

Multicultural Astronomy: A Resource Guide to the Astronomy of Non-western Cultures

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Abstract. This brief list is an introduction to some of the resources for the study of astronomy of various cultures that are of interest to non-specialists and educators. The branch of archaeology that looks at the astronomical ideas and monuments of ancient cultures is called archaeoastronomy. We cite some of the most useful sources in this field for beginners, but acknowledge that we are only scraping the surface. Additions to this list are most welcome, and should be sent to the author at: fraknoiandrew@fhda.edu

1. General Books and Articles

Aveni, A. "Archaeoastronomy: Past, Present and Future" in *Sky & Telescope*, Nov. 1986, p. 456.

Aveni, Anthony *Conversing with the Planets*. 1992, Times Books. Celebrates the myths of many cultures; emphasizes the importance of seeing them in their own context.

Aveni, Anthony *Empires of Time*. 1989, Basic Books. A discussion of calendars, clocks, and cultures, with chapters on the Maya, Aztecs, Incas, Ancient Chinese, and several other early civilizations.

Aveni, Anthony *Stairways to the Stars: Skywatching in Three Great Ancient Cultures*. 1997, John Wiley. Focuses on the monuments and astronomy of the people who built Stonehenge, plus the Maya and the Inca.

Gleiser, Marcelo *The Dancing Universe: From Creation Myths to the Big Bang*. 1997, Dutton/Penguin. An exploration by a physicist of ideas from many cultures of how the universe came to be, including ancient legends and modern science.

Hadingham, Evan *Early Man and the Cosmos*. 1984, Walker & Co. A clear primer on the subject of ancient sites and the astronomical thinking of ancient cultures around the world.

Krupp, Edwin *Beyond the Blue Horizon: Myths and Legends of the Sun, Moon, Stars, and Planets*. 1991, HarperCollins. Superb collection of astronomical tales from many cultures. Best book to start with.

- Krupp, Edwin** *Skywatchers, Shamans, & Kings: Astronomy and the Archaeology of Power*. 1997, J. Wiley. Fine guide to sites around the world, written for beginners with humor and verve.
- Krupp, Edwin** *Echoes of the Ancient Skies: The Astronomy of Lost Civilizations*. 1983, Harper & Row. An excellent introduction on the thoughts and monuments of earlier cultures.
- Percy, John & Batten, Alan** "Chasing the Dream: Astronomy in Developing Countries" in *Mercury* (the magazine of the Astronomical Society of the Pacific), Mar/Apr. 1995, p. 14. What is happening in the study of astronomy in third-world countries and how others can help.
- Ruggles, Clive** *Ancient Astronomy: An Encyclopedia of Cosmologies and Myth*. 2005, ABC-CLIO. Mammoth A-Z compilation of the ancient knowledge of a wide range of cultures.
- Sakimoto, Phil & Rosendhal, Jeff** "Obliterating Myths About Minority Institutions" in *Physics Today*, vol. 98, #9, pp. 49–53 (September 2005). The authors, formerly the heads of NASA's space science education and public outreach program, offer some frank comments about the task of developing space science programs at minority colleges and universities.
- Walker, Christopher, ed.** *Astronomy Before the Telescope*. 1996, St. Martin's Press. 17 essays on how people observed and interpreted the sky before modern instruments.
- Zeitlin, Steve** *The Four Corners of the Sky: Creation Stories and Cosmologies from Around the World*. 2000, Henry Holt. Short book introducing and retelling the stories.

2. General Websites

- Ancient Observatories, Timeless Knowledge (Stanford Solar Center)**
<http://solar-center.stanford.edu/A0/>
 An introduction to ancient sites where the movements of celestial objects were tracked over the years (with a special focus on tracking the Sun).
- Astronomy Before History by Clive Ruggles and Michael Hoskin**
<http://assets.cambridge.org/052157/2916/sample/0521572916web.pdf>
 A nice pdf file with a well-written introduction to ancient astronomy (from the Cambridge Concise History of Astronomy).
- The Center for Archaeoastronomy at the University of Maryland**
<http://www.wam.umd.edu/~tlaloc/archastro/>
 Good site to learn more about the serious study of the astronomical relics of ancient cultures; some parts for the public, some for professionals in the field.
- Cultural Astronomy Web Exhibit**
http://ecuip.lib.uchicago.edu/diglib/science/cultural_astronomy/

Modules and resources on many cultures that have an astronomical tradition, created with the assistance of Chicago's Adler Planetarium.

