

HISTORY 493
Man and the Cosmos
Spring 2004

Many of the American peoples who were dispossessed by the compass-guided invaders from the East structured their world upon the four wind directions (or half-directions) and two more, Above and Below, also radial to the center/self/here and now, which may sacramentally contain the other six, and thus the Universe.

Ursula K. LeGuin
1982

Instructor: Stephen McCluskey TTh 4:00-5:15
Office Hours: TTh 11:00-12:30 G-4 Woodburn
202-D Woodburn
Also by appointment 293-2421 x 5225
E-Mail: scmcc@wvu.edu

Required Texts:

These books are not in the bookstore because they are either expensive (Ruggles) or out of print (Walker). But both can be obtained at reasonable prices on the web. I have listed web pages where I know that they can be obtained under each book; shopping around you may find a better deal. To save shipping costs, I suggest trying to arrange a joint purchase.

For the moment, the books are available on reserve, but don't count on being able to get at them for all your readings.

C. L. N. Ruggles *Prehistoric Astronomy in Britain and Ireland*. List price \$75.00; Available from the US distributor for Oxbow books (David Brown Books) for \$29.98.

<http://www.oxbowbooks.com/bookinfo.cfm/ID/22968//Location/DBBC>

Christopher Walker (ed.) *Astronomy before the telescope*. Out of print; Available at various prices from amazon.com and abebooks.com

References:

Encyclopaedia of the History of Science, Technology, and Medicine in Non-western Cultures, ed. Helaine Selin.

Books and Articles on Reserve

A. F. Aveni *Skywatchers*

A. F. Aveni, (ed.) *Archaeoastronomy in the New World*

A. F. Aveni *Between the Lines: the Mystery of the Giant Ground Drawings of Ancient Nasca, Peru*

A. F. Aveni *The Lines of Nazca*

A. F. Aveni, (ed.) *Native American Astronomy*

A. F. Aveni, (ed.) *The Sky in Mayan Literature*

A. F. Aveni, (ed.) *World Archaeoastronomy*

A. F. Aveni and G. Urton (eds.) *Ethnoastronomy and Archaeoastronomy in the American Tropics*

Brian S. Bauer *The Sacred Landscape of the Inca: the Cusco Ceque System*

Bede *Ecclesiastical History of the English People*, tr. Colgrave & Mynors

Johanna Broda "Astronomy, *Cosmovisión*, and Ideology in Pre-Hispanic Mesoamerica," pp. 81-110 in Aveni and Urton, *Ethnoastronomy and Archaeoastronomy in the American Tropics*, *Annals of the New York Academy of Sciences*, 385(1982).

Johanna Broda, David Carrasco, and Eduardo Matos Moctezuma *The Great Temple of Tenochtitlan: Center and Periphery in the Aztec World*

