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STAR STORIES: USING INDIGENOUS KNOWLEDGE FOR STAKEHOLDER ENGAGEMENT

ABSTRACT

Radio astronomy projects require large open spaces with minimal radio frequency interference, light and air pollution. Often, indigenous minorities such as the San in South Africa and the Wajarri Aboriginal peoples in Western Australia live on this land or have cultural rights to the land. Communication and engagement challenges with these stakeholders include language, culture, cultural heritage and stakeholder expectations. This study shows how the Square Kilometre Array South Africa (SKA SA) used the narratives and indigenous knowledge of astronomy of the San peoples of South Africa to facilitate some stakeholder engagement. These narratives were originally documented by Bleek and Lloyd (1911). Different versions of these narratives are still being told in the Central Karoo region of South Africa by the descendants of the San people. The key finding was that narratives are an effective method of creating a communication and engagement platform and for fostering collaboration, particularly for astronomy projects where the establishment of common ground among stakeholders could be challenging. The study concluded that it is important for astronomy projects and science communication to invest in indigenous knowledge systems and to preserve and recover cultural heritage as far as possible for the benefit of future research. In this way, beneficial stakeholder collaboration can be facilitated and progress can be made towards the achievement of global sustainability goals.

Keywords: strategic communication; stakeholder engagement; science communication; indigenous knowledge systems; corporate social responsibility; communication strategy; narrative inquiry

INTRODUCTION

The |Xam, a San tribe, were the first people to walk the land where the Square Kilometre Array (SKA) will be constructed. The SKA project in South Africa works with stakeholders on different levels. These include individuals, local bodies like municipalities and local farming unions, regional,

provincial and national bodies, like the South African San Council and the National Khoisan Council, as illustrated in Figure 1. This means that both the government-acknowledged bodies and individuals from local communities are engaged and the organisation is open to working with other stakeholders that come forward, ensuring that all stakeholders are engaged.

There has been some criticism from social anthropologists and social scientists with regard to the work the NRF|SARAO (National Research Foundation | South African Radio Astronomy Observatory) is conducting with the San people and specifically the San Council. The criticism is based primarily on online documents referring to the Memorandum of Understanding with the San Council and interviews with selected individuals from one specific community (Chinigò 2019; Walker & Chinigò 2018; Parkington *et al*. 2019; Walker 2019). A key criticism of the SKA SA project in these articles (Parkington *et al*. 2019; Walker 2019) is that it has sterilised the land in the Northern Cape and has dispossessed the descendants of the |Xam people from reclaiming their identity. A second criticism is that the development plans introduced by the project are top-down and not conceived by the local people, especially the |Xam descendants. All these articles make statements about the lack of consultation and the wish of |Xam descendants to re-establish their identity, which is bound in the land. Anthropologists acknowledge that it is hard to identify |Xam descendants as they do not have a representative organisation or organisations. Walker and Chinigò (2018) do not specify how they identified the widespread demand for access to the land to re-establish identity. The article by Parkington *et al*. (2019) disputes the commonly accepted version of the location of specific San groups in the Karoo. The articles by Walker (2019) and Chinigò (2019) focus on what they regard as problems with the SKA SA in the Karoo, especially with regard to development and its impact on the way local San people identify themselves. The articles all acknowledge that the samples are limited and apply to this sample only and cannot be generalised. Another common feature of these articles and critiques is that all social and other investment in communities is disregarded and is not mentioned.

Radio astronomy projects require large open spaces with minimal radio frequency interference, light and air pollution to ensure optimal observations. Stakeholder engagement with indigenous minority groups often living on or having cultural rights to land in such areas has gained increased attention in recent years. In strategic communication, discourse has shifted from stakeholder management to stakeholder engagement, with the emphasis on collaboration and cooperation. The SKA SA project is evolving this aspect of its strategic communication with a focus on sustainability.

This article discusses how the SKA SA used the San peoples' narratives on astronomy to facilitate stakeholder engagement. Both Australia and South Africa see cultural minority groups as important, therefore projects like the Shared Sky Exhibition were developed to tell the stories of the San and the Wajarri and how they understand cosmology. At present, there is no academic publication that documents the process and challenges of stakeholder engagement with the San peoples. The aim of this article is to report on the stakeholder engagement initiative that took place in the Central Karoo region of South Africa and to show how narratives could be used to

mitigate challenging stakeholder engagement. The authors argue that stakeholder engagement with indigenous minority groups in scientific projects, such as astronomy, can be facilitated by drawing on their indigenous knowledge. Considering the San peoples have been telling stories about astronomy for centuries, their narratives can offer insights into their cultural heritage that can be a point of departure for further engagement and collaboration.

