Stone Age temples of Malta, Machu Picchu in Peru, Nabta Playa in Egypt, as well as Indian temples. We include research done in the Sophia Centre on medieval churches as well as modern phenomena such as the now famous 'Manhattanhenge' in New York.

We raise crucial questions on the nature and interpretation of evidence, the difference between quantitative and qualitative methodologies, and the value of cultural and ethnographic evidence. One significant question we investigate is the problem of intentionality: if we find an astronomical alignment or orientation at an archaeological site, how do we know if the builders intended it? And, you will also be taught how to plan and conduct fieldwork at archaeological sites using a compass and clinometer, as well as how to analyze and interpret survey measurements.

At the end of this module you will have acquired:

- a critical understanding of the development and theory of skyscape archaeology and archaeoastronomy;
- the ability to conduct simple survey work investigating astronomical alignments or orientations at archaeological sites;
- an enhanced ability to communicate ideas, evidence and arguments to others in writing.

AIMS

To:

- Introduce students to the theory and development of the discipline of archaeoastronomy as celestial symbolism in the material record, including architecture;
- Become familiar with the use of orientation measurement and astronomical data as a means of establishing evidence for the existence of celestial symbolism or alignment in architecture, whether prehistoric, pre-modern, or contemporary;
- Investigate the nature of the evidence in recent academic literature for astronomical knowledge in a variety of cultures, including prehistoric and non-modern;
- Consider the wider context concerning theories for the meaning and purpose of astronomical knowledge, including for the regulation of agricultural, social, religious and political affairs.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- demonstrate a systematic understanding of methodological issues in the collection of astronomical data in relation to landscape features, the archaeological record and the built environment;
- be able to measure simple orientations of potential archaeoastronomical interest in the archaeological record, built environment or landscape;
- demonstrate a critical understanding of the use of ethnographic material to support quantitative evidence;
- display a sophisticated awareness of current academic debates on archaeoastronomy and skyline archaeology;
- evaluate the nature of the evidence concerning the relations between the archaeological record, the built environment and the skyline of a society.

SEMINAR TIMETABLE

Online seminars will happen on Wednesdays at 4pm GMT, via WebEx, starting on February 6th 2019. A timetable of seminars will be provided separately.

REQUIRED READING

You will need to acquire the following books. Silva and Campion's is available as an ebook from the TSD library, whereas the others are all reasonably priced, either new or 2nd hand on Amazon or Abebooks.

- Silva, Fabio and Nicholas Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015.
- Aveni, Anthony (ed), *Foundations of New World Cultural Astronomy*, Boulder: University Press of Colorado, 2008.
- Malville, J.McKim, *Guide to Prehistoric Astronomy in the Southwest*, Boulder: Johnson Books, 2008.
- Ruggles, Clive, *Astronomy in Prehistoric Britain and Ireland*, New Haven and London: Yale University Press, 1999.

ASSESSMENT

1. One 1500 word assignment (20% of total marks) DUE March 4th 2019

Write a critical review of a debate over the interpretation of one of the archaeological site(s) below. You need to choose only ONE out of the three options below.

For the critical review, you should critically evaluate the different methodologies, theories and evidence provided by each scholar and you need to refer to other literature in the field (five or more works). You should read the guidelines on writing critical reviews (available on Moodle) before starting your assignment.

Option 1: Chankillo, Peru

- Ghezzi, I and C Ruggles (2011) "The Social and Ritual Context of Horizon Astronomical Observations at Chankillo."
- Malville, K (2011) "Astronomy and Ceremony at Chankillo: an Andean Perspective."

Option 2: Passage Graves of Western Iberia

- Hoskin, M (1998) "Studies in Iberian Archaeoastronomy (5) Orientations of Megalithic Tombs of Northern and Western Iberia"
- Silva, F (2015) "The View from Within: a 'time-space-action' approach to Megalithism in Central Portugal"

Option 3: Medieval Churches in the United Kingdom

- Ali, JR and Cunich, P (2001) "The Orientation of Churches: Some New Evidence"
- Brady, B, Gunzburg, D and Silva F (2016) "The Orientation Of Cistercian Churches In Wales: A Cultural Astronomy Case Study"

2. One 3500 word assignment (80% of total marks) DUE July 29th 2019

A research project within the subject area. You may choose one of the following approaches:

- Conduct a simple fieldwork exercise, investigating the likelihood of celestial alignments at prehistoric or sacred site(s). We can suggest places and projects, depending upon where in the world you live or would like to travel. Separate guidance will be posted. If you choose this approach, you will have to provide a literary justification and context.
- Take an experimental approach and, using simple tools and materials, put to test one archaeoastronomical theory regarding how a given culture measured, observed, marked and/or experienced a particular astronomical event. We can suggest projects, depending on the resources available to you. Separate guidance will be posted. If you choose this approach, you will have to provide a literary justification and contextualize your methodology within the field of experimental archaeology.

Your research project and title MUST be approved by your course tutor, and we will provide suggestions for additional reading in your chosen area. Your initial step will be to complete the Research Proposal Form.

STUDY GUIDE

This handbook, as well as the Moodle page for this module, is split into a weekly series of sections that include the purpose of the week, a class description, the required and extra optional reading, as well as other tasks for the week. The following tries to explain each section so you can plan your week's study.

Purpose of the week

In this section, you will find a short summary of what you can expect to achieve this week.

Thought for the Week

This section includes a question for you to think about during your readings of the week. It will provide the seed for a weekly forum on the module's Facebook page where everyone can join in with their thoughts.

