

# Astronomy in the cultural heritage of African societies

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**Abstract.** The African perspectives of astronomy are explored from the point of view of using indigenous knowledge of the night sky for purposes of addressing local challenges such as food insecurity and periodic natural weather phenomena such as droughts and floods. The local ethnic groups use stellar positions, and plant and animal behaviour changes for purposes of forecasting the weather and climate for the coming seasons. These traditional indicators give rise to an interdisciplinary discourse that could benefit the community in environmental protection measures and boost the tourism industry in some countries in Africa.

**Keywords.** Traditional indicators, eco-system, eco-tourism, cultural value of astronomy

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## 1. Introduction

Most African societies have developed indigenous astronomical knowledge largely for understanding and predicting seasonal weather changes. These communities depend mostly on rain-fed agriculture for subsistence farming, so they use their knowledge of the day and night sky to forecast rainfall and to predict periodic phenomena such as floods and droughts. In this paper we discuss a few traditional tools that are used by some ethnic communities in East Africa to interpret astronomical phenomena for solving their local problems. These traditional methods rely on the interaction of plants and animals with the terrestrial environment. Their scientific value needs to be established and recognized.

## 2. Traditional biological and astronomical Indicators

African communities combine their knowledge of plant and animal behavioural changes together with their night sky knowledge to predict the weather and climate for the coming season. These communities recognize that some plants and animals are more sensitive to changes in the atmospheric conditions than others. Traditional forecasting complements modern meteorological forecasting and is still the major source of weather and climate information for farm management in the rural areas. In this discussion we focus on the traditional forecasting methods used by the Luo community who live around Lake Victoria in Kenya and Tanzania. In this part of Kenya and Tanzania, there are two distinct wet seasons. Short rains occur from October to December and long rains from March to May.

### *Plant indicators*

Certain types of plants are known to shed their leaves to signal the onset of dry conditions, or they flower before a wet season begins. The shedding of leaves is an indication of water stress conditions associated with dry conditions. The trees shed their leaves to reduce

evapo-transpiration and grow leaves when the rains approach. These behavioural changes have been used to predict the weather and climate for the coming season. Among the plants with these observed properties are:

(i) Those plants that shed leaves to indicate an impending dry season are: *Terminii brownii*, *Ficus sur* & *Kigelia africana* – trees that shed leaves twice a year to mark distinct dry conditions around Lake Victoria region. The plants grow leaves when a wet season is approaching.

(ii) Those that flower to indicate an impending change of season are:

(a) *Zephranthus* - a field flower that appears a week or two before the onset of rains. The flower appears white during rainy season and pinkish during dry periods.

(b) **Blue Lotus (or Water Lily)** - this plant grows in water but will never blossom during the dry season. Its flowering is normally an indication that a wet season is approaching and that the rains will be adequate. If the coming rains will be poorly distributed this plant does not flower at all.

#### *Animal indicators*

The behaviour of certain animals is believed to indicate changes in the weather:

(i) The bird **Robin Chat** disappears for several months and only reappears when a rainy season begins. The swallows **Hirundo Abyssinia** and **Hirundo Smithic** exhibit circular movements in the sky when the rain is forming. Certain seasonal cries of birds are also believed to communicate changes in the weather.

(ii) The absence of **frogs** and **toads** indicates a dry season. When frogs stop croaking during the rainy season, even when it is still raining, it is an indication of the onset of a dry spell.

(iii) Movements of **ants** indicate that a wet or rainy season is approaching.

(iv) The appearance of **snakes**, and other **reptiles** and wild animals around houses is an indication of the prevalence and continuity of a dry spell.

#### *Astronomical indicators*

The movement of stars has also been related by the Luos to the weather and change of seasons. The constellation, **Orion**, is classified by the Luos as the “male constellation” and the **Pleiades** as the “female constellation”. Their appearance in the sky is linked with an impending change of season.

(i) The appearance of the female constellation indicates the cultivation season, while the appearance of the male constellation signals a decline in rains showing the start of dry season or harvesting.

(ii) It has been noted that the appearance and positioning of the **Milky Way** (called *Rip-* in Luo), especially in April, is normally an indication of the impending dry season. These traditional indicators are still the most widely used methods for farm management and food production. An understanding of link between these traditional indicators of weather/climatic changes and astronomy could change peoples’ view of astronomy to see it as a practical discipline that can help put food on the table rather than an esoteric science that it is perceived be.

### **3. Cultural and economic value of astronomy to society**

In the African perspective it seems that the best way to spread knowledge in astronomy is to begin by appreciating its cultural value. A possible path to follow is to:

(a) establish the scientific value of these traditional indicators in an interdisciplinary project involving both astronomers and biologists, and then to incorporate them into the standard astronomy curriculum;

(b) emphasize the traditional role that astronomical knowledge has played and continues to play in agrarian societies in Africa.

These kinds of initiatives will:

(i) Encourage the protection of the specific flora and fauna used as traditional indicators and this will be a good strategy for sustainable environmental protection. By linking indigenous astronomical knowledge to indigenous biological knowledge, the importance of astronomy will be recognized and astronomy will be seen as an intrinsic part of African culture, rather than as an esoteric 'foreign' pursuit.

(ii) Promote greater awareness of African perspectives of the cosmos, which will be of interest not only to the local inhabitants, but also to international visitors. Moreover, the generally lower levels of light pollution in African countries creates opportunities for people to re-aquaint themselves with the night sky in a way that is not possible for city-dwellers in the northern hemisphere.

(iii) Translate to a boost in revenue collection, especially for some African countries, like Kenya, that rely substantially on eco-tourism for their foreign exchange earnings. Thus most African governments might find the need to support programmes in astronomy if it is to bring that much needed capital for development.

#### **4. Conclusion**

Indigenous African astronomical beliefs and uses of astronomical knowledge need to be explored and recognized. Most, if not all, African ethnic groups have their own usage of sky knowledge and it would be interesting to find out the scientific basis of the traditional indicators that these groups (such as the Luos of Kenya and Tanzania mentioned in this paper) use to predict the weather, climate and periodic natural phenomena such as droughts and floods.

For purposes of spreading astronomy education in Africa, it would be necessary to tap into these traditional values of astronomy and incorporate them into the standard astronomy curriculum, so that the role of astronomy in tackling local challenges continues to be recognized. This would in turn lead to the conservation of the environment and a boost in the tourism sector. Once the value of indigenous astronomical knowledge is recognized, and it is seen as an intrinsic part of African culture, it might be possible to use this to secure funding for the development of astronomy from the various African governments.

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#### **References**

Cerdonio, M. & Noble, R.W. 1986, *Introductory Biophysics*, World Scientific Publishing Co, 40



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l to r in centre: Julieta Fierro, Barrie Jones and Patricia Rosenzweig