Indiana Jones and the Astronomy of Yore

<http://www.astrosociety.org/education/publications/tnl/31/31.html>
Issue of a newsletter on teaching astronomy, focusing on archaeoastronomy.

An Introduction to Archaeoastronomy

<http://www.le.ac.uk/archaeology/rug/aa/a3015/index.html>
Clive Ruggles' 2003 Introductory Course Notes and Images at the University of Leicester.

Multicultural Cosmology Education Resource Center at Pomona College

<http://www.astronomy.pomona.edu/archo/intro.html>
Bryan Penprase and his collaborators have made this useful introductory site, which includes a world atlas of ancient astronomy, course outlines, a timeline and links to other resources.

Solar Folklore from the Stanford Solar Center

<http://solar-center.stanford.edu/folklore/>
Myths and legends about the Sun from cultures around the world.

Traditions of the Sun

<http://www.traditionsofthesun.org/>
The NASA Sun-Earth Connection Education Forum site offers virtual visits to Mayan astronomical sites and Chaco Canyon placed in appropriate historical, cultural, and scientific contexts.

Using Multicultural Dimensions to Teach Astronomy

Issue of a newsletter¹ on teaching astronomy, with suggestions for classroom activities and topics.

3. Resources about Specific Cultures

3.1. Astronomy and People of Color in the U.S.

Ferris, Jeri *What Are You Figuring Now?: A Story about Benjamin Banneker*. 1988, Carolrhoda Books. Children's book about 18th century black astronomer, mathematician, surveyor.

Price, J., et al. "American Minorities in Astronomy: Some Gains, A Long Way to Go" in *Mercury*, May/June 1995, p. 11. Multi-author report, with some poignant anecdotal notes.

Rall, Gloria "The Stars of Freedom" in *Sky & Telescope*, Feb. 1995, p. 36. On how slaves used songs with the Big Dipper to show them escape routes from the South.

Stassun, Keivan "Building Bridges to Diversity" in *Mercury*, May/June 2005, p. 20. The Chair of the Committee on the Status on Minorities in Astronomy for the American Astronomical Society discusses what could be done to increase the number of minority astronomers.

¹<http://www.astrosociety.org/education/publications/tnl/53/multicultural.html>

“Have Minorities Broken Astronomy’s Glass Ceiling” – a roundtable in *Astronomy* magazine, May 2003, pp. 55–58.

Committee on the Status of Minorities (AAS) Website: <http://www.aas.org/csma> Discussions of and resources about minority issues in the training of professional astronomers in the U.S.

Follow the Drinking Gourd Educator’s Guide (about how slaves used a song about the Big Dipper to find their way North in the U.S.; note however, the next reference in our list for some doubts about the modern song’s antiquity)
<http://www.rapides.k12.la.us/schooltech/david/UR.htm>

Follow the Drinking Gourd Website
<http://www.followthedrinkinggourd.org/> An amateur music scholar has researched the history of the song about the Big Dipper more thoroughly and presents his work here.

3.2. Astronomy of Native North American Cultures

Canby, T. “The Anasazi: Riddles in the Ruins” in *National Geographic*, Nov. 1982, p. 554.

Carlson, J. “America’s Ancient Skywatchers” in *National Geographic*, vol 177, #3, Mar 1990, p. 76.

Krupp, E. “Whiter Shade of Pale” in *Sky & Telescope*, July 2000, p. 86. A rock that looks like the Milky Way and was used in ceremonies by Native Americans in California.

MacDonald, John *The Arctic Sky: Inuit Astronomy, Star Lore and Legend*. 1998, Royal Ontario Museum. Astronomical stories and explanations from Northern Canada and Alaska, including a discussion of interpretations of the aurora.