Hands-on exercise for the Week

This section describes a simple exercise of astronomical observation or measurement that everyone can do from their homes. Record and/or photograph your results and share them on the Facebook page of the module. If you encounter any issues or have questions you can also use the Facebook page to ask them. By doing these exercises you will build up hands-on knowledge of how to measure the quantities archaeoastronomers routinely measure and allow you to feel comfortable in any future fieldwork (for instance, for your research essay). You will also be repeating the kinds of measurements, using hands and fingers, that would have been used by early monument builders.

Other tasks this week

This lists any other tasks that you should also be doing during the week.

Class Description

In this section, you will find a more in-depth description of the topic of the week which should give you an idea of how to plan your readings.

Required Reading

This lists the required reading of the week, including material that can be found on Moodle, or online.

Optional Reading

Extra reading on the week's topic can be found in this section. Use this only if you have time, if you are interested in the topic or if one of your essays is on a related topic.

Recommended resources

This lists other resources, such as archaeoastronomy journals, free software or other websites that can help you extend your readings and knowledge beyond those provided here. The list is presented on a weekly basis so you only need to spend ten or so minutes each week exploring the listed resources and then deciding whether you should explore them more on your own time.

WEEK 1: The Sky in Archaeology

Purpose of the week

The topic of Archaeoastronomy and its history is introduced this week. Like all academic disciplines, its definition is not fixed. In addition, it may be considered a practice, in that academic archaeoastronomers study the practice of archaeoastronomy. There is also a blurring of boundaries between the strict notion of archaeoastronomy as concerning the relationship between astronomy and archaeology, and the wider field of 'cultural astronomy', which is introduced in the Introduction module.

Other tasks this week

- Familiarize yourself with the weekly structure of the module
- Look at the assessment criteria for the first essay.

Class Description

The study of the sky in archaeology has a history that dates back to the early British antiquarians of the 19th century. Relationships between ancient monuments and the sky have been proposed, off and on, for the better part of the last century. However, it was not until the 1960s, with Gerald Hawkins' *Stonehenge Decoded*, that this topic caught the imagination of both the general public and the attention of the wider academic community. Since then archaeoastronomy acquired solid foundations in the social sciences, especially Archaeology, Anthropology and History. This week's readings explore its history and foundations from three different perspectives. Clive Ruggles (an insider) is an astronomer turned archaeoastronomer that has been leading the field for the past few decades; Ronald Hutton (an outsider) is an historian with an interest in British paganism and magic; and Nick Campion (both insider and outsider) is well known to students of the MA CAA.

The readings are light this week as part of your time will be taken by familiarizing yourself with the course material. Take some time to familiarize yourself with the website of academic organizations, such as ISAAC and SEAC. These will be especially helpful for you to learn the names of the key scholars on specific topics, as well as conference proceedings and announcements, which will help you on your research projects. The recommended resources below list a couple of websites for you to start with.

Thought for the Week

What distinguishes Archaeoastronomy from Cultural Astronomy? Is there a difference?

Hands-on exercise for the Week

What phase is the moon on?

Use a smartphone or camera to take a picture of the moon and post it on the module's Facebook page. Don't forget to tell us where you are and what time it was when you took the picture.

WEEK 1: The Sky in Archaeology

Required Reading

Clive Ruggles is one of the most influential figures in the development of Archaeoastronomy over the last twenty years. It is essential to understand how he has defined, changed and presented the discipline. More than that – his works are some of the most accessible introductions to the topic from an insider. Ronald Hutton has written extensively on the history of paganism, witchcraft and magic in the British Isles. In this piece he turns his historical gaze towards the history of archaeoastronomy in Britain and asks why the disciplines of archaeology and archaeoastronomy have fallen out. Nick Campion takes this further and describes the current position of archaeoastronomy within the academic world.

Some of the reading material will overlap, but the different authors focus on different aspects of the history of archaeoastronomy and provide different views of the key issues and disputes over archaeoastronomical claims.

Ruggles, Clive, *Astronomy in Prehistoric Britain and Ireland*, New Haven and London: Yale University Press, 1999, Introduction (pp. 1-11).

Hutton, Ronald, 'The Strange History of British Archaeoastronomy', *Journal for the Study of Religion, Nature and Culture* 7(4), 2013, pp. 376-396. [PDF ON MOODLE]

Campion, Nick, 'Skyscapes: Locating Archaeoastronomy within Academia'. In Silva, Fabio and Nick Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015 (in press), pp. 8-19. [E-BOOK AVAILABLE ON TSD LIBRARY]

Recommended resources

ISAAC – International Society for Archaeoastronomy and Astronomy in Culture

<http://www2.archaeoastronomy.org/>

SEAC – European Society for Astronomy in Culture <http://www.archeoastronomy.org/>

WEEK 1: The Sky in Archaeology

Optional Reading

You can read more on archaeoastronomy by considering what others have to say about it. The following list includes writings and videos by archaeoastronomers and cultural astronomers on the meaning and importance of the sky to past societies.

