Making Astronomy Culturally Relevant

Nancy Alima Ali
UC Berkeley, Space Sciences Lab, California, USA
E-mail: nali@ssl.berkeley.edu

Key Words

Cultural Astronomy
Archaeoastronomy
Public Outreach
Informal Education

Summary

This article investigates how astronomy can be made relevant to ethnically diverse audiences by integrating astronomical concepts within cultural contexts. A series of Cultural Astronomy workshops is used to illustrate how highlighting the human connection to astronomy makes it easier to relate to.

Introduction

Do a Google image search using the term "astronomer" and the first image that comes up is Vermeer's painting *The Astronomer* (Figure 1). Illuminated by soft light falling through a window, the astronomer is gazing at a celestial globe. The next image in the search results is a cartoon of a young boy gazing through a telescope. This is followed by a glow-in-the-dark jigsaw puzzle of a wizard in a fanciful observatory. Keep going and you'll find a variety of photos of contemporary astronomers sitting in front of computers. What is striking about all these images is that, by and large, all the astronomers depicted appear to be Caucasian. In fact, the only notable ethnic diversity in the first three pages of the Google search results is a green alien.

This lack of diversity is an indication of the face of astronomy that is presented to the general public. Unfortunately, it sends a message that astronomy is an enterprise specific to one ethnic group, when the truth is that sky-gazing is a universal human endeavour. The overwhelming majority of cultures around the world have gazed at the sky and used their observations in daily life (Kelley & Milone, 2004). Considering that more than one third of the United States population identifies itself as an ethnic minority (Minckler, 2008), we, as astronomy communicators, would do well to acknowledge the diversity of the sky-gazing heritage.

Figure 1. The Astronomer *by Vermeer.*

In an attempt to highlight cultural connections to astronomical knowledge, I created and taught a series of Cultural Astronomy workshops for the general public that presented specific astronomical concepts within cultural contexts. The underlying premise was that exploring the cultural connections to astronomy would appeal to segments of the population that might not otherwise engage in astronomy education. As it turned out, this approach was not only effective with ethnic minorities, but also with the Caucasian majority. Feedback provided by workshop participants indicated that highlighting the human connection to astronomy brings astronomy down to Earth by making it easier to relate to. Instead of being remote and incomprehensible, astronomy becomes something that can be experienced every day in a personal way.

Cultural Astronomy workshops

The series of three Cultural Astronomy workshops were offered to the general public through the non-credit outreach division of Windward Community College in Kaneohe, Hawaii, USA. The workshop series took place on three Sunday afternoons in January and February, 2008. Registration was open to anyone aged ten and up, although the vast majority of the participants were adults. In total, 100 people attended the workshop series. Two of the workshops were roughly equally attended by males and females, while the third (which was inadvertently scheduled during the Super Bowl football game) was attended predominantly by females.

The workshops were organised thematically around the Sun, the Moon and the stars. Each workshop focused on an astronomi-

cal concept related to one of the themes, exploring the concept from both scientific and cultural perspectives. Each 90-minute workshop included a planetarium demonstration of the astronomical concept, a lecture component using PowerPoint slides and a hands-on activity. Opportunities for discussion were sprinkled throughout the workshops.

The Sun workshop explored the astronomical concepts of solstices and equinoxes within the context of the Native Hawaiian site Kukaniloko. Kukaniloko is a place that was used by the Hawaiian royalty as a birthing site, but it also is reported to have astronomical connections. Looking towards the Waianae Mountains from Kukaniloko, the Sun sets over the highest point of the mountain range at the equinoxes, into the lowest valley of the range at the winter solstice and at the point where the mountain range meets the ocean at the summer solstice. Investigating the astronomical connections of Kukaniloko gave a purpose for understanding the observable movement of the Sun along the horizon as related to seasonal change.

