Astronomy, Indigenous Knowledge, and Interpretation: Advancing studies of Cultural Astronomy in South Africa

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Abstract:
The International Society for Archaeoastronomy and Astronomy in Culture (ISAAC) Oxford X conference came to Africa for the first time in 2014. Oxford X exposed South African students and researchers to cultural astronomy data collection and analysis methods, as well as to potential mentors to further the goal of advancing the field. Cultural Astronomy studies in South Africa, however, remain in a nascent stage, which in some ways can be said for the entire field, but especially when it comes to studies of Africa. An overview of the debates within the field of cultural astronomy since the 1980s is presented along with ideas for advancing cultural astronomy in South Africa.

Keywords: South Africa, Cultural Astronomy, Indigenous Knowledge, Astronomy

Introduction

Cultural Astronomy is the study of humans and their relationship to the sky. These relationships include practical things such as timekeeping, weather prediction, seasonal calendars for agricultural activities, and navigation; artistic inspiration such as songs, poems, myths, stories, paintings, sculptures, etc.; and metaphysical beliefs such as celestial deities, astrology, the location of the Christian heaven and other religious connections; as well as human relationships regarding the scientific studies of astronomy, astrophysics, space sciences, atmospheric science, and planetary science. Included is the study of the history and evolution of all of these and more within regions, cultures, and sub-groups. A formal definition of cultural astronomy was put forth by Nicholas Campion (1997):

> Cultural astronomy is the study of the use of astronomical knowledge, beliefs, or theories to inspire, inform, or influence social forms and ideologies, or any aspect of human behaviour. Cultural astronomy also includes the modern disciplines of *ethnoastronomy* and *archeoastronomy*.

Here considered part of Cultural Astronomy, Archaeoastronomy is defined by Dictionary.com as "the branch of archaeology that deals with the apparent use by prehistoric civilizations of astronomical techniques to establish the seasons or the cycle of the year, especially as evidenced in the construction of megaliths and other ritual structures." Ethnoastronomy, in turn, is "the branch of astronomy concerned with the astronomical beliefs and practices of specific cultures." Within this broader formulation, the discipline of cultural astronomy has roots going back hundreds of years, though the term itself was first used in the late 1980s. Scholars trace the discipline to Athanasius Kircher (1635; cf. Fletcher 1970) who worked to understand the time keeping devices of the ancient world. Later, Charles Dupuis (1794) studied the astronomical symbolism found in religions, and Sir Norman Lockyer (1894) measured alignments of ancient structures, such as the Egyptian pyramids, to celestial bodies.

Scientific meetings focused on cultural astronomy were held with some regularity,

Table 1. "Oxford Conferences" sponsored by ISAAC

Year	Theme	Location
1981	Archaeoastronomy	United Kingdom
1986	World Archaeoastronomy	Mexico
1990	Archaeoastronomy in the 1990s	Scotland
1993	Astronomical Traditions in Past Cultures	Bulgaria
1996	Conversations Across Space and Time	USA
1999	Astronomy and Cultural Diversity	Spain
2004	Viewing the Sky Through Past and Present Cultures	USA
2007	Astronomy and Cosmology in Folk Traditions and Heritage	Lithuania
2010	Archaeoastronomy and Ethnoastronomy Building a Bridge	Peru
2014	Astronomy, Indigenous Knowledge, and Interpretation	South Africa

starting in 1981 with an inaugural conference on archaeoastronomy held at Oxford University. Since then, an "Oxford" conference sponsored by the International Society for Archaeoastronomy and Astronomy in Culture (ISAAC) has been held every few years at different locations around the world (Table 1). The conferences advance the field by creating a cadre of scholars that contribute articles, provide a peer review network, and establish journals.

At the early Oxford meetings, participants debated assumptions, data collection methods, and analysis techniques. These approaches seemed to be divided into two camps that focused on the differences of studying archaeoastronomy in two different global regions: "Old World" and "New World." Originally put forth by Anthony Aveni (1989), Old World archaeoastronomy focused on the study of astronomical alignments in ancient monuments and megaliths (mainly in Europe) and was heavily reliant on the archaeological record and statistical analyses of the sites. New World archaeoastronomy was focused on living indigenous cultures in the Americas, relying heavily on historical and ethnographic records, as well as anthropological studies. A subset of the latter approach evolved into what we call ethnoastronomy.