Campion, Nicholas, *A History of Western Astrology*, Vol 1. The Ancient World, London: Continuum, 2009, chap.1

Ruggles, Clive, "Archaeoastronomy". In Renfrew, Colin and Paul Bahn (eds), *Archaeology: The Key Concepts*, London: Routledge, 2005, pp. 11-16. [E-BOOK AVAILABLE ON TSD LIBRARY]

Ruggles, Clive and Michael Hoskin, "Astronomy before History". In Hoskin, Michael (ed), *The Cambridge Concise History of Astronomy*, Cambridge: Cambridge University Press, 1999, pp. 1-17. Available online: <http://assets.cambridge.org/052157/2916/sample/0521572916web.pdf>

Iwaniszewski, Stanisław, 'Ancient Cosmologies: Understanding Ancient Skywatchers and their Worldviews', *Journal of Cosmology*, 2010, Vol. 9. <http://journalofcosmology.com/AncientAstronomy118.html>

Iwaniszewski, Stanislaw, "Cultural Interpretation of Archaeological Evidence Relating to Astronomy." In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 315-324. [E-BOOK AVAILABLE ON TSD LIBRARY]

Henty, Liz, "An examination of the divide between archaeoastronomy and archaeology." In Silva, Fabio and Nick Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015 (in press), pp. 20-31. [E-BOOK AVAILABLE ON TSD LIBRARY]

Stellar Connections: Explorations in Cultural Astronomy - Pt. 1, Gary Urton

<http://www.youtube.com/watch?v=uPhMN5b8tSM>

Stellar Connections: Explorations in Cultural Astronomy - Pt. 2, Michael Wassegijig Price

<http://www.youtube.com/watch?v=nVny6LnTOLg>

WEEK 2: Skyscapes

Purpose of the week

The required readings of the previous week already highlighted some of the failures and present issues of archaeoastronomical work. This week will introduce you to the skyscapes approach that the Sophia Centre has been spearheading to try to overcome archaeoastronomy's limitations and better integrate it with the other relevant academic disciplines.

Other tasks this week

- Familiarise yourself with the key Archaeoastronomy journals
- Read the two pieces to review for your first assignment.

Class Description

The study of the landscape is now well established in archaeology. Seascapes and waterscapes extend these approaches into the seas and rivers, whereas taskscapes look at executed tasks and the temporality of the landscape. The skyscape extends this upwards to encompass the heavens and the celestial bodies and how they relate back down to human beliefs and practices, to their notions of time and place, to their structures and material remains. The skyscape is meaning mapped into, or pre-existing in, the sky. It doesn't imply a purely functional attitude: it can be used for functional, symbolic or religious purposes; it can encode mythologies and cosmologies; it can do all these things, or any combination of them.

This new term, devoid of modern preconceptions except for those brought about by its similarity to landscape, is a way of rethinking the role of the sky in past societies. Skyscapes are not ancient astronomies (in the modern sense of the word): they crosscut and correlate with other aspects of a given society, of which monumentality is but one. As such, they are ready to be plucked into larger research questions, requiring multi-disciplinary approaches, a wider attention to the material record, and a broader span of methodologies.

Thought for the Week

Does it make sense to talk of 'prehistoric astronomy'?

Hands-on exercise for the Week

How high is the moon?

Taking note of your time, date and place, use your closed fist, open palm and/or fingers to estimate how high the moon is relative to the distant horizon. Is it two closed fists high? Or an open palm and two fingers?

WEEK 2: Skyscapes

Required Reading

The Skyscapes approach originated as a response to the lack of engagement of archaeoastronomers with the cultures they study, as well as the lack of dialogue between archaeology and archaeoastronomy. Clive Ruggles' piece sets the state of archaeoastronomy in 2011 – still pretty much valid today – and thus sets the scene for the new approach.

The Skyscape Archaeology approach is still pretty much recent and being spearheaded by the Sophia Centre. The key publications, so far, are the *Skyscapes: The Role and Importance of the Sky in Archaeology* volume and the *Journal of Skyscape Archaeology* (JSA), but other works are in print or in preparation. The introductions to the Skyscapes volume below, as well as the first editorial to JSA are good starters to the topic of skyscapes. The blogpost goes one step further by clarifying the meaning of skyscape and setting the agenda for skyscape research.

Ruggles, Clive, "Pushing back the frontiers or still running around the same circles? 'Interpretative archaeoastronomy' thirty years on," *Proceedings IAU Symposium No. 278*, 2011, pp 1-18. Available online: <http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=8334279&fulltextType=RA&fileId=S1743921311012427>

Silva, Fabio, 'The Role and Importance of the Sky in Archaeology: an introduction'. In Silva, Fabio and Nick Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015, pp. 1-7. [E-BOOK AVAILABLE ON TSD LIBRARY]

Silva, Fabio and Liz Henty, "Editorial" *Journal of Skyscape Archaeology* 1(1): 1-7. [PDF ON MOODLE]

Silva, Fabio, "Defining Skyscape" *Sophia Centre Press* blog [PDF ON MOODLE]

Case Study

Malville, J. McKim, *Archaeoastronomy of the Incas Notes* [DOC ON MOODLE]

Recommended resources

Journal of Skyscape Archaeology

<http://equinoxpub.com/JSA>

Journal of Astronomy in Culture

<https://escholarship.org/uc/jac>

Journal for the History of Astronomy

<http://www.shpltd.co.uk/jha.html>

WEEK 2: Skyscapes

Optional Reading

Gumerman and Warburton's piece complements Ruggles and Silva's pieces in the Required Reading list with an American take on the gap between cultural studies and cultural astronomy. The skyscape approach we are promoting is recent and, as such, there is still little published material on it. However, take the opportunity to familiarize yourself with other chapters of the edited volume *Skyscapes*, as well as papers published in the *Journal of Skyscape Archaeology*.

Gumerman, George J. and Miranda Warburton, 'The Universe in a Cultural Context: An Essay'. In John Fountain and Rolf Sinclair (eds) *Current Studies in Archaeoastronomy*, Carolina Academic Press, 2005.

Silva, Fabio and Nick Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015.