Malville, J.M. & Putnam, Claudia *Prehistoric Astronomy in the Southwest*. 1993, Johnson Books. A nice introductory book about cultures and monuments in the Arizona area.

Maryboy, Nancy & David Begay *Sharing the Skies: Navajo and Western Cosmos*. 2006, Indigenous Education Institute & World Hope Foundation (available from <http://www.amazon.com>). An authoritative compilation by Navajo and Western astronomers of illustrations, stories, and observations of Navajo constellations coupled with stories from corresponding Greek constellations and Hubble Space Telescope images of objects found in that part of the sky. This is a kit that includes an audio CD, a small poster of the Dine Universe, and learning activities.

McLeary, Timothy *The Stars We Know: Crow Indian Astronomy and Lifeways*. 1997, Waveland.

Miller, Dorcas *Stars of the First People: Native American Star Myths and Constellations*. 1997, Pruett.

Monroe, Jean & Williamson, Ray *They Dance the Sky: Native American Star Myths*. 1987, Houghton Mifflin. Skylore from a number of tribes retold.

Williamson, Ray *Living the Sky: The Cosmos of the American Indian*. 1984, Houghton Mifflin/University of Oklahoma Press. The sky world of the Native Americans, through their tales and their observing sites.

Aboriginal Star Knowledge and Native American Astronomy
<http://www.kstrom.net/isk/stars/starmenu.html>

Exploratorium Chaco Canyon Site
<http://www.exploratorium.edu/chaco/index.html>

Meteors and Native Americans (Gary Kronk)
<http://farshores.org/a03mmm.htm>

Solar Astronomy in the Pre-historic Southwest

(P. Charbonneau, et al)²

3.3. Astronomy of Central American (Maya and Aztec) Cultures

Aveni, Anthony “Emissaries to the Stars: The Astronomers of Ancient Maya” in *Mercury*, Jan/Feb. 1995, p. 15. (See the books by Aveni in the first section.)

Barnhart, Edwin “Reconstructing the Heavens: Archaeoastronomy and the Ancient Maya World” in *Mercury*, Jan/Feb. 2004, p. 20. The Mayan calendar, sky observations, and monuments.

Kurtz, P. “An Astronomer Reads Archeology’s Message” in *Astronomy*, Oct. 2002, p. 48. Profile of Anthony Aveni, with a focus on his work on Mayan structures.

Milbrath, Susan *Star Gods of the Maya: Astronomy in Art, Folklore, and Calendars*. 2000, University of Texas Press. Scholarly monograph.

Mayan Calendar Activity

An activity from NOVA to figure out your birthday in the Maya calendar (if you were born 1980 or after).

http://www.pbs.org/wgbh/nova/teachers/activities/pdf/2804_maya.pdf

Mayan Astronomy Page (Leslie Welser)

<http://www.starteachastronomy.com/mayan.html>

The Maya Astronomy Page (Dawn Jenkins)

<http://www.michielb.nl/maya/astronom.html>

²<http://www.hao.ucar.edu/Public/education/archeoslides/archeoIndex.html>

Maya Exploration Center (Dr. Edwin Barnhart)

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

Includes tours of sites, resources, interviews, etc.

Mesoamerican Archaeoastronomy (James Jacobs)

http://www.jqjacobs.net/mesoamerica/meso_astro.html

Venus and the Maya (David Rosenthal)

<http://www.ridgenet.net/~n6tst/maya/default.html>

3.4. Astronomy of South American Cultures (Inca, Nasca, etc.)

Aveni, Anthony *Between the Lines: The Mystery of the Giant Ground Drawings of Ancient Nasca, Peru*. 2000, U. of Texas Press.

Aveni, Anthony *Nasca: Eighth Wonder of the World? 2000*, British Museum. (Available on line from several sources).

See many of the books in section A above.

3.5. Astronomy of African Cultures

DeVries, Dan “Teaching Across Cultures” in *Mercury*, Jul/Aug. 2005, p. 12. A physicist recounts his experience teaching science in Botswana.

Schilling, G. “The Star-Pyramid Connection” in *Mercury*, Jul/Aug. 2001, p. 28. On the Egyptian pyramids and their astronomical orientation.