The case of Africa, however, does not fit comfortably within the "Old World" vs "New World" divide. Monuments with astronomical symbolism and alignments are found across the continent, such as Great Zimbabwe, Namorotunga in Kenya, and the pyramids of Egypt (Bent and Swan 1892; Doyle 1997; Robbins and Lynch 1983). But there are also studies of the large number of indigenous peoples with living traditions throughout Africa (Bennett 1899; Ruggles 1987; Snedgar 1997; Turton and Ruggles 1978). Connected to this division was the methodological issue of statistical approaches versus ethnographic approaches. Since we have few or no records from the people who constructed many astronomically aligned monuments and megaliths across Europe, researchers studying these structures depend upon amassing statistics to show regional patterns. The larger the dataset, the more robust the statistics and, hence, the greater the evidence of intentionality. In contrast, researchers working with living cultures tend to focus on one group of people which they study deeply rather than broadly (Aveni 2003; Ruggles 2011); thus with living cultures, astronomical knowledge is established through directly questioning people.

Debates ensued about which of these two approaches is more "scientific" and/or more rigorous. Further arguments ensued about whether or not having strong statistical results was evidence enough to

prove the intentionality of celestial alignments without having supporting evidence from artifacts, written records, or religious artifacts (Aveni 2006a, 2006b; Schaefer 2006a, 2006b).

Oxford X, held at the South African Astronomical Observatory in Cape Town in 2014, was the first Oxford conference hosted in Africa. Titled "Astronomy, Indigenous Knowledge, and Interpretation" the conference sought to push the boundaries of how statistical and other data are interpreted in cultural astronomy. Although this was the first "Oxford" meeting held in Africa, two related conferences were held in South Africa over the previous decade: the *African Astronomical History Symposium Symposium* in Cape Town, 2005 and the *Re-emergence of Astronomy in Africa* conference at the Cradle of Man, 2012 (Du Plesis and Masilela 2013; Glass 2005).

In previous Oxford conferences, discussions emerged about the problems raised when interpreting celestial alignments at archaeological sites without conducting background research on the history, culture, and beliefs of the people that built the site. This raised concerns about how we project the way we think today back onto ancient cultures and onto other cultures; about over-interpreting existing data; and about not considering the material remains associated with the site. When faced with these issues, the cultural astronomy community responded by promoting collaborations with archaeologists, historians, anthropologists, and others to strengthen the rigour of interpreting their research. They also pushed for stronger peer review and continued discussions at conferences, such as the one in Cape Town. The Oxford X conference achieved three goals: it increased our understanding of how to more rigorously interpret astronomical sites and knowledge systems, it solidified research in cultural astronomy in Africa, and it fostered collaborations between researchers within South Africa.

Advancing Cultural Astronomy in South Africa

Cultural astronomy in South Africa encompasses a range of projects, from the history of astronomy and the study of South African astronomers, to archaeology, folklore, art history, and interdisciplinary pursuits such as gender and indigenous studies. Modern astronomy and astrophysics in South Africa began with the establishment of the South African Astronomical Observatory (originally the Royal Observatory of the Cape of Good Hope) in 1820. The history of the South African Astronomical Observatory has been studied in some detail, but this is not the case with Boyden Observatory near Bloemfontein (established by Harvard University in 1927) and other observatories across South Africa (Gill 1913; Jarrett 1971; Laney 1996a, 1996b; Warner 1995, 2008). Studies of indigenous South African astronomy include broad overviews and compiling information found in historical records and early ethnographies, such as the Bleek and Lloyd Collection (Alcock 2014; Bergland 1976; Bleek and Lloyd 2001, 2007; Breutz 1969; Snedgar 1997, 1998). Very little research is being done on the indigenous astronomical knowledge of past and present South African cultures (Holbrook and Prada-Samper n.d.). To advance cultural astronomy in South Africa, the Oxford X conference introduced South Africans to archaeoastronomical techniques used to analyze ancient sites throughout the country, as well as interpreting astronomical symbolism in rock art and artifacts. Examples were presented from other parts of the world where similar projects are being undertaken. These include Peru, Hungary, and Mesoamerica (Aldana 2002; Ghezzi and Ruggles 2011; Malville 2011; Pásztor