Journal of Skyscape Archaeology (all issues) [AVAILABLE VIA TSD LIBRARY]

WEEK 3: Archaeology and Cosmology

Purpose of the week

Archaeology is interested in understanding cultures based on the material culture they leave behind. The nature of the primary sources – the archaeological record – has deep implications on their interpretation. In the absence of other sources, care must be taken not to over-interpret the data, and this has been a big problem in the field, especially when dealing with prehistory. However, only recently did archaeologists become interested in the beliefs and associated practices – the cosmologies – of past societies. This week focuses on the paradigms that have been used to interpret the archaeological record and the issues with reconstructing the intangible (cosmology) from the tangible (material culture).

Other tasks this week

- Plan the essay for your first assignment.

Class Description

The focus of this week's readings is on how one should approach the study of material culture when one is interested in cosmology, religion, belief and associated practices such as ritual, magic, etc. The primary sources of a scholar interested in the skyscape are the material remains left by a given culture, be it a megalithic tomb, a pyramid, a medieval church or a prehistoric piece of bone carved with celestial symbols. Most often than not, these were identified in a survey, retrieved or even restored during archaeological excavation work. The latter, by its very nature, is destructive: archaeological fieldwork has been compared to a historian reading a book and tearing up and destroying the pages as he goes. Archaeological methodology, and by extension that of Archaeoastronomy, is thus unique among the social disciplines and a balance needs to be struck not to over-interpret the data.

Throughout the history of archaeology there have been various approaches to the interpretation of material remains and the creation of theories. Your readings this week will cover the several paradigms (or 'Theories', with capital T) in Archaeology: from the diffusionism and evolutionist views of Victorian antiquarians, through the functionalism of Processual archaeology, to the more recent Interpretative Archaeologies.

Thought for the Week

What is the relationship between archaeoastronomical alignments and the cosmology of their builders?

Hands-on exercise for the Week

What is the altitude of the celestial poles?

Use your hands (and the appropriate conversion table), a clinometer or a smartphone app to measure the altitude of Polaris (if you are in the northern hemisphere) or the celestial

pole (if in the southern hemisphere). There will be instructions on Facebook on how to find the celestial poles in the night sky.

WEEK 3: Archaeology and Cosmology

Required Reading

How archaeologists have interpreted the past and the main historical and current paradigms that have influenced them will occupy you this week. This parallels similar developments in Anthropology, which you'll have read about in the Researching Contemporary Cosmologies module. A solid research methodology is as important in this module as it was then, so feel free to go back and reread some of the material for that module.

Renfrew and Bahn's chapter reviews the development of Theory and Method in archaeology. This provides the background upon which cosmological and archaeoastronomical hypotheses were put forward. Iwaniszewski provides a good review of ethnographic analogy used for the purposes of reconstructing cosmological elements from the archaeological record, and its key themes and concepts. Finally, Darvill's piece looks at archaeoastronomy, and the skyscapes approach, from the point of view of an interpretative archaeologist interested in cosmology as a whole.

Renfrew, Colin and Paul Bahn, *Archaeology: Theories, Methods and Practice* (6th ed), London and New York: Thames and Hudson, 2012, Chapter 1 (pp. 21-48). [PDF ON MOODLE]

Iwaniszewski, Stanislaw, "Concepts of Space, Time, and the Cosmos." In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 3-14. [E-BOOK AVAILABLE ON TSD LIBRARY]

Darvill, Timothy, 'Afterword: Dances beneath a diamond sky'. In Silva, Fabio and Nick Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015, pp. 140-148. [E-BOOK AVAILABLE ON TSD LIBRARY]

Case Study

Lomsdalen, Tore, 'Can archaeoastronomy inform archaeology on the building chronology of the Mnajdra Neolithic Temple in Malta?'. In Silva, Fabio and Nick Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015, pp. 59-75. [E-BOOK AVAILABLE ON TSD LIBRARY]

WEEK 3: Archaeology and Cosmology

Optional Reading

The following list expands the required readings by suggesting reviews of the development of archaeological theory as well as interesting takes on ritual, religion, magic or wider cosmology stemming from archaeologists. You will have access to some of these as e-books via the TSD online library.

Johnson, Matthew, *Archaeological Theory* (2nd ed), Chichester: Wiley-Blackwell, 2010.

Renfrew, Colin and Paul Bahn (eds), *Archaeology: The Key Concepts*, London: Routledge, 2005. [E-BOOK AVAILABLE ON TSD LIBRARY]

Hodder, Ian and Scott Hutson, *Reading the Past: Current Approaches to Interpretation in Archaeology* (3rd ed), Cambridge: Cambridge University Press, 2003. [E-BOOK AVAILABLE ON TSD LIBRARY]

Bell, James, *Reconstructing Prehistory – Scientific Method in Archaeology*, Philadelphia: Temple University Press, 1994.

Parker Pearson, Mike, *The Archaeology of Death and Burial*, Stroud: The History Press, 2009 [1999].

Tilley, Christopher, *A Phenomenology of Landscape*, Oxford: Berg Publishers, 1994.

Ucko, Peter J. and Robert Layton (eds), *The Archaeology and Anthropology of Landscape: shaping your landscape*, London and New York: Routledge, 2011 [1999]. [E-BOOK AVAILABLE ON TSD LIBRARY]

Pauketat, Timothy R, *An Archaeology of the Cosmos*, London and New York: Routledge, 2013.

Ingold, Tim, *Being Alive: Essays on Movement, Knowledge and Description*, London and New York: Routledge, 2011. [E-BOOK AVAILABLE ON TSD LIBRARY]

Insoll, Timothy, *Archaeology, Ritual, Religion*, London and New York: Routledge, 2004.