The discussion commences with a description of the SKA SA project and its stakeholder challenges. The literature review focuses on the SKA SA scientific project, stakeholder engagement and the San Peoples' previously recorded stories about astronomy. The study used semi-structured interviews to compare documented indigenous knowledge with current narratives from a selected group of San peoples in Central Karoo. The results show how this method of engagement could facilitate effective stakeholder communication.

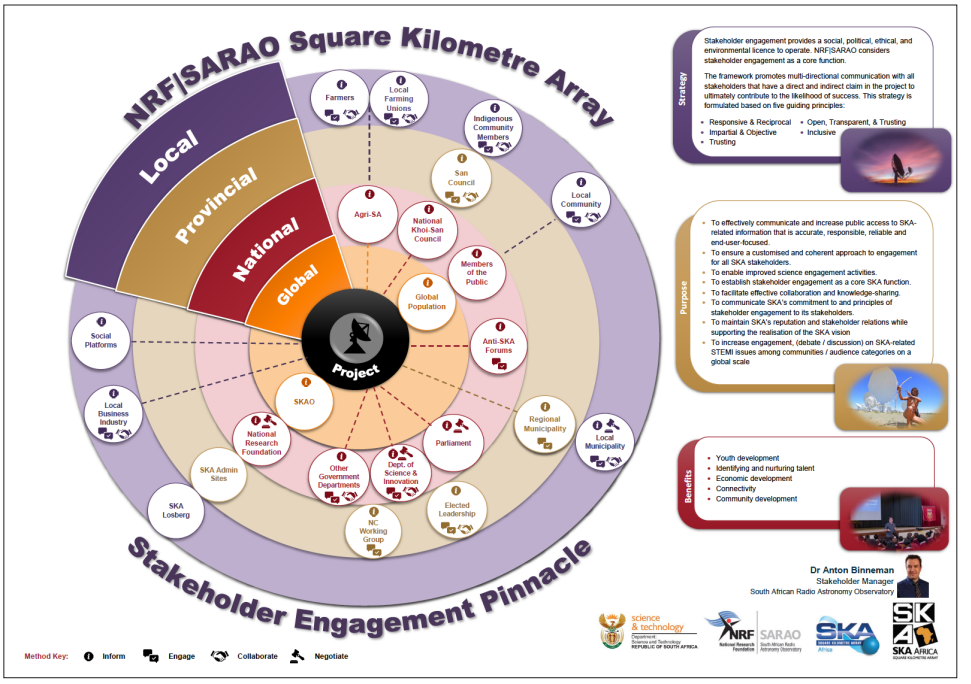

FIGURE 1: NRF|SARAO STAKEHOLDER PINNACLE

THE SQUARE KILOMETRE ARRAY PROJECT

The SKA project is an international effort to build the world's largest radio telescope. South Africa's Karoo region and Western Australia's Murchison Shire were chosen as co-hosting locations for many scientific and technical reasons, ranging from the atmospherics above the sites to the radio quietness as a result of being two of the most remote locations on earth. South Africa's arid Karoo region will host the core of

the mid-frequency dishes, extending over the African continent, whereas Australia's Murchison Shire will host the low-frequency antennas. As one of the largest scientific endeavours in history, the SKA will involve a wealth of the world's leading scientists, engineers and policymakers to bring the project to fruition. An overview of astronomy in South Africa, covering its history and a brief discussion on the instruments that have been established worldwide, as well as in South Africa gives a perspective on the enormity of the SKA project and how it involves multiple disciplines, including science, engineering, anthropology and strategic communication.

The SKA in South Africa

The SKA Organisation, with its headquarters at Jodrell Bank Observatory near Manchester in the United Kingdom, was established in December 2011 as a not-for-profit organisation to formalise relationships between the international partners and to centralise the leadership of the project. Eleven countries are currently members of the SKA Organisation – Australia, Canada, China, Germany, India (associate member), Italy, New Zealand, South Africa, Sweden, the Netherlands and the United Kingdom. The scale of the SKA demonstrates the immense progress in both engineering and research, as well as the development towards building and delivering a radio telescope that will most likely produce an exponential and transformational increase in scientific capacity. The brief descriptions of the different projects below highlight the aims and scope of the different programmes.

As mentioned before, and indicated in Figure 2, the Karoo region in South Africa will host the core of the mid-frequency dishes, extending over the African continent, whereas Australia's Murchison Shire will host the low-frequency antennas. While the 11 member countries are the cornerstone of the SKA project, around 100 organisations from approximately 20 countries are participating in its design and development. The project requires the involvement of world-leading scientists and engineers to design and develop a system with supercomputers that are faster than any in existence at this time, as well as network technology that will generate more data traffic than the entire global system of interconnected computer networks or the Internet.