The Moon workshop focused on how the phases of the Moon were used as the basis of the Hawaiian calendar. The Hawaiian calendar was composed of twelve months that began with the first sighting of the waxing crescent Moon and ended with the new Moon (Beckwith, 1932). Since a synodic month is approximately 29.5 days long, a year in the Hawaiian lunar calendar would be approximately 354 days long. However, the Hawaiian calendar also included a sidereal year, based on the rising of the Pleiades at sunset (Malo, 1951). Since a sidereal year is approximately 365.25 days long, the Hawaiians must have had some way of intercalating the discrepancy of approximately 11 days. This example provided an excellent context for exploring the nature of the Moon's orbit around the Earth and the Earth's orbit around the Sun.

The Stars workshop investigated how Polaris, also known as the Pole Star, may have been used in Polynesian celestial navigation. It is well known that the first people who came to Hawaii voyaged on canoes from Polynesia using only natural cues, including the stars, to guide them (Finney, 1994). The star Polaris is currently used in Hawaiian navigation as a latitude marker (Polynesian Voyaging Society, 2008). Because the Polynesian migrations to Hawaii occurred over a period of several hundred years (TenBruggencate, 2006), the effect of precession must be taken into account when considering how Polaris was used in navigation. Presenting precession within a cultural context provided a reason for learning about such an abstract concept.

Participant feedback

In order to assess the effectiveness of integrating astronomy and culture as a way of engaging minority audiences, workshop participants were asked to complete a survey and were invited to provide feedback through informal focus groups.

At the end of each workshop, participants completed a paper survey that included a space for them to list their ethnicity. The purpose of this was to obtain data regarding the attendance of ethnic minorities in the workshop. The survey did not include preset ethnicity categories, but rather allowed people to write in their response. Eighty-three percent of workshop participants completed the survey. Of the participants who completed the survey, 47% identified themselves as Caucasian, 38% identified as belonging to two or more ethnicities, 9% as Asian, 4% provided no response and 2% identified as "other" (Figure 2).

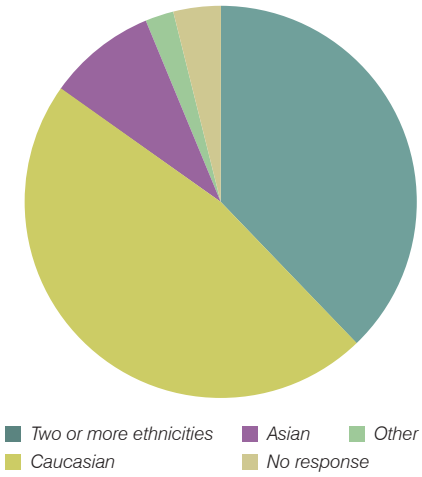

Figure 2. Workshop participant ethnicities.

In addition to the survey, participants were invited to linger after the workshops to provide feedback during informal focus groups. During the focus groups, participants responded to question prompts to share their thoughts regarding the value of integrating astronomy and culture. In total, 28 people participated in the focus groups. The responses that emerged from the focus group participants confirmed the value of recognising cultural minority perspectives of astronomy as a way of engaging the public.

When asked why they were interested in cultural astronomy, numerous participants responded that it made astronomy more understandable by making it easier to relate to. In the words of one participant, *"Astronomy is so out there, not here where I live."* Another participant elaborated on this by saying, *"It has more meaning for people because you can see how [astronomy] has some kind of help to your life … you can apply it to your life."* A third participant explained how integrating cultural aspects makes astronomy *"come alive more, rather than boring you silly with a bunch of math. Because angles are cute, but who cares? So when you see a reason why somebody would be watching the stars for culture or for navigation or doing planting or for other purposes, that just means more."*

A second theme that emerged was that of valuing non-European cultures. One participant explained how, in her opinion, *"Just to teach [astronomy] in terms of European [culture] is almost offensive. You want to know how you have value too and how your heritage is equally valid. Everyone wants to know their importance. It wasn't just Europeans looking at the sky."* In the case of Hawaii, where much of the traditional knowledge was lost due to the active suppression of the native language and cultural practices in the early 20th century, there is a desire now for people to reconnect with their culture. One participant described how teaching about traditional knowledge related to the stars is important in a larger sense because it is *"part of salvaging the identity of culture for the kids"*. Another participant put it this way: *"This is just another brick in the sense of building the wall of understanding."*

Guidelines for integrating astronomy and culture

Based on the experiences gained from the Cultural Astronomy workshop series, I have developed three guidelines for integrating astronomy and culture.

