Archaeoastronomy of the Southwest
Arizona Archaeological Society
Todd W. Bostwick, Ph.D.

PURPOSE

This class will review the current literature on archaeoastronomy in the American Southwest, discuss important issues relating to the naked eye observation of celestial objects in the night sky, and cover basic recordation techniques and methods. This class will sample a small portion of a large body of literature on archaeoastronomy. Mesoamerican archaeoastronomy will be included because of the influence of Mesoamerican cultures on the Southwest and because of the advanced state of archaeoastronomy studies in Middle America.

Archaeoastronomy is most productive when undertaken as an anthropological study that uses archaeological and astronomical methods and theories. It should include the study of both the landscape and the night sky surrounding an archaeoastronomy site or location, as well as the cultural context in which the ancient/historic astronomy took place. Thus, ethnographic information, when available, should be used to develop research designs and for assisting interpretation; archaeological methods should be applied to the recordation and measurements of alignments; and knowledge of naked eye astronomy is essential.

Three types of archaeoastronomy phenomena in the Southwest will be studied in class and in the field: (1) Alignments of petroglyphs, buildings, cairns, or trails with celestial phenomena (sunrise, sunset, moonrise, moonset, planets, constellations or star clusters, etc.); (2) light and shadow interaction with rock art panels during certain times of the year; and (3) recorded oral traditions, songs, poems, and other ethnographic data that provide cultural context for understanding prehistoric astronomy.

Students in this class will create a notebook that summarizes the main points covered in the readings and in class, and will prepare a field journal describing field observations made by the student during the class. In addition, students will prepare a short (5-7 page) research paper that covers reading materials not assigned in class (see bibliography for additional references).

COURSE OBJECTIVES

At the conclusion of the course, students are expected to:

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1. Understand the issues involved in observation of celestial objects with the naked eye
2. Understand the ethnographic basis of astronomical observation
3. Be able to use basic recordation techniques and methods
4. Appreciate the importance of research designs in archaeoastronomy studies
5. Be able to understand and describe alignments of various man-made structures with astronomical objects and events.
6. Observe and describe solar interactions with rock art panels
7. Understand how and why astronomical observation was used in various significant cultures related to the American Southwest: Mesoamerican, Hohokam, Pueblo, Navajo, Apache, and others

**PREREQUISITES**

The only requirement is the completion of Prehistory of the Southwest I or permission of the instructor.

**COURSE FORMAT**

The course is designed to be presented in approximately 34 hours, with 20 hours of lecture (as indicated under the Classroom Instruction Section) and 14 hours of laboratory/field experience. Classroom instruction occurs from 6:30 to 9:00 pm once a week for eight sessions. Field observations take place during the week and on weekends.

**FIELD WORK**

Visits by individual students or groups of students to local sites for observation will be determined during the course. Some field observations will be required for individual students on their own and some will be done together as a class under the supervision of the instructor.

**LABORATORY/FIELD MATERIALS**

All students will be required to create a journal that records their field observations.

**REQUIRED READING**

COURSE OUTLINE (Classroom and Field Work Assignments)

I. Introduction to Archaeoastronomy Issues

Topics covered in this class session include the classification of celestial phenomena based on the strength of impression on a naked eye observer, the celestial sphere, charting the sun’s movement, and moon and eclipse cycles.

Reading for this session:


Field Exercise No. 1 (Night Sky):
Students will examine the night sky and plot the most obvious star clusters (constellations) as they see them using graph paper. Position the polar star in the middle of the page. Record time, date, and location. In addition, find a location to place a stick about 1 foot (30 cm) in height that will cast a shadow and then record that shadow over the course of the class, both at the same time and at different times of the day, if possible.

II. Ethnographic Studies in Southwest Astronomy

This class session reviews ethnographic information on astronomy for the Pueblos, Eastern Pueblos, Zuni, Hopi, Navajo, Mescalero Apache, Jicarilla Apache, Seri, Tohono O’odham, Pima, Maricopa, Cocopa, Havasupai, Walapai, and Yavapai.

Reading for this session:


Field Exercise No. 2 (Sunrise and Sunset):
Select an archaeological site or prominent natural feature which has a view of the horizon; observe the sunrise over part of the site or
natural feature. Find a comfortable and/or obvious location (e.g., open or cleared area, rock seat, etc.) to make this observation. Sketch the sun’s location on the horizon, record its azimuth, and note the direction/angle in which the sun moves up into the sky. Fill out the field form. Repeat this exercise for the sunset from the same observation location.

III. Recordation Techniques and Issues 1
This class session examines naked eye astronomy and recording techniques and forms, including determining azimuths.

Reading for this session:
- Archaeoastronomy Site Forms

Field Exercise No. 3 (Night Sky):
Observe the helical rise and set of several major constellations to help determine the ecliptic and celestial equators. Chart their movement across the sky in your journal, record dates and times. Note the movement of the star clusters you observed in field exercise no. 1.

IV. Recordation Techniques and Issues 2
Recordation is discussed further in this class, including methodological issues, the development of archaeoastronomy research designs, criteria for determining if a site is an observatory, and web-based reporting. There also will be a demonstration of the Redshift Star Chart Computer Program.

Reading for this session:
- www.sinaguasunwatchers.com
**Class Demonstration:**
Redshift Star Chart Computer Program

**Field Exercise No. 4 (Shadow Interactions):**
Record a mid-day shadow on a rock art panel in your journal. Sketch the shadow’s shape and its relationship to the petroglyph(s). Observe changes in the movement and shape of the shadow over a period of at least an hour. Fill out field form.