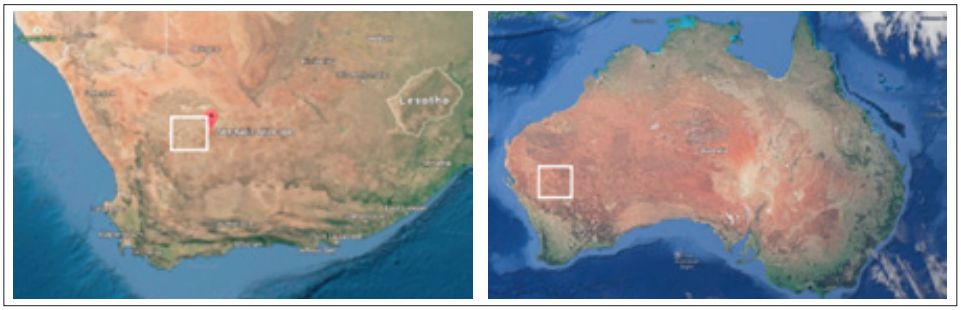

FIGURE 2: LOCATION OF THE TELESCOPE IN SOUTH AFRICA AND AUSTRALIA

(Source: Square Kilometre Array Organisation)

The SKA SA will eventually use thousands of receivers and up to one million low-frequency antennas that will enable astronomers to monitor space in unprecedented detail and survey the entire night sky much faster than any system currently in existence. The SKA's unique configuration will give it unrivalled scope in observations, largely exceeding the image resolution quality of the Hubble Space Telescope. The SKA SA will be able to produce images of large areas of the sky in parallel; a feat no survey telescope has achieved on this scale and at this level of sensitivity. With a range of other large telescopes in the optical and infrared spectrum being built and launched into space over the coming decades, the SKA SA will augment and complement scientific discovery.

The NRF|SARAO spearheads the SKA activities in engineering, science and construction in South Africa. The NRF|SARAO is a facility managed by the NRF and incorporates radio astronomy instruments and programmes such as the MeerKAT and KAT-7 telescopes in the Karoo; the Hartebeesthoek Radio Astronomy Observatory (HartRAO) in Gauteng; the African Very Long Baseline Interferometry (AVN) programme situated in nine African countries; as well as the human capital development and commercialisation endeavours that support these projects.

South Africa has a rich history of astronomy and has collaborated with international astronomers frequently over the past 100 years. These collaborations were mostly in optical astronomy, but there have been collaborations in radio astronomy as well. The HartRAO was built in 1961 by the National Aeronautics and Space Administration (NASA) from the United States of America. A 26-metre diameter antenna was used to retrieve data from and send commands to many unmanned US space probes beyond earth's orbit.

The San people of southern Africa are among Africa's most intriguing people. Genetic evidence suggests that they are some of the earth's most ancient people, having been around for 22 000 years (Barnard 1992). For centuries, the San people of southern Africa have experienced colonial violence, ethnocide and dispossession, which has pushed them into arid lands in the north of South Africa (Lee, Hitchcock & Biesele 2002). By the beginning of the 20th century, the remaining formal San in South Africa were found in the arid areas of the Northern Cape, Southern Namibia and Botswana with descendants across the areas where they moved prior to 1900. The San people's early ancestors, the !Xam, walked the land where the SKA SA will be hosted. This group has mostly been driven from the area, with only some descendants remaining. This is evident when one looks at the heritage found by Barnard (2002) on the land procured for construction of MeerKAT and the SKA SA. The San were driven from the land by white settlers and later the British government in the 1800s. The complexity of the San peoples' heritage and genealogy has been well documented by authors such as Bleek and Lloyd (1911). The SKA sites in Western Australia and South Africa are on land that traditionally belonged to indigenous peoples. For the entire SKA project, engagement with these peoples is a priority. Consequently, discussions with the San Council started in 2012 to look at opportunities for collaboration with the San peoples. The opportunity for mutually beneficial projects was clear, considering indigenous minority groups such as the San peoples have limited resources.

The SKA SA will transform the Karoo and the Northern Cape socially and economically and will provide opportunities for the people who live there. These opportunities include human capital development through school programmes, bursaries and artisan apprenticeships, community development, job opportunities and socioeconomic investment. Even though the objectives of and opportunities provided by the SKA SA and MeerKAT projects illuminate multiple stakeholder benefits, there were many challenges and barriers to stakeholder engagement presented by common denominators such as historiography, language, culture and socio-economic factors. Informed by experts from multiple disciplines, the SKA SA decided to use the San peoples' indigenous knowledge of astronomy to facilitate stakeholder engagement.

STAKEHOLDER ENGAGEMENT

Against the background of the SKA SA and the San peoples as stakeholders in the project, it followed that conventional organisation-focused stakeholder approaches would not provide a comprehensive theoretical framework for this study (Roloff 2008). An organisation-focused approach would not be relevant to these stakeholders as they had no knowledge of the SKA at the time. The need for an issue-focused approach, as discussed by Roloff (2008), was apparent and in this case narratives on astronomy provided the link to the issue of science and its connectivity to global sustainability objectives (United Nations 2019).

