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CONFERENCE REPORT

Report on the Human Sciences Research Council (HSRC) 2012 Conference — The Re-emergence of Astronomy in Africa — A Transdisciplinary Interface of Knowledge Systems

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Introduction

For today's scientists, astronomy provides the opportunity to look back in time and study the origins of our universe through modern technology. To do so, the international Square Kilometre Array (SKA) project was recently allocated to be hosted by South Africa. South Africa will build a full dish array and a dense aperture array in the Northern Cape Province on a site of 12 million hectares where the world class Meerkat-telescope is already being constructed (seven dishes are already completed). The sparse aperture array (low frequency array) will be built in Australia. The SKA project will:

- Generate independent earth observation high-resolution satellite data available for all of Africa from a constellation of satellites designed and manufactured in Africa.
- Undertake at least one launch from South African territory in partnership with another space nation , and have in place a 20-year launch capability plan.

- Specify and co-build a domestic/regional communications satellite and secure a launch date and ITU slot for its operations.
- Become the preferred destination for major astronomy projects and associated international investment in construction and operations.
- Construct a powerful radio-astronomy telescope and use it for world-class projects.

A number of African countries are also developing initiatives in astronomy:

- Egypt is refurbishing its 1.9-metre optical telescope.
- Mauritius has the Mauritius Radio Telescope, which was constructed in the early 1990s.
- South Africa and Mauritius are jointly building a low frequency array with telescope stations in both countries.
- Burkina Faso is installing a 1-metre optical telescope.
- Ethiopia is considering installing a 2-metre robotic optical/infrared telescope and increasing the number of universities to support astronomy.
- Kenya and Mozambique, as a result of the African bid for the SKA, have started an astronomy programme at the University of Nairobi and University of Eduardo Mondlane, respectively.
- Ghana has started conversion of a communications antenna into a radio telescope.
- Nigeria is erecting a 25-metre radio telescope and has expressed an interest in taking part in the African VLBI network.
- Namibia has the HESS telescope, which is a high-energy telescope owned by an international consortium.
- South Africa has completed a 7-dish array called Karoo Array Telescope (KAT-7).

Traditional astronomy

The SKA project will not be the first time that Africa will study the stars. History proves that astronomy, currently considered as

a natural science, dates back to antiquity with origins in the philosophical, religious, mythological and astrological practices of pre-history. Nowhere is this more explicitly encountered than in the evidence found in the ancient manuscripts from Timbuktu dating back to the thirteenth century (Jeppie & Diagne, 2008). Within the manuscript collection at Timbuktu we find documented evidence of the roots of philosophy - manifested as a distinct discipline in the tradition of *falsafa* within the Muslim sciences and considered as precursor to Greek philosophy (Diagne, 2008). We also find documents containing astrological references and recordings of the stars and sun and moon cycles by ancient Muslim scholars such as Shaykh Sidi al-Mukhtar al-Kunti (1729-1811) (Mahamoudou, 2008). Current archaeo-astronomers are particularly interested in the manner in which these different ancient cultures studied the sky, thereby linking landscape archaeology with cognitive archaeology. The complexity of this quest obliges archaeo-astronomers to make use of interdisciplinary research information.

Due to the intertwined nature of research from the physical (natural) scientists and the social sciences it is apt to consider current astronomy research to be formulated through a transdisciplinary approach to the topic – an approach that moves beyond disciplinary methodological constraints. This is especially appropriate in the African context where virtually all policy-oriented studies require collaborations between social, human and natural scientists. This is evident in studies on environmental change, but also in cases where public policy requires human-machine interaction, where the *social embeddedness of technologies* is at stake, or where innovation challenges previous beliefs and practices (Wittrock, 2010). The African philosopher Cheickh Anta Diop (Nabudere, 2011:31) argued persuasively that the Platonian-Cartesian epistemology, supported by the Aristotelian 'corpuscle duality', set in motion a process of separation within the study of physics and brought about a clearly demarcated 'excluded middle'. The advent of quantum physics provided the unexpected 'space' to enter this 'excluded middle' by means of a transdisciplinary approach. It is within the space of the 'excluded middle' that this conference positioned the diversity of contributions under the topic of

astronomy. In the African context Cheikh Anta Diop declared that: "for us, the retrieval of the Egyptian heritage in all disciplines is a first, necessary step on the way to the reconciliation of Africa's civilizations with history. It is *a condition we must fulfill before we can design an up-to-date corpus of disciplines in the humanities and the social sciences;* the foundation for the renovation of African culture. The heritage of Greek and Roman antiquity has had a decisive impact on Western culture. Just as profoundly, the heritage of ancient Egypt will help shape the African culture we aspire to rethink and remake" (Diop 1981:12).

We find ample evidence of astronomy being mentioned by African philosophers:

- Philosphers of Alexandria, Cyrene, Carthage and Hippo (323 BC to 221 BC) i.e. Aristarchus who describe the earth's rotation on its axis and its rotation around the sun in his treatise: On the Magnitude of the Distance of the Sun and the Moon.
- The philosophical schools of Timbuktu (University of Sankore), Gao and Djenne (14th and 15th centuries AD) and the great Sudanese empires (Ghana, Mali, Gao, and Songhai).
- The plural tendencies in modern and contemporary African Philosophy: "… culturalist tendency, hermeneutic tendency, diachronic tendency, and the so-called functionalist tendency, which contemplates the integration of science and technology into African social, economic and cultural realities, while simultaneously trying to establish perspective for a new epistemology" (Obenga, 2004:12).
- Even more provocatively, the pyramids in Egypt bear testimony of the utilisation of expertise in astronomy. The pyramids, royal tombs built between 2750 BC and 1600 BC, were basically solar monuments invoking various modes of ascension such as stairways and shafts of sunlight that putatively enable the pharaohs to live in the afterlife as companions of the Sun God. The very precise north-south orientation of the construction of the

> pyramids was the result of precise astronomical calculations. By the time of Alexander the Great (356-323 BC), the Egyptians had already accumulated records of the observation of 832 lunar eclipses - and must have concluded easily enough that the earth was a sphere moving in space.