V. **Mesoamerican Archaeoastronomy**

This class session discusses the Mayan 584-day Venus calendar (Dresden Codex), the 260-day calendar, the 365-day calendar, Venus star wars, and astronomy temples. In addition, the class examines the conceptualization of geographic latitude by Mesoamerican groups through solar zenith observations and a complex calendar system, as well as the expansion of the Teotihuacan state during the first millennium A.D. based on archaeological data such as pecked circle crosses, building and site orientations, and culturally modified underground caves illuminated with beams of light during certain times of the year.

**Reading for this session:**

**Field Exercise No. 5 (Venus):**
Locate Venus in the night sky; in your journal plot its general location in the sky (cardinal direction and low or high in the sky). Record location (UTMS), date, and time.

VI. **Archaeoastronomy of the Pueblos**

This class session discusses evidence of archaeoastronomy at Chimney Rock in southwestern Colorado and Chaco Canyon in northwestern New Mexico, as well as the apparent responses among the ancient Pueblos to known solar eclipses during prehistoric times.

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**Reading for this session:**


**Movie:** “The Mystery of Chaco Canyon” by Anna Soafer, narrated by Robert Redford (1999).

**Field Exercise No. 6 (Lunar Observation):**

Examine lunar charts to determine the location and shape of the moon one evening. Observe the night sky from an archaeological site or prominent observation location and observe the rising of the moon. Sketch the moon and its movement in the sky. Record location (UTMS), date, and time.

**VII. Hohokam Archaeoastronomy**

Examples of Hohokam archaeoastronomy are discussed in this class session, including Casa Grande, the Shaw Butte Hilltop site, and the Hole-in-the Rock at Papago Park in Phoenix.

**Reading for this session:**

- Mixon, Benjamin, and Raymond E. White (1991) “Skywatchers of the Salt River Valley Hohokam”
Field Exercise No. 6 (Sunrise and Sunset, again)

Return to the archaeological site or prominent natural feature which has a view of the horizon that you previously recorded; observe the sunrise again over the same part of the site or natural feature. Sketch the sun’s location on the horizon (record azimuth) and note the direction/angle in which the sun moves up into the sky. Fill out field form. Repeat this exercise for the sunset from the same observation location. Note changes in the location of the sun from your previous observations.

VIII. Conclusions

Students will turn in their research paper and journal, and provide a 5-minute oral presentation on their paper to the class.
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Archaeoastronomy Field Notes

Site No./Name___________________ Other ___________________________

Recorder: ______________________________ Date: _________________

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**ARCHAEOASTRONOMY AND ROCK ART PANEL/ELEMENT**  
**LIGHT AND SHADOW CONDITION REPORT**  
**FOR THE SOLAR DAY AND YEAR**

- **Site No./Name**: 
- **Recorder(s)**: 
- **Panel No.**: 
- **Element No.**: 
- **Other**: 
- **UTMS**: 
- **Date(s) of Observations**: [enter date]

**Summer Solstice (SS):** 
**August Crossquarter (Acq):** 
**Autumn Equinox (AE):** 
**November Crossquarter (Ncq):** 
**Winter Solstice (WS):** 
**February Crossquarter (Fcq):** 
**Vernal Equinox (VE):** 
**May Crossquarter (Mcq):**

**Other Days**: 

### Light and Shadow Movements

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- **[X]** Dark (Shadow)  
- **[O]** Lit  
- **[—]** Both Shadow and Light on Element(s)  
- **[No]** No observation

### Sketch Map

- North?

### Light and Shadow Shapes on Petroglyph(s): [see form terminology] (enter date/time)

- __________ ( ) __________ ( )
- __________ ( ) __________ ( )
- __________ ( ) __________ ( )

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### Sunlight and Shadow Form Terminology

<table>
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Site No./Name________________
Recorder(s)_______________________________________

Dates Recorded_____________________ UTMS_________________

Panels/Elements____________________________ Time(s) of
Event_____________________

Azimuth (Compass Bearing) from Place of Observation to Horizon Event
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Comments:
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Sketch Map

Eastern Horizon

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Describe Horizon:________________________________________________________
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Describe Place of Observation:____________________________________________
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TWB Horizon Map East 7/7/2006
ARCHAEOASTRONOMY
WESTERN HORIZON SUNSET RECORD

Site No./Name _______________________
Recorder(s) ________________________________

Dates Recorded ___________________ UTMS ________________
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Panels/Elements ___________________________ Time(s) of Events:
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Azimuth (Compass Bearing) from Place of Observation to Horizon Event

Comments:
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Sketch Map

Western Horizon

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<td>Sunset</td>
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Describe Horizon: _________________________________________________________
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Describe Place of Observation:
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TWB Horizon Map West 7/7/2006
Site No./Name________________
Recorder(s)_______________________________________

Dates Recorded_____________________ UTMS_________________

Panels/Architecture_________________________ Time(s) of Event_____________________

Azimuth (Compass Bearing) from Place of Observation to Star Cluster ______________________

Describe Star Cluster(s) [Constellation] and Alignment(s) with Archaeological Feature(s):
______________________________________________________________________
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Sketch Map of Night Sky

Describe Place of Observation: _______________________________________________
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The Southwestern Night Sky
(Dan Heim 1997)