Though the SKA SA project commenced with a stakeholder management approach (Binneman 2017) to secure the bid for the land in the northern Karoo, it soon became clear that a stakeholder engagement approach, as discussed by Cornelissen (2014), was the preferred option to secure long-term communication with the stakeholders. It has become apparent in other studies on corporate social responsibility and global sustainability objectives (Aguinis & Glavas 2012) that multi-level issue-focused stakeholder engagement aimed at collaborative problem resolution has become a popular approach in stakeholder engagement (Roloff 2008). In this regard, the benefits of the SKA SA for scientific development can make sense to the San peoples because of their existing indigenous knowledge, which can help to place current knowledge of astronomy in context for them. Eriksson and Barnes (2018) affirm that language, culture and history present many challenges for communicating with the San peoples. Therefore, engaging with these stakeholders through narratives that acknowledge their indigenous knowledge, cultural heritage and ancestry can be considered an effective communication strategy. Eriksson and Barnes (2018) confirm that storytelling is an inclusive approach towards stakeholder engagement aimed at problem solving and innovation.

THE SAN PEOPLES' INDIGENOUS KNOWLEDGE OF ASTRONOMY

There are several indications in history that astronomy is not of Western origin and that peoples like the San developed early astronomy. The East, Islam and China have very early documentation of the night skies and its uses in their cultures and religions. This is similar for the San although their knowledge was mostly depicted in rock art

(Binneman 2017). This article focuses on how the SKA SA project used the San narratives and understanding of astronomy as part of the stakeholder engagement process. The San were also referred to as Bushmen, and one of their ancient sayings is: “A Bushman without a story is a Bushman without a home.” In terms of astronomy and cosmology this is especially true, as emphasised by Bleek (1875) and Bleek and Lloyd (1911). These narratives can be aligned with existing scientific knowledge.

The Karoo has some of the clearest night skies in the world and therefore it hosts numerous astronomy projects like the South African Large Telescope, MeerLICHT, HERA and HIRAX, to name a few. San peoples have been observing these skies for thousands of years, which has resulted in their linking what happens in the sky to what happens on earth. The visible objects from the dominant sun and moon to even minor points of light, like Antares, Canopus and Sirius, and the planets in our solar system move in both daily and longer-term time scales. These movements are regular and predictable; the patterns of movement are linked to other significant events such as the flowering and fruiting seasons of plants, the movements and life cycles of game species, and the shifting periodicities of temperature and rainfall change. In some regards, the San and most other indigenous peoples could be viewed as some of the first astronomers, perhaps dating back to times before Galileo Galilei, and thus creating common ground for engagement and projects. The San peoples had to make sense of what the night skies meant for their everyday life and how this fitted into their cosmology. This was done through the narratives that were handed down for generations and are still to some extent being told by the descendants of the ancient San peoples.

There are many San tales told of the sun, moon and stars. There are also stories about the relationship between the ancient Bushmen and the night skies. Some stories say that the sun was once a man, from whose armpits shone rays of light. He dwelt alone in a hut and his light shone only for him. Some children of the first Bushmen were sent to throw the sleeping man high up into the sky, from where he now shines upon all. In the evening, he draws his blanket of darkness over himself to keep warm. But the blanket is old and has many little holes in it and at night the sun still shines through these holes to make stars. Another story tells of a lonely young girl who awaits the return of her hunter companions. To light their way in the dark of the night she throws up a handful of white wood-ash. This became the stars in the Milky Way, and even when there is no moon, its shining light guides the hunters home. In another tale, the moon, say the Bushmen, is really an old shoe belonging to Mantis, who lost it while running errands for the gods. As the moon rises on early summer evenings, it is red with the red dust of the Kalahari and cold like old leather. These are some of the stories documented by Bleek and Lloyd (1911).

What the SKA and San cosmologies have in common is a sense of wonder at the expanse of a clear night sky. Although the versions differ considerably, both begin with the ideas provoked by the innumerable points of light that move as if alive. Following intensive study of the |Xam San beliefs and ritual practices, as well as those of other San groups in southern Africa, Lewis-Williams (1996) and Lewis-Williams and Pearce (2004) have formulated a bi-axial model of the San cosmos, shown in Figure 3. From

this figure, it can be concluded that cosmology and astronomy formed an important part of the San peoples' lives.