Droogan, Julian, *Religion, Material Culture and Archaeology*, London: Bloomsbury, 2013.

WEEK 4: How the Sky Moves

Purpose of the week

One of the most important knowledge-sets for the study of skylscapes is to know how the sky moves: how the sun and moon behave throughout the year, how and when the stars rise and set, and how different these movements were in the past. This week covers the essentials of celestial mechanics, with emphasis on horizon events (rises and sets) as well as on the key measurements that you'll need in order to check whether you have a potential celestial alignment.

Other tasks this week

- Familiarize yourself with software that virtually recreates the sky for any location and date

Class Description

An understanding of how the heavenly bodies move (usually named Celestial Mechanics) and how their position changes through time is an important part of Archaeoastronomy. This week you will learn:

1. how the sun moves on a daily and yearly basis;
2. how the moon moves on a monthly and yearly basis;
3. how the stars move;
4. what the sky looked like in the past and how to reconstruct it using simple tools;
5. what celestial coordinates are and why they are important for fieldwork.

A freely available and easy to use tool which you can use to recreate the sky from any point on Earth at any time in the past or future is Stellarium, which you should familiarize yourself with this week.

Thought for the Week

What concepts and tools are necessary for prehistoric people to align two poles to a celestial event?

Hands-on exercise for the Week

What is the orientation of your street?

Use a compass or a smartphone/tablet app to measure the orientation of your street.

WEEK 4: How the Sky Moves

Required Reading

This week's reading includes specially designed notes, which are a solid start on this topic. Ruggles' chapters extend the notes by introducing celestial mechanics and the long-term changes in the appearance of the sky. Brady's paper on star phases is the leading publication on this current hot topic.

However, when it comes to the movements of the sky, the most important thing is for you to find a planetarium software or tablet app and play with it: fast forward time and track the movements of the sun, moon and stars; go back in time and explore, at your own pace, how different the positions of the stars are. Below we recommend Stellarium, but feel free to use a different one if you already know and own one.

Notes on Celestial Mechanics [DOC ON MOODLE]

Ruggles, Clive, "Basic Concepts of Positional Astronomy." In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 459-472. [E-BOOK AVAILABLE ON TSD LIBRARY]

Ruggles, Clive, "Long-Term Changes in the Appearance of the Sky." In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 473-482. [E-BOOK AVAILABLE ON TSD LIBRARY]

Brady, Bernadette, 'Star phases: the naked-eye astronomy of the Old Kingdom Pyramid Texts'. In Silva, Fabio and Nick Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015, pp. 76-86. [E-BOOK AVAILABLE ON TSD LIBRARY]

Case Study

Malville, J. McKim, *Cosmic and Sacred Cities Notes* [DOC ON MOODLE]

Recommended resources

Stellarium – Free Planetarium software

<http://www.stellarium.org/>

WEEK 4: How the Sky Moves

Optional Reading

Celestial Mechanics can be a highly mathematical subject, but its concepts are easy to comprehend. Fabian's book is an excellent review of the subject with a focus on culture. It is rich in ethnographic examples that complement the explanations of the movements of the celestial objects. In addition, Clive Ruggles' astronomy boxes cover much of the same ground covered in the recommended reading, but the different figures might help you understand some concepts. Video animations can also help understand this, such as the YouTube video below.

There are, however, some concepts of observational astronomy that might feel alien to our modern mind-sets whereas they might have been natural to other societies. Some of these have been noticed in antiquity (eg star phases, covered in the required readings), others have only been noticed more recently (eg lunar standstills and crossovers). Below you will also find key readings on some of these topics, particularly Morrison on the lunar standstills and Silva and Pimenta on the crossover phenomena.

Fabian, Stephen M., *Patterns in the Sky: An Introduction to Ethnoastronomy*, Long Grove: Waveland Press, 2001.

Ruggles, Clive, *Astronomy in Prehistoric Britain and Ireland*, New Haven and London: Yale University Press, 1999, Astronomy Boxes 1, 2, 3, 4 and 6 (pp. 18, 22, 24-5, 36-7, 57).

YouTube video explaining the many motions of the Earth throughout time, including precession. Available online: <http://www.youtube.com/watch?v=82p-DYgGFjI&app=desktop>

Morrison, L. V. (1980) On the Analysis of Megalithic Lunar Sightlines in Scotland. *Journal for the History of Astronomy* xi, 1980, pp. S65-S77. Available online: <http://adsabs.harvard.edu/abs/1980JHAS...11...65M>

Silva, Fabio and Fernando Pimenta, "The Crossover of the Sun and Moon" *Journal for the History of Astronomy* xliii, 2012, pp. 191-208. Available online: <http://adsabs.harvard.edu/abs/2012JHA....43..191S>

WEEK 5: Theory & Method

Purpose of the week

This week focuses on theoretical and methodological considerations. Archaeoastronomy has suffered from lack of epistemological reflexivity, that is of thinking about how knowledge is attained: how the data is collected, how interpretations are done or what assumptions, presumptions and anachronisms are being imposed by the scholar? The aim of the week is to consider Theory & Method in skyscape research.

Other tasks this week

- Write your critical review for the first assignment.

Class Description

As you've read in weeks one and two, after the rift with the Thomist paradigm, archaeoastronomical methodology has split in two very different "flavours": brown and green, focused on statistical and ethno-historical argumentation respectively. However, scholars are very rarely reflective and self-critical, rarely engaging critically with the theoretical and methodological aspects of their work.