2009). These examples demonstrated a deep understanding of ancient people, their lives, their religion, and the artifacts and structures connected to their knowledge and use of the night sky. Studies of people living today included examples from North America (Lee et al. 2013; Tedlock 1985), and emerging unpublished research in South Africa. These examples emphasized the time, care, and difficulty involved with conducting ethnographic work with living cultures to record their knowledge correctly and appropriately. The different studies show what is possible for studies within South Africa, and focused on South African people. Attracting more young people to the field is key to advancing cultural astronomy within South Africa. Only a handful of undergraduate and postgraduate students attended the conference. Many more are needed.

Astronomy and Indigenous Knowledge in South Africa

Through the National Research Foundation (NRF), the South African government has financially supported the disciplines of Indigenous Knowledge Systems and Astronomy. The NRF estimated budget for Indigenous Knowledge Systems for 2016/2017 was 15,300,000 ZAR. On a much larger scale, Astronomy and Space Sciences is allocated 114,900,000 ZAR (Georgiet 2015). These large financial commitments indicate the importance of these areas of research and scholarship to South Africans.

Official definitions of indigenous knowledge appear in the 2014 IKS Bill (Pandor 2015):

"indigenous knowledge" means tangible and intangible aspects of the whole body of knowledge that has been held, used, refined and transmitted by the indigenous communities collectively or as individual custodians of such knowledge as part of expressing their cultural identity and includes but is not limited to -

- *a) knowledge of and management of biological resources and ecosystems;*
- *b) literary, performing and artistic works (arts and culture);*
- *c) all items of moveable cultural property;*
- *d) all items of immoveable cultural property;*
- *e) indigenous institutions, philosophies, governance matters and languages;*
- *f) scientific, technical and spiritual knowledge;*
- *g) indigenous environmental resources; and*
- *h) indigenous communities' heritage*

"indigenous knowledge systems" refers to a combination of knowledge systems encompassing technology, cosmology, spiritual, social, economic and philosophical learning, or educational, legal and governance systems which manifest as indigenous knowledge, indigenous cultural expressions and indigenous knowledge associated with the utilisation of natural resources.

It is in the NRF IKS document that "IKS and Astronomy" is listed as one of the areas covered by their Indigenous Knowledge Systems funding instrument (National Research Foundation 2015). Thus, in terms of government funding support, it would appear that this would be an ideal NRF unit to apply to for grants with the potent combination of astronomy and Indigenous Knowledge systems. However, there is the stipulation that each grant proposal under IKS has a co-investigator that is a recognized indigenous knowledge holder. This is a stumbling block for many cultural astronomy projects. There remains the option of situating future projects in the humanistic and social sciences within NRF, emphasizing links to anthropology, art history, folklore, etc. rather than IKS if a knowledge holder cannot be recruited.

Conclusions

Cultural Astronomy has deep historical roots but remains a new endeavour in South Africa. Africa has not been overlooked in the cultural astronomy literature (e.g. Aveni 1993; Baity 1973; Bent and Swan 1892; Holbrook et al. 2003; Roberts 1981), but active research remains focused on Europe and the Americas. To advance the field of cultural astronomy in South Africa, research students, funding, and mentors are needed. As outlined above, funding could be obtained through the National Research Foundation. Also, the international scholars that attended the Oxford X conference can help with mentoring South African students. The Oxford X conference helped lay a foundation by hosting workshops for students and school teachers, and exposing South Africans to the many different types of projects that fall within the cultural astronomy rubric. The initial groundwork has been laid. Attracting students and new researchers to undertake projects is the next goal.

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