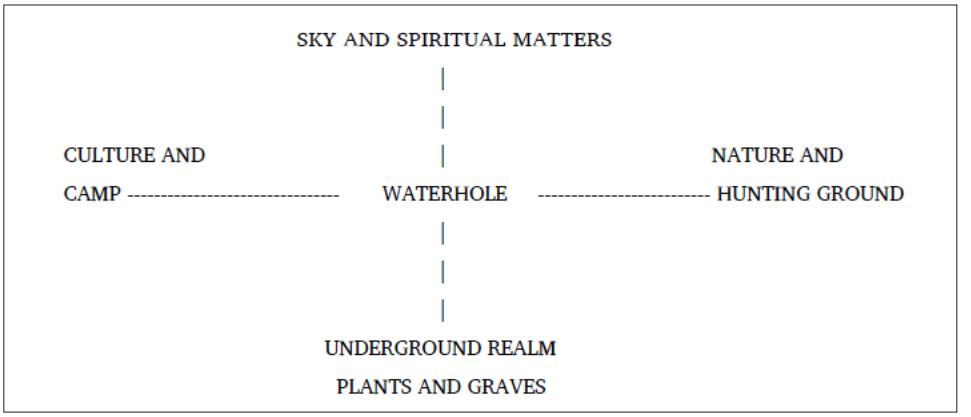

FIGURE 3: SIMPLIFIED BI-AXIAL MODEL OF THE |XAM COSMOS

(Source: Lewis-Williams 1996; Lewis-Williams & Pearce 2004)

San cosmology is thus not narrowly spiritual but entails an all-encompassing worldview, the influences of which extend into every sphere of their existence (Yates & Manhire 1991). San cosmology simplified would be that the horizontal line essentially represents daily life and the vertical line represents spiritual matters with the waterhole as an important aspect of life. Everything in this cosmology is connected. God first created himself and then the land, its food, water and air. If God is angered, he sends bad fortune. Ouzman (2008) explains that potency is a key foundational feature in San cosmology, stating that "[s]mall amounts of potency aid apotropaism, astral travel, healing and rainmaking, but high concentrations can kill. Controlling potency and passage to the Spirit World requires everyone's labour". Morris (n.d.: 35) describes San cosmology as intimate, writing that it is "a relational epistemology, a perspective that does not assume from the outset a world divided between animate and inanimate, human and non-human, culture and nature, earth and sky." Broadly, San cosmology can be described as using these elements:

- Creation and God
- Mantis and his family
- The baboons
- How Mantis stole fire from Ostrich
- The rainbow
- The sun, moon and stars

With reference to the stars, Table 1 lists some of the known stars mentioned in |Xam stories told by the San peoples. When compared to Figure 3, it is clear that most of the observable celestial bodies had been observed and named by the early San people. There are also some similarities between the Wajarri and the San in this regard (Square Kilometre Array Organisation 2020). The SKA organisation could use this to facilitate future collaboration between the San and the Wajarri and to further engage with these peoples.

TABLE 1: SAN ASTRONOMY NARRATIVE THEMES

CELESTIAL BODY	SAN NAME/DESCRIPTION
Achernar	“star digging stick’s stone”
Aldebaran	“He-hartebeest”
Apha Orion (Betelgeuse)	“She-hartebeest”
Aquila	“They were named by the great star”
Canopus	“Ant egg star” / Rice Star” (ant’s eggs are “Bushman rice”)
Castor and Pollux	“Eland’s wives”
Cetus	“orphan, poor person”
Corona Australis	“bush, hut, branch house, nest”
Magellan Clouds	The |Xam saw a family of steenbok (!koeŋ) in this celestial body
Milky Way	This was made by one of the earliest Bushman girls, who threw ashes into the sky and ordered them to become the “Milky Way”. She wanted a little light to be made so that the Bushmen would be able to return home (even) in the night; for, the earth, then, could not even be a little light; were it not for the Milky Way and the stars. The same girl also thought that she would throw up into the sky a certain root so that it would become stars. The flesh of this root, when young, is white and when old it turns red – this makes some of the stars white, and others red.
Momo	A constellation round the moon (a lunar rainbow) is the dust made by a dancing party that ascends and surrounds the moon.