And yet, researching skylscapes is full of theoretical and methodological assumptions that, if one doesn't tread carefully, one might fall into. Interpretations are marred by anachronisms such as talk of "prehistoric astronomy", "megalithic science", "astronomer-priests" and "ancient observatories", whereas fieldwork and data analysis are also riddled with assumptions that constrain the identification of patterns and their interpretation.

This week focuses on works that either consider the more theoretical side of skyscape research or take a decidedly (self)critical take on research methodologies, for instance by contrasting how landscape archaeologists and archaeoastronomers approach the same, or similar, primary sources.

Thought for the Week

What constitutes 'evidence' in Archaeoastronomy?

Hands-on exercise for the Week

What is the azimuth of the setting moon?

Use a compass or a smartphone/tablet app to measure the azimuth where the new moon is setting.

WEEK 5: Theory & Method

Required Reading

There are few works on Theory and Method in archaeoastronomy. This is a reflection of the discipline's lack of reflexivity. The Skyscapes approach, however, was born out of a reflexive approach and, as such, the number of theoretical pieces is on the rise. Your required reading for the week reflects this. It starts off with a 1993 piece by Ruggles and Saunders where both theory and method are considered. Malville's *Seven Sins of Archaeoastronomy* forms a critique of the field, but also a list of common pitfalls to be avoided by serious scholars. The last two pieces compare and contrast the approaches of archaeologists with those of archaeoastronomers for two key types of prehistoric sites: passage graves (Silva) and stone circles (Henty). The authors suggest new approaches that bridge the academic chasm are required to further our understanding of the prehistoric societies that built these lasting monuments. Henty's case study highlights not only the importance of paying attention to the material record but also to phenomenology.

Ruggles, Clive and Nicholas Saunders, "The Study of Cultural Astronomy". In Aveni, Anthony (ed), *Foundations of New World Cultural Astronomy*, Boulder: University Press of Colorado, 2008, Chapter 32 (pp.725-50). Originally published in Ruggles, C and N Saunders (eds), *Astronomies and Cultures*, Niwot: University Press of Colorado, 1993. [PDF ON MOODLE]

Malville, Kim, *Seven (Deadly) Sins of Archaeoastronomy Notes* [PDF ON MOODLE]

Silva, Fabio, "A Tomb with a View': New methods for bridging the gap between land and sky in megalithic archaeology." *Advances in Archaeological Practice* 2(1), 2014, pp.24-37. [PDF ON MOODLE]

Case Study

Henty, Liz, "The Archaeoastronomy of Tomnaverie Recumbent Stone Circle: A Comparison of Methodologies" *Papers from the Institute of Archaeology* 24(1), 2014, 15.
Available online: <http://www.pia-journal.co.uk/article/view/pia.464>

WEEK 5: Theory & Method

Optional Reading

The optional reading for the week presents other current voices introducing fresh ideas into the theoretical melting pot (Iwaniszewski, McCluskey and Sims). To this is added a piece discussing a key theoretical point, namely how the different ways of “finding” the equinox result in very different orientations that might be identified in structural alignments (Ruggles). Lastly, Hayden and Villeneuve warn about the dangers of over-interpreting primary sources: they use the ethnographic record of contemporary hunter-gatherers to take a critical look at claims of Palaeolithic astronomy.

Iwaniszewski, Stanisław, ‘Ancient Cosmologies: Understanding Ancient Skywatchers and their Worldviews’, *Journal of Cosmology*, 2010, Vol. 9.
<http://journalofcosmology.com/AncientAstronomy118.html>

Iwaniszewski, Stanisław, “The Sky as a Social Field.” In C Ruggles (ed), *Proceedings IAU Symposium No. 278*, 2011, pp. 30-37. Available online:
<http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=8334285>

McCluskey, Stephen, “The cultures of archaeoastronomy and the history of science.” In C Ruggles (ed), *Proceedings IAU Symposium No. 278*, 2011, pp.19-29. Available online:
<http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=8334282&fulltextType=RA&fileId=S1743921311012439>

Sims, Lionel, “Which Way Forward for Archaeoastronomy? West Kennet Avenue as a Test Case” *Journal of Cosmology* 9, 2010, pp. 2160-2171. Available online:
<http://journalofcosmology.com/AncientAstronomy107.html>

Ruggles, Clive L.N., “Whose Equinox?” *Journal for the History of Astronomy* xxviii, 1997, pp. S45-50. Available online: <http://adsabs.harvard.edu/abs/1997JHAS...28...45R>

Hayden, Brian and Suzanne Villeneuve, “Astronomy in the Upper Palaeolithic?,” *Cambridge Archaeological Journal* 21(3), 2011, pp.331-55. [PDF ON MOODLE, see week 7]

WEEK 6: Fieldwork

Purpose of the week

Fieldwork is as important in archaeoastronomy as it is in archaeology: it is the principal means of access to the primary sources. It is thus important to be conversant with fieldwork methodologies, their advantages and limitations, even if one is doing literary work. This week you will study the basics of archaeoastronomical fieldwork, including: how to use a GPS unit to get your location coordinates; how to use a compass to measure azimuths; how to use a clinometer to measure horizon altitudes; how to prepare and execute a fieldwork investigation.

Other tasks this week

- Discuss your ideas for the research project in the forum/Facebook page

Class Description

Fieldwork is as important in skyscape research as it is in archaeology: it is the principal means of access to the primary sources. And despite archaeologists' best efforts most often than not an excavated site hasn't been recorded to the level of detail required by an archaeoastronomer. North arrows on archaeological plans are often not precise and which north is indicated (true, magnetic or grid) is omitted. In other instances orientations are given very roughly (e.g. E or NE) as opposed to providing an azimuth and information on the horizon is altogether ignored.

