

MA in Cultural Astronomy and Astrology
Archaeoastronomy Module – AHAN7010
Week Description

Week 3: Celestial Mechanics and Fieldwork

Purpose of the week

Two of the most important 'toolboxes' of the archaeoastronomer, Celestial Mechanics and Fieldwork, are introduced this week. Both are interconnected in Archaeoastronomy as one needs to be aware of the movements of the celestial bodies, and the 'coordinates' that are used to describe their positions, before one goes into the field and tries to measure them. This week you will learn what are azimuths and declinations and why they are important, how to plan a fieldwork visit, as well as how to use a GPS and compass to survey an archaeological site.

Tasks this week

- Familiarise yourself with the movements of the celestial bodies in the sky. You can do this by direct observation and/or using planetarium software that virtually recreates the sky
- Familiarize yourself with the Excel spreadsheet that converts azimuth into declination
- Plan the essay for your first assignment.

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. In this week you will learn:

1. what celestial coordinates are and why they are important to Archaeoastronomy;
2. what horizontal coordinates are;
3. what equatorial coordinates are;
4. how to convert from horizontal to equatorial coordinates using a simple Excel spreadsheet;
5. how to reconstruct the sky in the past using simple tools.

Fieldwork is as important in Archaeoastronomy as it is in Archaeology: it is the principal means of access to the primary sources. However, fieldwork methodologies are more often than not dependent on pre-conceived theories or assumptions, and thus prone to misconstruction and misdirection. 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:

1. how to use a GPS unit to get your location coordinates;
2. how to use a compass to measure azimuths;

3. how to use a clinometer to measure horizon altitudes;
4. how to prepare and execute a fieldwork investigation.

The recommended resources list includes tools that will assist your archaeoastronomical work. The Excel spreadsheets available on Moodle will help you convert your fieldwork data (azimuths, horizon altitudes and latitude) into declination. Stellarium is a freely available and easy to use planetarium software, which you can use to recreate the sky from any point on Earth at any time in the past or future. The National Geophysical Data Center is very useful if you need to estimate the magnetic declination (the deviation between True and Magnetic North) for any given date and location.

Required Reading

This week's reading is split between Celestial Mechanics and Fieldwork readings. You've got specially designed notes for this module but it's important to read others thoughts on the same topics. Fabian's book is a good introduction to celestial mechanics, with several emic examples from worldwide ethnography which can enrich any research project. Drewett's book is a textbook on Archaeological fieldwork. Chapter 4 is concerned with the surveying component, which most closely mimics fieldwork in Archaeoastronomy. Ruggles book contains boxes on Celestial Mechanics and an excellent Appendix on essential fieldwork techniques.

Notes on Celestial Mechanics [DOC ON MOODLE]

Fabian, Stephen M., *Patterns in the Sky: An Introduction to Ethnoastronomy*, Long Grove: Waveland Press, 2001, Chapters 1, 2, 3 and 4.

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).

Notes on Fieldwork in Archaeoastronomy [DOC ON MOODLE]

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

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

Optional Reading

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

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

Silva, Fabio, "Cosmology and the Neolithic: A New Survey of Neolithic Dolmens in Central Portugal," *Journal of Cosmology* 9, 2010, pp. 2194-206, Appendix A. Available online: <http://journalofcosmology.com/AncientAstronomy109.html>

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>

Recommended resources

MA CAA Archaeoastronomy Excel Spreadsheets [XLS ON MOODLE]

Stellarium – Free Planetarium
<http://www.stellarium.org/>

National Geophysical Data Center – Magnetic Declination Estimator
<http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp>

Thought for the Week

Is fieldwork always 'objective', or is it dependent on preconceived ideas, theories and expectations?