CELESTIAL BODY	SAN NAME/DESCRIPTION
Moon	The moon was created by a being called |kaggen, who, once being inconvenienced by darkness, threw one of his shoes up into the sky to become the moon and make light. The moon is red because the shoe was dusty with red dust, and cold because it is skin (or leather). The moon is also looked upon as a male being; a man with whom the sun becomes angry (on account of his going out before him). The sun then stabs and cuts him with his (the sun's) knife, i.e. rays. These attacks are continued until the moon is reduced to a mere backbone, which he entreats the sun to spare so that he may live to return home and see his children. "The Sun has mercy and spares the little piece, which goes home, and grows again to a full Moon; – when the stabbing and cutting process recommences. The wife and children of the Moon are in his house."
Orion	"Three she-tortoises hung upon a stick"
Pleiades	"They are like ostrich eggs; therefore, the Bushmen seek for Ostrich eggs, when they come out"
Regulus or Alpha Leonis	"Day's Heart's Child"
Sirius	"to sing" and "honey",
Southern Cross	"Male Lions". The lions themselves are Alpha and Beta Centauri, the Pointers as stated above. From this one can deduce that the |Xam saw in the Southern Cross, or at least in part of it, a pride of lions.
Sun	The Sun was a man; but not one of the early races of people [...] He only gave forth brightness for a space around his own dwelling. Before the children threw him up, he had not been in the sky, but had lived in his house on earth. As his shining had been confined to a certain space at and around his own dwelling, the rest of the country seemed as if the sky were very cloudy; as it looks now, when the Sun is behind thick clouds. The sky was black (dark?). The shining came from one of the Sun's armpits as he lay with one arm lifted. When he put down his arm, darkness fell everywhere; when he lifted it up, it was as if day came. In the day, the Sun's light used to be white; but at night it was red, like a fire. When the Sun was thrown up into the sky it became round, and never was a man afterwards. Before being thrown into the sky, the Sun was called "Sun-armpit" (||koiŋ|k"átten-ttu). A version of this myth appears in Bleek and Lloyd (1911: 45-57). A longer version appears in Guenther (1989: 75-81).
Venus	"the Daybreak's Great Star"

The early San had names and stories for and about most of the visible celestial bodies. Some of these stories were mentioned in the interviews with the San elders. What was realised during and after the interviews was that some of the stories once told by the |Xam were no longer being told and, except for the documentation by Bleek and Lloyd, are not used by the San peoples. Nonetheless, these stories can serve as a bridge between the San and modern science infrastructure projects like the SKA SA. The ancient people can be seen as astronomers and cosmologists in their own right, pondering over the same scientific questions as modern astronomers.

METHOD

The main purpose of the research was to explore how indigenous knowledge can be used to facilitate stakeholder engagement in scientific projects, such as astronomy. For this purpose, narrative inquiry was used to establish the San peoples' current knowledge of astronomy compared to the indigenous knowledge documented by Bleek and Lloyd since the end of the 19th century. The aim was to use their indigenous knowledge as points of connectivity for future engagement with the San community. These stories could then also be used in future initiatives, such as the protection and preservation of San culture and heritage through arts and other craft initiatives or projects similar to Shared Sky. A qualitative approach was used to explore existing indigenous knowledge and to compare it to evidence that had been documented to establish whether or how these stakeholder narratives have evolved. The intention was not to generalise but to identify. The population was the San peoples and San Council members who attended the Kalahari Desert Festival held from 23-25 September 2017. Snowball sampling was used to identify the most authoritative members of the community. The method was semi-structured narrative interviews and three themes were explored.

The first question was what stories they know and tell about the moon and the stars. The second question related to how the San peoples use the stars, and the third question was whether they believe they could learn from the SKA SA, and vice versa. Six knowledgeable participants were identified. The participants had to be prompted at times, using the themes identified by Bleek and Lloyd. The San elders were interviewed at a San Festival in the Northern Cape near Witdraai. All San elders attend this festival as it coincides with other San leadership events. The sample included six San leaders representing six different San tribes. These stories are being told with the permission of the elders, with the understanding that it needs to be to the benefit of the San peoples and promote the San culture in general with no commercial gain. This work was presented at the Public Communication of Science and Technology conference in Dunedin, New Zealand, in 2018 with the same permission and understanding from the San leaders.

As this was an exploratory study not aimed at generalisation, a representative sample was not required. The interviews were transcribed, and the findings were thematically analysed and compared to themes in narratives recorded predominantly by Bleek and Lloyd.

RESULTS AND DISCUSSION

The expectation when starting the interviews was that the Bleek and Lloyd documented folklore should be the stories that the elders would tell. However, this was not the case; the majority of the stories were linked to the use of the stars by the San. These stories mention most of the visible objects in the Southern Hemisphere. When Table 1 is compared to Figure 3, it is clear that although different, the ancient San people had methods of observing the night skies in detail. One finding is that the participants of the study were not familiar with all the stories documented by Bleek and Lloyd. In some cases, it could be assumed that aspects of these stories still exist but not in the same manner as the early documented stories. One aspect that stood out in the interviews with older San people was the use of stars in everyday life, for example, navigation and tracking of the seasons. Stories like the creation of the Milky Way by the girl who threw ashes up into the sky is a popular story that exists in different forms.