All of the above make fieldwork such an essential component of the skyscape archaeologist's toolset. In this class you will learn the basic tools and surveying methods and how to plan and conduct archaeoastronomical fieldwork.

However, fieldwork methodologies are more often than not dependent on pre-conceived theories or assumptions of what is expected, and thus prone to misconstruction and misdirection. One should therefore take care when adopting or developing one's fieldwork methodology.

Thought for the Week

Can fieldwork ever be objective?

Hands-on exercise for the Week

This week, take some time to review previous hands-on exercises and try them on your own: measure azimuths and altitudes of different things: streets, houses, tree alignments, but also of the sun, moon or stars.

Post pictures on facebook and any of your measurements. Don't forget to include your time, date and location.

WEEK 6: Fieldwork

Required Reading

This week's reading focuses on aspects of archaeoastronomical fieldwork. You've got specially designed notes for this module but it's important to read others' thoughts on the same topics, particularly because different structures, ancient or modern, need to be surveyed differently. Ruggles' book appendix is still considered the go-to guide for fieldwork in our field. However, newer and innovative approaches are being developed by a new generation of scholars. Prendergast wrote the chapter of fieldwork in the *Handbook of Archaeoastronomy and Ethnoastronomy* and is, therefore, an important work. You should also go back to Silva's 'A Tomb with a View' (from week 5 and repeated below) to consider the new fieldwork methodology developed there, which derives from phenomenological experience and reasoning.

Notes on Fieldwork in Archaeoastronomy [PDF ON MOODLE]

Ruggles, Clive, *Astronomy in Prehistoric Britain and Ireland*, New Haven and London: Yale University Press, 1999, Appendix (pp. 164-71).

Prendergast, Frank, "Techniques of Field Survey." In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 389-409. [E-BOOK AVAILABLE ON TSD LIBRARY]

Silva, Fabio, "A Tomb with a View': New methods for bridging the gap between land and sky in megalithic archaeology." *Advances in Archaeological Practice* 2(1), 2014, pp.24-37. [PDF ON MOODLE]

Case Study

Malville, J. McKim, *Prehistoric Astronomy in the American Southwest Notes* [DOC ON MOODLE]

Recommended resources

National Geophysical Data Center – Magnetic Declination Estimator

<http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp>

WEEK 6: Fieldwork

Optional Reading

Advances in archaeoastronomical fieldwork methodologies have been slow, in part due to the simplicity of the necessary measurements for most research projects. However, recent advances in archaeological surveying (particularly using non-invasive techniques and satellite imagery) are finding their way into the study of skylscapes. The two volumes below were printed almost one hundred years apart but they encapsulate the very best of surveying techniques in archaeology, particularly Drewett's textbook.

Munro and Malville explore specific archaeoastronomical fieldwork methodologies applied to Chaco Canyon and thus show how different sites require different approaches.

Lockyer, Norman, *Surveying for Archaeologists*, London: MacMillan, 1909. Available online: <http://archive.org/details/surveyingforarc00lockgoog>

Drewett, Peter, *Field Archaeology: An Introduction* (2nd ed), Oxon: Routledge, 2011, Chapter 4 (pp. 54-71). [E-BOOK AVAILABLE ON TSD LIBRARY]

Munro, Andrew M. and Malville, J. McKim, "Archaeoastronomy in the Field: Methodologies Applied in Chaco Canyon," *Journal of Cosmology* 9, 2010, pp. 2147-59. Available online: <http://journalofcosmology.com/AncientAstronomy115.html>

WEEK 7: Identification and Interpretation

Purpose of the week

This week deals with the identification and interpretation of structural alignments with celestial events. You will learn how to interpret your fieldwork data and identify the celestial events that match it. You will also learn to avoid some issues and pitfalls of interpretation, a topic that has partially been covered in week 5.

Other tasks this week

- Familiarize yourself with the Excel spreadsheet that converts azimuth into declination

Class Description

This week focuses on the identification of celestial targets of alignments as well as on the issues of interpretation. The key resource this week is to familiarise yourself with the Excel Spreadsheets that help you convert your fieldwork data to declination (revisit the material from weeks 4 and 6 to remind yourself of the key terms and definitions if need be). The hands-on task of the week requires you to calculate the declination of the setting sun. Use your compass and clinometer, or equivalent, to obtain the key measurements and then use the spreadsheet to get the declination.

Obtaining a declination is essential, particularly if one is working with multiple sites in different landscapes, but this is just the beginning of the journey of interpretation. Firstly, one needs to identify what celestial object, or objects, match the declination obtained. For this there are readily available solar and lunar tables, but you can also use Stellarium or other planetarium software to obtain them (don't forget to set the date!). And secondly one needs to interpret it: why is there an structural alignment or celestial symbolism in your primary sources? Why did such-and-such society spend so much time building a monument like Stonehenge that is aligned to key celestial events? This requires cultural contextualization, a topic that has been discussed here since week 2.

Thought for the Week

Should Archaeoastronomy be concerned only with the study of alignments?

Hands-on Task for the Week

What is the declination of the setting sun?

As the sun is setting, go outside with your compass/clinometer or smartphone app and measure its azimuth and altitude. Then use the excel spreadsheet on Moodle to convert it to declination.

WEEK 7: Identification and Interpretation

Required Reading

This week focuses on the identification of celestial targets of alignments as well as on the issues of interpretation. The key resource this week is to familiarise yourself with the Excel Spreadsheets that help you convert your fieldwork data to declination and/or the skyscapeR app or R package (revisit the material from weeks 4 and 6 to remind yourself of the key terms and definitions if need be).