Snedegar, Keith “Ikhwezi is the Morning Star” in *Mercury*, Nov/Dec. 1997, p. 12. On African myths related to the sky.

Ancient Horizons

<http://stardate.org/egypt/> – From the University of Texas McDonald Observatory, material from a planetarium show on Egyptian astronomy and culture.

The Dogon Tribe and the so-called “Sirius Mystery”

<http://www.ramtops.co.uk/dogon.html>

http://chandra.harvard.edu/chronicle/0400/sirius_part2.html

Holbrook, Jarita “African Astronomy”

<http://www.wam.umd.edu/~tlaloc/archastro/ae28.html>

A brief overview of astronomical ideas in African tradition. (Jarita Holbrook specializes in this area and keeps the field updated at: <http://www.u.arizona.edu/~holbrook/>)

Doyle, Laurence and Frank, Edward “Astronomy of Africa”

<http://www.tusker.com/Archaeo/art.encyclo.htm>

A review article from the Encyclopaedia of the History of Science, Technology and Medicine in Non-Western Cultures.

3.6. Astronomy of India

Vowahsen, Andreas *Cosmic Architecture in India*. 2001, Prestel. On the astronomical and ceremonial observatories built by Jai Singh in the 17th & 18th centuries.

Astronomy of India (Leslie Welser)

<http://www.starteachastronomy.com/indian.html>

3.7. Astronomy of Ancient European Cultures

Burl, Aubrey *The Stone Circles of Britain, Ireland, and Brittany*. 2000, Yale University Press. Detailed guide to Stonehenge and other ancient stone monuments.

Cunningham, Clifford "The Scottish Moon" in *Mercury*, Jul/Aug. 2006, p. 10. On the Callanish stones off the coast of Scotland their alignments with the motion of the Moon in the sky.

Gingerich, Owen "The Basic Astronomy of Stonehenge" in *The Great Copernicus Chase*. 1992, Cambridge U. Press. Uses a wonderful Coca-Cola can model to explain how the builders thought of the sky.

Krupp, E.C. "Inner Glow" in *Sky & Telescope*, Dec. 2004, p. 50. About the underground shrine at Newgrange, Ireland.

Maranto, G. "Stonehenge: Can It Be Saved?" in *Discover*, Dec. 1985, p. 60. On what tourism is doing to the ancient monument.

Zimmermann, L. "Heads and Tales of Celestial Coins" in *Sky & Telescope*, Mar. 1995, p. 28. On astronomical events depicted on Roman coins.

Archaeoastronomy at Stonehenge

<http://witcombe.sbc.edu/earthmysteries/EMStonehengeD.html>

An art historian examines Stonehenge from many perspectives, including the astronomical.

Stone Pages

<http://www.stonepages.com>

Mammoth web catalog about European stone circles and monuments, including Stonehenge and others with astronomy connections.

3.8. Astronomy of Islamic Cultures

Ahmad, I. & Khalid Shaukat, S. "Muslim Moon Sightings" in *Mercury*, May/June 1995, p. 38. The Muslim calendar and sighting the first crescent moon.

Gingerich, Owen "Islamic Astronomy" in *Scientific American*, April 1986, vol. 254, p74.

Arab and Islamic Astronomy (Leslie Welser)

<http://www.starteachastronomy.com/arab.html>

The Arabs and Astronomy (brief intro)

<http://mec.sas.upenn.edu/marhaba/resource/astronomy.html>

The Role of Astronomy in Islam (Dr. Shirin Haque-Copilah)

<http://moonsighting.com/articles/roleofislam.html>

Records of Eclipses in Muslim Astronomy

<http://www.muslimheritage.com/topics/default.cfm?ArticleID=810>

First Visibility of a Lunar Crescent Site (some easy, some technical)³**3.9. Astronomy of Hawaiian, Polynesian, and Native Australian Cultures**

Bryan, E.H. & Crowe, Richard *Stars Over Hawaii*, 2nd ed. 2002, Petroglyph Press (available from BasicallyBooks.com). An introduction to the stars as seen from Hawaii and their use as navigation aids in traditional Hawaiian voyaging.