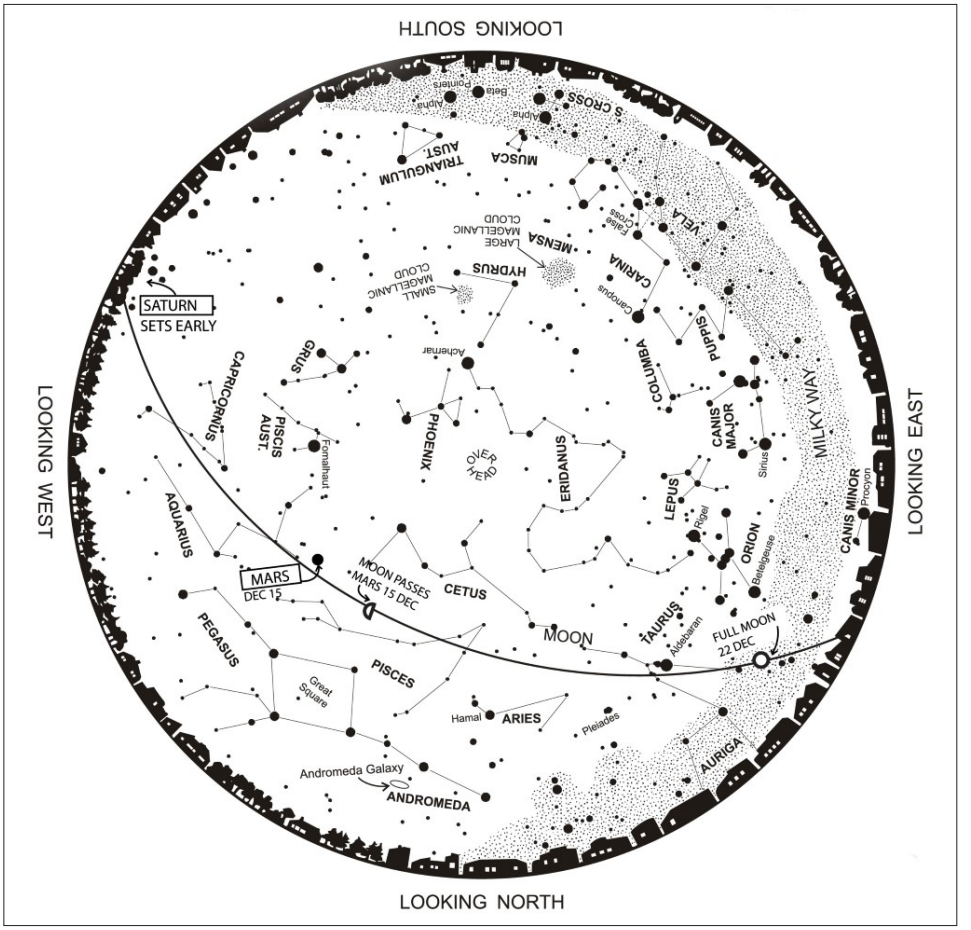

FIGURE 3: SOUTHERN STAR CHART

(Source: Anon 2003)

What is certain is that Western influences have slipped into these ancient stories. Some of the |Xam stories would have been erased with the |Xam if not for early scientists like Bleek and Lloyd. Some San leaders blame the loss of the indigenous knowledge of the |Xam people who first walked the Central Karoo on "the great San genocide", a process through which the |Xam people were hunted like animals and driven to the north by the early settlers, the Khoi, the British Government and the Xhosa, a process confirmed by the following inscription in the announcement book of the Dutch Reformed Church in Fraserburg: "Today we want to congratulate elder Smit for shooting four Bushmen." When talking to the San about a lot of different aspects linked to their indigenous knowledge, they mention this genocide. The surviving San were forced to give up their tradition and language and to become farmworkers, say the San leaders. Most of them were classified as coloured and integrated to become part of the Khoi. The San leadership made it clear that they are not Khoisan, but San; that is, bushmen, one of the oldest cultures in the world. Stories about times long past are, to a large extent, all that the San people have left of the Central Karoo. The land where their forefathers walked, their heritage left there, their graves and the veld they once knew well was mostly off limits to them.

When reflecting specifically on the interviews conducted with the San elders, one can assume that due to the language and cultural barriers, the participants answered the questions in terms of their own frames of reference. The key themes that emerged among the six participants pertaining to their recall of San narratives about the moon and stars are presented in Table 2.

TABLE 2: KEY THEMES IN SAN ELDERS' STORIES ABOUT ASTRONOMY

Key themes	Sub themes
Creation of the Milky Way through spreading of ashes The moon is the shoe of Mantis and created the stars through humans and nature	Stories are interwoven with how the San people use the stars Stars are important to the San

Modern San people view themselves as linked to their ancestors in different ways. One of the ways they experience this link is through the stories they tell. One participant said: "The stories we tell are stories about the beginning of times; they are the stories our people remember about the creation of the world." All the participants indicated that the stars and stories about the stars are important to the San, making statements such as "[i]t influences who we are as people". The chief of the Platfontein San peoples said that the stars were woven into the San peoples' being and who they are. He explained that this was partly because they only had stars in the evenings and nothing else to occupy them. It is evident from their answers that most of the other stories recorded by Bleek and Lloyd were not referred to, suggesting that they may have been forgotten.