1. Make it relevant

Relevance to your target audience should be a primary consideration in choosing which cultural contexts and scientific concepts to integrate. In the case of the Cultural Astronomy workshops, the participants represented a variety of cultural backgrounds, but an interest in Native Hawaiian culture was shared among all. There is currently a great deal of interest in Hawaiian culture in Hawaii, creating a market for workshops and programmes that focus on Hawaiian culture. This workshop series built on this common interest and used it as a springboard for teaching astronomical concepts.

Likewise, the science concepts explored should be relevant to the target audience. In this case, the movement of the Sun along the horizon, the phases of the Moon and the use of Polaris as a marker of the north celestial pole are all concepts that have relevance to Hawaiian culture and can be easily viewed in Hawaii. In contrast, Pamela Eastlick (1995) describes trying to

teach children in Micronesia how to build sundials, only to discover that the gnomon would need to be about a millimetre high in order to be accurate for Micronesia's low latitude. Clearly, sundials are not culturally relevant in Micronesia.

2. Make it authentic

In the early 1990s, the Bishop Museum in Hawaii held a contest to choose a name for the phenomena of the zenith passage of the Sun. The phrase Lahaina Noon was chosen because it means "cruel Sun" in Hawaiian (Pukui, 1974; Williams, 2005)[1]. Although the contest may have been intended to engage the public in astronomy, it ignored the fact that the Hawaiian language already had a term describing the zenith passage of the Sun.

The Hawaiian term for this phenomena is *kau ka la i ka lolo* (Pukui, 1974)[2]. It may not be as catchy as Lahaina Noon, but it is certainly a more authentic and meaningful term. The phrase roughly translates to "the Sun rests on the brain". Hawaiians believe that the moment in which a person's shadow disappears as the Sun passes over the zenith is a time of great personal power. At this moment the person's *mana* or energy would collect inside and the person becomes aligned with the forces of the Universe (Pukui, Haertig & Lee, 1972).

Because of the Bishop Museum's role as an authority on Hawaiian culture and astronomy, the phrase Lahaina Noon survives within Hawaii. Each time Lahaina Noon is repeated it represents a lost opportunity for educating the public about the original Hawaiian knowledge regarding the zenith passage of the Sun.

This example illustrates the need for cultural content to be based on authentic cultural information rather than inventiveness, conjecture, misunderstanding or exaggeration. Otherwise, there is the risk that repeated inaccuracies become known as truth. In choosing the cultural content, seek out knowledge from cultural experts such as anthropologists, archaeologists, linguists, community leaders and elders. Cultural astronomy is interdisciplinary by nature, so sources of information must be gathered from a variety of field studies.

3. Make it holistic

The nature of scientific study often involves breaking down a concept or phenomenon into its constituent parts. In astronomy, a particular star may be understood as a mass of hydrogen and helium atoms which can be reduced to an equation. Yet cultural perspectives of the cosmos tend to present a holistic understanding of the natural world. Cultural understanding of a star may integrate observations of the star's colour and seasonal movements with mythological connections that contain historical elements and practical guidance for everyday life. When integrating astronomy with culture, it is important to honour this holistic way of knowing by drawing connections.

For example, a holistic exploration of the Mayan understanding of the stars Alnitek, Rigel and Saiph could highlight the role of these stars as symbolising the three stones of a traditional Mayan cooking hearth, out of which comes the mythological smoke of creation, which can be seen in the sky as the Orion Nebula (Freidel, Schele & Parker, 1993). Scientific understanding of the stars is integrated with mythology, cosmology and daily life of the Mayan people.