These brief examples serves as proof that there is a wealth of information embedded within the field of astronomy and, more specifically, archaeo-astronomy. It is no secret that ancient Africans were proficient star-gazers, and knowledge of the stellar systems formed part of their cosmology and worldview. Through their understanding of the star systems, they intuited the universal laws of nature. To them stars were not only cosmic arms of time, but also shaped their reality and day to day life like agriculture, health, education, relationships, environmental management and nation-building rituals.

HSRC Africa Knowledge Producers conference

The SKA project is considered as an intellectual site for collaborations between the humanities, social sciences and natural sciences. In this spirit the 2012 Human Sciences Research Council (HSRC) hosted an African Knowledge Producers conference that took place at Morapeng, at the Cradle of Humankind, South Africa on the10th and 11th September 2012. The conference focused on the theme '*The re-emergence of astronomy in Africa — a transdisciplinary interface of knowledge systems*' and provided a platform for meaningful science communication — building on social conversations, multi-media interaction, and reflective engagement.

The conference brought together participants from diverse research fields to deliberate on the re-emergence of astronomy in Africa through the transdisciplinary interface of knowledge systems. On the one hand presentations will cover the wealth of knowledge embedded in the area of ancient astronomy. On the other hand, through the participation of the natural sciences, presentations focused on the current three international telescopes in the Northern Cape Karoo. The first is SALT, an optical telescope near Sutherland. The second is the C-Band All

Sky Survey (C-BASS), which is a radio telescope. The third is PAPER (Precision Array to Probe the Epoch of Reionisation), which is a radio telescope.

To empower the participants in the conference to bridge the epistemological gap between the natural and social sciences and humanities we took up the following challenges:

- We will need to 'dare' in a qualitative manner as the space for new knowledge is already being generated through various other sources.
- Daring also means going into the history of ideas that configured the various 'Africas' over time and space.
- Daring means unpacking the ethnicising and restrictions on notions of universality as it emerged in the Western world.
- Unpacking notions of 'mindset' and tradition means deconstructing sources that are at the root of language normalisation and ideology.
- The role of science communication research as facilitator between the sciences and indigenous knowledge systems.

The conference placed high value on the contributions from Science Communication research as well as Public Understanding of Science (PUS) research that takes a comprehensive view of 'science' which is inclusive of the social sciences, the natural sciences and the humanities. One of the marker discussions of science communication falls under the broader topic of 'science and society'. This topic, in turn, addresses the key problem that arises from the interaction between science and the public(s) and the relation between science and common sense (also referred to as Indigenous Knowledge Systems — IKS). With debates ranging from philosophical aspects to empirical research, questions were posed regarding the 'epistemic gap' between science and common sense (IKS). In these debates certain traits emerged:

- A tradition of debunking false perceptions is being created between science and IKS (where IKS is considered to be situated in the place of superstition, half-knowledge, ignorance and misunderstandings).

- IKS is currently a focus of intellectual concern and the target of interventions.
- IKS progressively serves as a resource of inspiration and provides oversight and legitimacy.
- There is a need to deconstruct IKS in an effort to distinguish between facts and fiction.

This conference gave high priority to the role of indigenous knowledge in its interface with science communication and the natural sciences. The intellectual capital developed through participation between science and society as well as between science and IKS, steered the theoretical, epistemological and methodological perspectives best suited for science communication research in South Africa in specific and in Africa in general.

Considering the rich heritage of countries such as India and China, international researchers, following a transdisciplinary approach, with a special interest in archaeo-astronomy, astronomy and science communication presented their work. The conference hosted a modest gathering of approximately 120 delegates, including key international and local speakers, important dignitaries, including the Minister of S&T, HSRC Council Members, organizers and the research component of the HSRC.

The meeting primarily consisted of plenary sessions with keynote presentations (in various formats) with over 33 presentations. Speakers comprised of policy-makers and academics, both internationally and within South Africa. The two-day programme included eight international speakers and twenty four local speakers representing an array of countries and organisations. International speakers included: Prof. Shi Shunke, China Research Institute for Science Popularisation (CRISP), Beijing, China; Shri Gauhar Raza, Head, Science Communication through Multi-Media, NISCAIR, CSIR, New Delhi, India; Prof. Bernard Schiele, University of Quebec, Montreal, Canada; Dr Julius Gatune Kariuki, Africa Centre for Economic Transformation, Ghana; Prof. Habib Sy, Howard University, Washington; Dr Peirre Sane, Imagine Africa International, Paris, France and Prof. Alfred Z Msezane,

Department of Physics, Clark Atlanta University, Fellow, American Physical Society.

During the conference a visit was arranged to the radio telescope at Hartebeesthoek Radio Astronomy Observatory (HartRAO) hosted by Dr. Michael Gaylard, Director of HartRAO. At a sit-down gala dinner a poetry reading session was provided by the following delegates: Gauhar Raza, NISTADS, CSIR, India (Urdu poet); Keith Gottschalk, University of Western Cape, South Africa and Pitika Ntuli, Artist.

The Conference has been another milestone in the post-apartheid trajectory of the HSRC. A HSRC Press book publication will be soon completed under the Africa Knowledge Producers Series: *The re-emergence of astronomy in Africa: a transdisciplinary interface of knowledge systems*, edited by Hester du Plessis, Jeffrey Sehume, Temba Masilela and Gauhar Raza.

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