- Von Del Chamberlain *When Stars Came Down to Earth: Cosmology of the Skidi Pawnee Indians of North America*
- G. V. Coyne, M. A. Hoskin, and O. Pedersen (eds.) *The Gregorian Reform of the Calendar*
- D. Dearborn & B. Bauer *Astronomy and Empire in the Ancient Andes: the Cultural Origins of Inca Sky Watching*
- David S. P. Dearborn, Mathew Seddon, B. Bauer "The Sanctuary of Titicaca, where the Sun Returns to Earth", *Latin American Antiquity* 9(3):240-258, 1998.
- H. von Dechend and G. De Santillana *Hamlet's Mill*
- Mircea Eliade *The Sacred and the Profane: The Nature of Religion*
- Yehuda Elkana "The Distinctiveness and Universality of Science: Reflections on the work of Professor Robin Horton." *Minerva* 15 (1977): 155-173.
- Evan Haddingham *Early Man and the Cosmos*
- Berard Haile *Starlore Among the Navajo*
- Douglas C. Heggie (ed.) *Archaeoastronomy in the Old World*
- Douglas C. Heggie *Megalithic Science: Ancient mathematics and astronomy in northwest Europe*
- Hesiod *Works and Days*
- F. R. Hodgson (ed.) *The Place of Astronomy in the Ancient World* (Published as *Phil Trans Roy Soc*, Vol. 276 A (1974): 1-276).
- Robin Horton "African Traditional Thought and Western Science" *Africa*, 37(1967):50-71, 155-187
- Michael Hoskin *Tombs, Temples and their Orientations: A New Perspective on Mediterranean Prehistory*
- David A. King, *Astronomy in the service of Islam*
- E. C. Krupp (ed.) *Archaeoastronomy and the Roots of Science*
- Thomas Kuhn "The Function of Dogma in Scientific Research," in A. C. Crombie (ed.), *Scientific Change*
- Daniel McCarthy, "Easter Principles and a Fifth-century Lunar Cycle Used in the British Isles", *Journal for the History of Astronomy*, 24(1993): 204-224
- S. C. McCluskey *Astronomies and Cultures in Early Medieval Europe*
- S. C. McCluskey "Astronomy, Time, and Churches in the Early Middle Ages," pp. 197-210 in Marie-Therese Zenner, ed., *Villard's Legacy: Studies in medieval technology, science and art in memory of Jean Gimpel*
- S. C. McCluskey "Historical Archaeoastronomy: the Hopi Example," pp. 31-57 in Anthony F. Aveni (ed.), *Archaeoastronomy in the New World*.
- S. C. McCluskey "Calendars and Symbolism: Functions of Observation in Hopi Astronomy," *Archaeoastronomy*, 15(*JHA*, 21(1990): S1-S16)
- S. C. McCluskey "Calendric Cycles, the Eighth Day of the World, and the Orientation of English Churches," forthcoming in Clive Ruggles and Gary Urton, eds., *Cultural Astronomy in New World Cosmologies: Papers in Honor of Anthony F. Aveni*.
- S. C. McCluskey, "Different Astronomies, Different Cultures, and the Question of Cultural Relativism," forthcoming in John Fountain and Rolf Sinclair, eds., *Current Studies in Archaeoastronomy: Conversations across Time and Space*.
- S. C. McCluskey "Gregory of Tours, Monastic Timekeeping, and Early Christian Attitudes to Astronomy," *Isis*, 81(1990): 8-22
- S. C. McCluskey, "The Inconstant Moon: Lunar Astronomies in Different Cultures" *Archaeoastronomy*, 15(2000): 14-31
- S. C. McCluskey "The Mid-Quarter Days and the Historical Survival of British Folk Astronomy," *Archaeoastronomy*, 13(*JHA*, 20(1989): S1-S19

- S. C. McCluskey "Science, Society, Objectivity and the Astronomies of the Southwest," in John Carlson and James Judge, eds., *Astronomy and Ceremony in the Prehistoric Southwest*.
- S. C. McCluskey "The Solar Year in the Calendar of Coligny," *Études Celtiques*, 27(1990): 163-174
- Otto Neugebauer, *The Exact Sciences in Antiquity*
- Otto Neugebauer *Astronomy and History: Selected Essays*
- C. L. N. Ruggles, "The Borana Calendar: Some Observations," " *Archaeoastronomy*, 11(*JHA*, 18(1987): S35-S53)
- C. L. N. Ruggles (ed.) *Records in Stone: Papers in memory of Alexander Thom*
- C. L. N. Ruggles & N. Saunders (ed.) *Astronomies and Cultures*
- Barbara Tedlock, *Time and the Highland Maya*
- Dennis Tedlock (trans.) *Popol Vuh*
- Alexander Thom *Megalithic Sites in Britain*
- Raymond Van Dam Leadership and Community in Late Antique Gaul
- B. L. van der Waerden *Science Awakening II* (Math Library)
- Michael Zeilik, "The Ethnoastronomy of the Historic Pueblos, II: Moon Watching," *Archaeoastronomy*, 10(*JHA*, 17(1985): S1-S22)
- Michael Zeilik, "The Ethnoastronomy of the Historic Pueblos, I: Calendrical Sun Watching," *Archaeoastronomy*, 8(*JHA*, 16(1985): S1-S24)
- Michael Zeilik, "Sun Shrines and Sun Symbols in the U. S. Southwest," *Archaeoastronomy*, 9(*JHA*, 16(1985): S86-S96)