Finney, Ben *Hokule'a: The Way to Tahiti*. 1976, Dodd Mead. An anthropologist describes recreating the voyages of the ancient Polynesians using the stars to navigate. Updated in his *Sailing in the Wake of the Ancestors: Reviving Polynesian Voyaging*. 2004, Bishop Museum Press.

Haynes, R. "Dreaming the Sky" in *Sky & Telescope*, Sep. 1997, p. 72. On the astronomical ideas in Australian aborigines culture.

Makemson, Maud *The Morning Star Rises: An Account of Polynesian Astronomy*. 1941, Yale University Press.

Introduction to Maori Star Lore (New Zealand)⁴**Polynesian Voyaging Society**

<http://pvs.kcc.hawaii.edu/welcome.html>

3.10. Astronomy of Asian Cultures

Nakayama, Shigeru *A History of Japanese Astronomy*. 1969, Harvard University Press. From ancient times through the 19th century, with a look at Chinese influences.

Spitz, Anna "Visiting the Moon Lady" in *Mercury*, Jul/Aug. 2006, p. 24. On Chinese moon legends and how they continue to be used in cultural celebrations.

Chinese Astronomy

<http://www.chinapage.com/astronomy/astronomy.html>

This site is potpourri of all kinds of information.

³<http://www.sao.ac.za/public-info/sun-moon-stars/moon-index/lunar-crescent-visibility/first-visibility-of-lunar-crescent/>

⁴<http://www.astronomynz.org.nz/maori-astronomy/taatai-arorangi-maori-astronomy-2.html>

The Mathematics of the Chinese Calendar

<http://www.math.nus.edu.sg/aslaksen/calendar/chinese.shtml>
By Helmer Aslaksen of the National University of Singapore.

Copernicus in China

<http://ccat.sas.upenn.edu/~nsivin/cop.html>
On the spread of
Copernican ideas by Nathan Sivin of the University of Pennsylvania.

Japanese Star Lore

<http://www2.gol.com/users/steve/jastro.html#Astro%20Lore>

The Lunar Calendar in Japan

<http://www2.gol.com/users/steve/calendar.htm>

Bibliography of Korean Astronomy

http://www.hawaii.edu/korea/bibliography/scientific_matters-astronomy.htm
This is a nice list of articles, but mostly in scholarly journals.

4. Some Technical Volumes

Batten, Alan, ed. *Astronomy for Developing Countries*. 2001, International Astronomical Union. Published by the Astronomical Society of the Pacific. Describes the many challenges of starting or continuing astronomy programs in countries without an extensive science infrastructure.

Bauer, Brian & Dearborn David *Astronomy and Empire in the Ancient Andes: The Cultural Origins of Inca Sky Watching*. 1995, University of Texas Press. Scholarly exposition.

Ruggles, Clive & Saunders, Nicholas, eds. *Astronomies and Cultures*. 1993, University Press of Colorado. Papers about Chinese, Japanese, Islamic, and Mesoamerican cultures.

Ruggles, Clive, et al, eds. *Songs from the Sky: Indigenous Astronomical and Cosmological Traditions of the World*. 2005, Ocarina Books. Proceedings of a 1983 international conference on ethnoastronomy (OK, so it took a while to publish). 32 papers about the sky knowledge, folklore and art of cultures around the world.

Selin, Helaine, ed. *Astronomy Across Cultures: The History of Non-western Astronomy*. 2000, Kluwer. A series of scholarly articles on the ancient astronomical traditions and monuments of a wide range of cultures.

Williamson, Ray & Farrer, Claire, eds. *Earth and Sky: Visions of the Cosmos in Native American Folklore*. 1992, University of New Mexico Press. Collection of essays.

David Dearborn's bibliography of technical and nontechnical readings in archaeoastronomy can be found at:

http://archaeology.about.com/od/archaeoastronomy/a/dearborn_bib.htm

Acknowledgments. I am very grateful to David Dearborn, Phil Sakimoto, Keivan Stassun, Cary Sneider, and Jarita Holbrook for suggesting and composing several entries for this list.