In addition to this there are three readings. Ruggles' astronomy box includes tables of declination that permit you to identify key solar and lunar events. The second reading discusses the different ways of defining an equinox and how they yield different orientations. The question to consider is how would one distinguish between them, and correctly interpret an alignment to "an" equinox. Finally, Hayden and Villeneuve delve into the problem of over-interpretation. With recourse to the ethnographic record of contemporary hunter-gatherers, they take a critical look at claims of Palaeolithic astronomy.

The case study of the week is Silva's study of the passage graves of central Portugal. By now you are familiar with the employed methods here but this book chapter is important because it takes the argument further: it discusses the interpretation of the identified alignments in its cultural context, and also explains why a simple calendrical or functionalist explanation is unsuitable.

Ruggles, Clive, *Astronomy in Prehistoric Britain and Ireland*, New Haven and London: Yale University Press, 1999, Astronomy Box 6 (p. 57).

Ruggles, Clive L.N., 'Whose Equinox?' *Journal for the History of Astronomy* xxviii, 1997, pp. S45-50. Available online:

<http://adsabs.harvard.edu/abs/1997JHAS...28...45R>

Hayden, Brian and Suzanne Villeneuve, "Astronomy in the Upper Palaeolithic?," *Cambridge Archaeological Journal* 21(3), 2011, pp.331-55. [PDF ON MOODLE]

Case Study

Silva, Fabio, 'The View from Within: a 'time-space-action' approach to Megalithism in Central Portugal'. In Silva, Fabio and Nick Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015 (in press), pp. 120-139. [E-BOOK AVAILABLE ON TSD LIBRARY]

Recommended resources

skyscapeR legacy app and/or package [INFO ON MOODLE]

WEEK 7: Identification and Interpretation

Optional Reading

The list below begins by focusing on the problems of identification and analysis of alignments to particular celestial objects. The last two are books that focus on archaeological interpretation.

Belmonte, Juan A., 'Solar Alignments – Identification and Analysis' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 483-492. [E-BOOK AVAILABLE ON TSD LIBRARY]

González-García, A. César, 'Lunar Alignments – Identification and Analysis' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 493-506. [E-BOOK AVAILABLE ON TSD LIBRARY]

Sprajc, Ivan, 'Alignments upon Venus (and Other Planets) – Identification and Analysis' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 507-516. [E-BOOK AVAILABLE ON TSD LIBRARY]

Ruggles, Clive, 'Stellar Alignments – Identification and Analysis' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 517-530. [E-BOOK AVAILABLE ON TSD LIBRARY]

Hodder, Ian and Scott Hutson, *Reading the Past: Current Approaches to Interpretation in Archaeology* (3rd ed), Cambridge: Cambridge University Press, 2003. [E-BOOK AVAILABLE ON TSD LIBRARY]

Bell, James, *Reconstructing Prehistory – Scientific Method in Archaeology*, Philadelphia: Temple University Press, 1994.

WEEK 8: Themes in Skyscape Research

Purpose of the week

Familiarize yourself with themes in Archaeoastronomy and Skyscape Archaeology.

Class Description

This week's reading list is a collection of research themes in Skyscape Research. You don't have to read them all but do select a few and read them.

By now you will have been thinking about your research project and you can use this week to read more on the region/period that concern your project. On the other hand, you might also want to broaden your scope and see how other scholars have approached similar structures in different regions. The *Handbook of Archaeoastronomy and Ethnoastronomy* includes dozens of case studies that are great introductions to approaches, regions and time periods.

Thought for the Week

Is Archaeoastronomy only concerned with the ancient world?

Hands-on Task for the Week

Pick a street on your neighbourhood and find out which day of the year do you get a Manhattanhenge-like effect.

Measure the azimuth and altitude of a street in your neighbourhood, and convert them to declination. You can then use the solar declination table on Moodle to find out on which day of the year does the sun have the same declination as your street.

WEEK 8: Themes in Skyscape Research

Reading

All of the following readings come from the *Handbook of Archaeoastronomy and Ethnography*. They provide general introductions to these themes in archaeoastronomy and cultural astronomy and you can also use them to discover other references that might be of interest to your and/or to your research project. The *Handbook* itself also provides the largest collection of case studies, spanning the entire world and all time periods. You can use this resource to learn what others have done in the region or period you are interested in. On Moodle you will also find a library of papers that complement this.

Ruggles, Clive, 'Calendars and Astronomy' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 15-30. [E-BOOK AVAILABLE ON TSD LIBRARY]

Krauss, Rolf, 'Astronomy and Chronology – Babylonia, Assyria and Egypt' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 31-42. [E-BOOK AVAILABLE ON TSD LIBRARY]

Pimenta, Fernando, 'Astronomy and Navigation' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 43-66. [E-BOOK AVAILABLE ON TSD LIBRARY]

Krupp, Edwin C., 'Astronomy and Power' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 67-92. [E-BOOK AVAILABLE ON TSD LIBRARY]

Belmonte, Juan A., 'Ancient "Observatories" – A Relevant Concept?' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 133-146. [E-BOOK AVAILABLE ON TSD LIBRARY]

McCluskey, Stephen C., 'Astronomy in the Service of Christianity' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 165-180. [E-BOOK AVAILABLE ON TSD LIBRARY]

King, David A., 'Astronomy in the Service of Islam' In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 181-196. [E-BOOK AVAILABLE ON TSD LIBRARY]