This course builds on the work I've been doing in the past twenty years investigating the astronomies of the peoples of medieval Europe, the American Southwest, and pre-Columbian Mesoamerica. The central theme I've taken for this course reflects the fact that almost every people that we've investigated have done something that we can call astronomy. In the best sense this is a multi-cultural course, showing the different ways different peoples have looked at the heavens and the different patterns of thought that they have used to order the things that they saw in the sky. By the time we're done, I hope we'll have some understanding of the fact that science, and particular astronomy, is not something that Western Europeans and their intellectual descendants do. All peoples construct frameworks to make their observations of the heavens intelligible; astronomy is a universal human activity.

To find out about these frameworks we will look at some of the recent investigations of astronomies and their place in culture that fall under the heading of "archaeoastronomy." It's not a very descriptive word, at its most restrictive it means the study of astronomy using the methods of archaeology, (i.e., surveys to determine if and how accurately Stonehenge, medieval churches, or Mayan temples face the rising or setting of heavenly bodies) Taken at its least restrictive, archaeoastronomy is the study of astronomies in early cultures, and that's the definition I'll use here.

This broad definition encompasses every kind of observation from precisely timed and measured observations of eclipses through general observations that on a given day the Sun rises at a certain point on the horizon, every kind of explanation from mathematically precise geometrical models to ambiguous mythological accounts. The one restriction is that it must be tied to something that we can actually see in the sky; a vague allusion such as "Monday's child is fair of face" may allude to the influence of the Moon, but it doesn't refer to anything we can see in the sky about the Moon on a Monday. Stellar or planetary mythology must be connected to observations to fit my definition of archaeoastronomy.

You may have noticed that I tend to speak of astronomies in the plural, unlike Carl Sagan I don't think of astronomy as a single way of looking at the sky. There may be one sky, but there are a whole range

of different ways of looking at the sky, different sets of questions that we can ask when we look at the sky, and different answers to those questions. In a word, there are many different astronomies.

I'm going to try to strike something of a balance between talking about astronomy and its social context, its functions in society. Before we're done we will know a bit about the things you can see in the sky without a telescope. We'll also learn a bit about the models that people have used to understand the regularly recurring events that they see in the sky. Chief among these (listed roughly in order of increasing difficulty) are the longest night of the year, a Full Moon, the appearance of a particular star in the morning sky, an eclipse of the Moon, or the movements of the planets among the stars). We'll also learn how to do the simpler kinds of calculations they have used to anticipate -- to predict -- some of these regularly recurring events. (For the mathematically timid, there will be nothing here beyond the kind of mathematics you need to balance your checkbook or to fill out an income tax form, and we all know how easy that is). Here, again, we'll see that different peoples took different approaches to predicting these events. Most of the techniques we'll use are relatively simple, but we will learn some technical details as we go along.

Equally important are the various ways in which these approaches to the study of the heavens served the societies in which they arose, whether in a practical utilitarian sense, in the sense of contributing to their broader world-view, or in the sense of supporting and/or reflecting the political structure of society. In this we will have to examine the interaction between astronomical and cosmological ideas and the various institutions, practices, and attitudes that contributed to, and were supported by, the understanding of the heavens. (Notice, I just spoke of the heavens: that common plural usage reflects the model of the universe as made up of hierarchically ordered celestial spheres, language reflects (and influences) our understanding of the heavens.

REQUIREMENTS AND GRADING POLICY

A tremendous amount of material has been written on traditional astronomies, more than anyone can cope with in a single semester. To make the job a bit more manageable, each student will select three cultures (five for grad students) where they will examine in some detail the astronomies of a particular culture. You will select one book (or at least three articles) on that culture and will submit a brief written report (600-800 words / 3-4 typewritten pages) on those readings. One of the final exam questions will be to compare the astronomies of the groups that you have studied.