Conclusion

Few things evoke a sense of wonder more than the mysteries of the cosmos. Yet while black holes and spiral galaxies capture people's imaginations, they can also seem very remote from human experience. The challenge for astronomy communicators is to bring the cosmos down to Earth so that the astronomical concepts become meaningful to people. Integrating astronomical concepts within cultural contexts provides a strategy for making astronomy relevant by highlighting the celestial heritage of ethnic minorities.

References

- Beckwith, M. W. 1932, *Kepelino's traditions of Hawaii*, (Honolulu: Bishop Museum Press)
- Division of State Parks, n.d, *Kukaniloko Birthstones State Monument*, (Hawaii: Department of Land and Natural Resources)
- Eastlick, P. 1995, *Astronomy at the cultural crossroads*, Mercury, 24, 16–18
- Finney, B. 1994, *Voyage of rediscovery*: *A cultural odyssey through Polynesia*, Berkeley: University of California Press)
- Freidel, D., Schele, L. & Parker, J. 1993, *Maya cosmos*, (New York: HarperCollins Publishers, Inc.)
- Kelley, D. H. & Milone, E. F. 2004, *Exploring Ancient Skies*, (New York: Springer-New York)
- Malo, D. 1951, *Hawaiian antiquities (Mo'olelo Hawaii)*, trans. Emerson, (Honolulu: Bishop Museum Press)
- Minckler, D. 2008, *U.S. Minority Population Continues to Grow*, from http://www.america.gov/st/diversity-english/2008/May/20080513175840zjsredna0.1815607.html, retrieved 28 April 2010
- Polynesian Voyaging Society, 2008, *Polynesian Voyaging Society: Education and archive site* from http://pvs.kcc.hawaii.edu/, Retrieved 22 March 2008.
- Pukui, M. K. 1974, *Place names of Hawaii*, (Honolulu: University of Hawaii Press)
- Pukui, M. K., Haertig, E. W., & Lee, C. A. 1972, *Nana i ke kumu (Look to the source)* (Vol. 1), (Honolulu: Queen Lili'uokalani Children's Center)
- TenBruggencate, J. 2006, *Researchers: East Polynesia settled later* [Electronic version], The Honolulu Advertiser, (Honolulu: Gannett Co, Inc.)
- Williams, J. 2005, *Sun beams directly down on Hawaii in May*, USA Today, (USA: Gannet Co, Inc.)

Notes

[1] The correct Hawaiian spelling for Lahaina Noon includes a macron over the first two "a's" in Lahaina.

[2] The correct Hawaiian spelling for *kau ka la i ka lolo* includes macrons over the "a" in la.

Biography

Nancy Alima Ali is the Coordinator of Public Programs at the Center for Science Education at University of California Berkeley's Space Sciences Laboratory. Throughout her career, she has taught STEM topics to people of all ages in both formal and informal settings. Before moving to California, Nancy managed Windward Community College's planetarium and served as the Science Education Manager at Bishop Museum in Hawaii. Nancy Ali became interested in cultural astronomy while working at Bishop Museum, where she learned how Hawaiian people used celestial navigation. Following this passion, she earned a Master of Education degree from Lesley University, specialising in integrating astronomy and culture. Nancy developed and taught an "Intro to Archaeoastronomy" course for Windward Community College, as well as wrote a monthly astronomy column for the *Honolulu Star–Bulletin* newspaper.

International Year of Astronomy 2009

Final Report

The 1400-page final report for the International Year of Astronomy 2009 (IYA2009) is a compilation of the achievements of the 216 IYA2009 stakeholders — 148 countries, 40 international organisations and 28 global projects. The report shows the excitement, engagement and community involvement engendered by IYA2009. The report is intended to stand as a record of the legacy of this astonishing international celebration of astronomy. Download the International Year of Astronomy 2009 Final Report here: www.astronomy2009.org