There will also be a one-hour MID-TERM EXAM scheduled for the regular class period of Thursday, Feb. 26. The FINAL EXAM will be held as scheduled in the University Schedule of Examinations from 8:00 - 10:00 AM on Monday, May 3 in the regular classroom. A study guide will be passed out about a week before each exam.

Given the different expectation of performance from undergraduates and graduate students, there will be different grading requirements for students of different levels:

	Undergraduates	Grad Students
Attendance	50	50
Written Reports	3 @ 50 = 150	5 @ 50 = 250
Mid Term Exam	100	100
Final Exam	150	150
TOTAL	400	500

TENTATIVE SCHEDULE OF TOPICS

Approaches to other Astronomies

Required Readings:

Ruggles, *Astronomy in Prehistoric Britain and Ireland*, pp. 1–11

Recommended Readings:

Neugebauer, "The Study of Wretched Subjects", p. 3 in his *Astronomy and History*

Ruggles and Saunders, "The Study of Cultural Astronomy", pp. 1-23 in Ruggles and Saunders, *Astronomies in Cultures*

Eliade, *The Sacred and the Profane*, pp. 20-47, 68-91.

Early astronomies have been studied from many different perspectives. For some, astronomy is an exact science, based on quantifiable measurements which lead to mathematical models which, in turn, provide exact predictions. Anything which does not lead in this direction is seen as superfluous. From this mathematical perspective neither celestial physics nor philosophy, let alone celestial mythology, had any role in his history of mathematical astronomy. Finally, from this view the only "really important" astronomies are those that contributed to the main development of Western astronomy, from the Babylonians through the Greeks to Ptolemy and Copernicus.

The alternative route, which we will follow in this course, does not see mathematical predictions or models as essential to astronomies, does not rule out mythological or broadly philosophical elements, and looks at them as strongly rooted in their cultures.

An Archaeoastronomical Site in West Virginia ?

As an example of academic debate about the fringe status of archaeoastronomy, discussed by Ruggles, we can look at the controversy surrounding a petroglyph site in Wyoming County. This inscription has been claimed to record in words and markings an observation of the sun at the winter solstice. A recently assembled web site has gathered together the materials concerning this site.

There are two aspects to this argument, the astronomical, discussed in the essays by Ida Jane Gallagher (1983) and Robert Wise (2003) and the linguistic, discussed in the essays by Barry Fell (1983) and Monroe Oppenheimer and Willard Wirtz (1989). An early reaction to the early articles is provided by the essay by W. Hunter Lesser (1983). Read these analyses and discuss the adequacy of the use of evidence in the linguistic and astronomical areas. As uninformed observers, what can you make of this academic debate.

Summarize your findings for class Thursday in a short 100-200 word essay.

Required Readings:

http://cwva.org/controversy/ogham_intro.html (In the unlikely event you have trouble with this link, a google search on <ogham "west virginia"> should work.)

Astronomy without Theory: Observing the Sun, the Moon, and the Stars

Required Readings:

Ruggles, *Astronomy in Prehistoric Britain and Ireland*, pp. 18, 22-25.

Making Order of Different Astronomies

Required Readings:

McCluskey, "Different Astronomies, Different Cultures, and the Question of Cultural Relativism"

McCluskey, "The Inconstant Moon: Lunar Astronomies in Different Cultures"

Astronomies of the Old World

Prehistoric "Megalithic" Astronomy

Required Readings:

Ruggles, *Astronomy in Prehistoric Britain and Ireland*, pp. 12-55.

Film: *The Mystery of Stonehenge*

Readings for "Megalithic" Group:

Ruggles, "Recent developments in megalithic astronomy," pp. 13-26 in Aveni, *World Archaeoastronomy*

Heggie, *Megalithic Science*, esp. pp. 83-184

Atkinson, "Aspects of the Archaeoastronomy of Stonehenge," pp. 107-116 in Heggie, *Archaeoastronomy in the Old World*

Prehistoric "Megalithic" Lunar Astronomy

Required Readings

Ruggles, *Astronomy in Prehistoric Britain and Ireland*, pp. 55-78

Babylonian Mathematics and Astronomy

Required Readings:

Britton and Walker, "Astronomy and Astrology in Mesopotamia," in Walker, *Astronomy Before the Telescope*

Readings for "Babylonian" Group:

Neugebauer, *Exact Sciences*, pp. 29-52, 97-144 (*do not* let yourself get overwhelmed by Neugebauer's mathematical detail)

Sachs, "Babylonian observational astronomy," *Phil. Trans. Royal Soc. London*, A 276(1974):43-50

Aaboe, "Scientific astronomy in antiquity," *Phil. Trans. Royal Soc. London*, A 276(1974):21-42

Neugebauer (ed.), *Astronomical Cuneiform Texts* (3 vols.) QB19 / .A87 / 1983 (*Do not* read these texts, but leaf through them to get a feel for what the sources are and what might have been the problems in interpreting them)

Egyptian Mathematics and Astronomy

Required Readings:

Wells, "Astronomy in Egypt," in Walker, *Astronomy Before the Telescope*

Readings for "Egyptian" Group:

Krupp, "Light in the Temples," pp. 473-499 in C. L. N. Ruggles (ed.), *Records in Stone: Papers in Memory of Alexander Thom*

Neugebauer, "On the Orientation of Pyramids," pp. 211-213 in his *Astronomy and History: Selected Essays*

Astronomy in Sub-Saharan Africa

Required Readings:

Warner, "Traditional Astronomical Knowledge in Africa," in Walker, *Astronomy Before the Telescope*

Readings for "African" Group:

Turton and Ruggles, "Agreeing to disagree: the measurement of duration in a southwestern Ethiopian community," *Current Anthropology*, 19 (1978), 585-600.

Ruggles, "The Borana Calendar: Some Observations"

Chinua Achebe, *The Arrow of God*.

Astronomy in the Service of Islam

Required Readings:

King, "Islamic Astronomy," in Walker, *Astronomy Before the Telescope*

Readings for "Islamic" Group:

King, *Astronomy in the Service of Islam*.

Solstices, Equinoxes, and Mid-Quarter Days in late antiquity

Required Readings:

McCluskey, "The Mid-Quarter Days..."

McCluskey, "The Solar Year in the Calendar of Coligny"

Computus and the problem of the Lunar calendar

Required Readings:

Pedersen, "European Astronomy in the Middle Ages," in Walker, *Astronomy Before the Telescope*
Bede, *Ecclesiastical History of the English People*, iii.25; v.21

Readings for "Medieval" group:

Pedersen, "The Ecclesiastical Calendar and the Life of the Church", pp. 17-74 in Coyne, Hoskin, &
Pedersen, *The Gregorian Reform of the Calendar*
McCarthy, "Easter Principles and a Fifth-century Lunar Cycle ..."
McCluskey, *Astronomies and Cultures in Early Medieval Europe*, Chap. 5

Orientations of Tombs, Temples, and Churches

McCluskey "Astronomy, Time, and Churches in the Early Middle Ages"

McCluskey "Calendric Cycles, the Eighth Day of the World, and the Orientation of English
Churches"

Readings for "Medieval" group:

McCluskey, "Astronomies and Rituals at the Dawn of the Middle Ages", pp. 100-123 in Ruggles and
Saunders, *Astronomies in Cultures*
McCluskey, *Astronomies and Cultures in Early Medieval Europe*, Chap. 6
Michael Hoskin *Tombs, Temples and their Orientations* skim

Monastic Timekeeping

Required Readings:

McCluskey, "Gregory of Tours ..."

Readings for "Medieval" group:

Van Dam, "Sacred Time: Liturgy and the Christianization of Time", pp. 277-300 in his *Leadership
and Community in Late Antique Gaul*

Astronomies of the Americas

Sun and Sacred Places

Required Readings:

Zeilik, "Keeping the sacred and planting calendar: Archaeoastronomy in the Pueblo Southwest," in
Aveni, *World archaeoastronomy*
McCluskey, "Calendars and Symbolism"

Films: *The Sun Dagger*
Watcher of the Winter Sun

Readings for "Native American" Group:

McCluskey, "Native American Cosmologies"

McCluskey, "Historical Archaeoastronomy: the Hopi ...," pp. 31-57 in Aveni, *Archaeoastronomy in the New World*

Sofaer, et al. "Lunar Markings on Fajada Butte, Chaco Canyon, New Mexico," pp. 169-181 in Aveni, *Archaeoastronomy in the New World*

Zeilik, "Sun Shrines and Sun Symbols in the U. S. Southwest."

Zeilik, "The Ethnoastronomy of the Historic Pueblos, I: Calendrical Sun Watching."

Moon, Stars, and nomads

Required Readings:

Michael Zeilik, "The Ethnoastronomy of the Historic Pueblos, II: Moon Watching"

Haile, *Starlore Among the Navajo*

Readings for "Native American" Group:

Chamberlain, *When Stars Came down to Earth*, pp. 47-55, 92-106, 211-224

Eddy, John A. "Medicine Wheels and Plains Indian Astronomy," pp. 147-169 in Aveni, *Native American Astronomy*

Hudson, Travis "California's First Astronomers," pp. 11-74 in Krupp, *Archaeoastronomy and the Roots of Science*

Vogt, "Medicine Wheel Astronomy", pp. 163-196 in Ruggles and Saunders, *Astronomies in Cultures*

Maya and Aztec sky-watchers

Required Readings

Aveni, "Astronomy in the Americas," pp. 269-291 in Walker, *Astronomy Before the Telescope*

Broda, Johanna "Astronomy, *Cosmovisión*, and Ideology in Pre-Hispanic Mesoamerica"

Readings for "Mesoamerican" Group:

Broda, Johanna "Astronomical Knowledge, Calendrics, and Sacred Geography in Ancient Mesoamerica", pp. 253-285 in Ruggles and Saunders, *Astronomies and Cultures*

Carrasco, "Myth, Cosmic Terror, and the Templo Mayor", pp. 124-162 in Broda, Carrasco, & Matos Moctezuma, *The Great Temple of Tenochtitlan...*

The Inca Empire and the astronomical organization of space

Required Readings:

Aveni, "Astronomy in the Americas," pp. 291-303 in Walker, *Astronomy Before the Telescope*

Dearborn, et al. "The Sanctuary of Titicaca, where the Sun Returns to Earth"

Readings for "Inca" Group:

Brian S. Bauer *The Sacred Landscape of the Inca: the Cusco Ceque System*

Dearborn & Bauer *Astronomy and empire in the ancient Andes: the cultural origins of Inca sky watching*

Urton *At the Crossroads of the Earth and the Sky: An Andean Cosmology.*

Aveni, *The Lines of Nazca*, Mem. Amer. Phil. Soc.,

Aveni *Between the Lines: the Mystery of the Giant Ground Drawings of Ancient Nasca, Peru*

Just what is it; Science, Religion, Myth, or Superstition?

In preparing for this discussion try to focus on those portions of the readings dealing with the question of whether there is any real distinction between a society's scientific and non-scientific activities. In particular what, if any, are the differences between the thought of "primitives" and of modern scientists.

Required Readings:

McCluskey, "Science, Society, Objectivity and the Astronomies of the Southwest"

Aveni, "Whither Archaeoastronomy", pp. 3-12 in his *World Archaeoastronomy*

Elkana, "The Distinctiveness and Universality of Science ..."

Recommended Readings:

Horton, "African Traditional Thought and Western Science" *Africa*, 37(1967):50-71, 155-187

Monday, May 3. 8:00 - 10:00 AM FINAL EXAM