Considering all participants' acknowledgement of the importance of their narratives, it can be of great value to re-introduce their ancient narratives to the San peoples.

TABLE 3: KEY THEMES IN SAN NARRATIVES ABOUT THEIR USE OF THE STARS

Key themes	Sub themes
Looking to and at the stars influences who and what we are as people	Frequented places
The stars are important in understanding significant events	Orientation
The stars are important in everyday life for navigating and telling time	Identifying events

The San understanding of the stars is not just about astronomy. The elders said that the stars and the stories about the creation of the stars determine who they are as people. One of the participants remarked: "When we look to the stars, they remind us of important things that happened to our people." Another stated: "As children our elders told us stories about how the stars were formed and how we are part of that." They told stories about how they used the stars to navigate, tell the time, determine seasons and to identify significant events. Some of these stories are ancient and can be used by Western scientists to understand how the San view the night skies. In some communities, the San still use the stars to navigate, to determine the change of seasons and to tell time.

While the SKA SA is a scientific project that uses advanced technology, it is interesting to note that it seeks to answer similar questions to those addressed in the San narratives with reference to the origins of the universe, how everything fits together and what the future holds, using the stars as points of reference. The third question aimed to establish what the San people thought they could learn from the SKA SA and what they could teach it in return, as discussed below.

TABLE 4: KEY THEMES IN THE SAN'S PERCEPTIONS OF WHAT THEY COULD LEARN FROM THE SKA SA AND VICE VERSA

Key themes	Sub themes
San stories can complement modern science Western science can learn from the San stories	Mutually beneficial collaboration Restoration of San history

The San who were interviewed all held the opinion that the SKA SA could learn from the San and the San from the SKA SA. One elder said that the wide-open Karoo provides a space for everyone and everyone is connected. The elders interviewed had different views on how the collaboration would work. The participants all indicated that

the stars were used by the San people in everyday life since the earliest days. Their stories are considered historical in their own frame of reference and can be used by modern scientists to gain an understanding of an almost extinct race that occupied the area, which, in turn, is becoming a historical site in its own right. Based on astronomy and cosmology, it is perceived as fitting that the area holds value for the San who were subsequently displaced from the area, only for it to again become dominant in the field of astronomy.

One of the respondents said: “The San people are excited about the project and what has already been done.” The participants suggested that role-players should have meetings where the scientists could tell the San about their “satellite” science and the San could tell the scientists about their “use” of the stars.

CONCLUSION

This article explored the narratives that were used by the San peoples to make sense of the cosmos. Although it is not a new way of engaging stakeholders it is definitely an effective way of doing so. These stories are a useful bridge between the ancient culture of the San and the high-tech science projects conducted by the SKA SA. While the SKA SA states that it is committed to social development one of the strategic objectives of the project is to communicate science and encourage communities to take ownership, understand and be excited about science in general. These narratives create common platforms to start sharing in a decolonialised way, where the knowledge of the San is not a lesser knowledge than that of the modern technology-driven science.

The main questions asked by both the San and the modern science of the SKA relate to where humans fit in and how to make sense of it all. The SKA SA site in the Karoo was once an important area for the ancient San people and their understanding of the cosmos and astronomy. Now this area is one of the most important astronomy sites in the world, one that will answer similar questions to those the ancient San once asked. This article is a unique account of how the San were engaged to participate in one of the largest scientific projects in human history. The stories told by the San and documented by Bleek and Lloyd created a bridge between the ancient San and the SKA, which was useful for the stakeholder engagement with the San. The Shared Sky Exhibition is one example of how this was done by using stories told through art. From this common ground established by them telling their astronomy stories other initiatives followed that could benefit the San peoples and could be used to re-establish some of the cultural heritage that has been lost.

Through this process it became evident that indigenous knowledge of peoples like the San is under threat and needs to be protected and developed. This process also provided a platform to conduct community development initiatives. For the San peoples, a substantial number of narratives have been documented by Bleek and Lloyd, and these stories have been preserved and are still available to the San peoples. Unfortunately, some of the stories and indigenous knowledge systems have been lost.

It is clear from this exercise that narratives of indigenous peoples could be used in other scientific infrastructure projects. These stories create an effective platform for

engagement with indigenous peoples and indicate what is important and, to some extent, sacred to them. It follows that listening to and taking the indigenous knowledge systems seriously ensure that this knowledge is not portrayed to be unscientific or dissimilar to Western science. Indigenous knowledge systems of communities such as the San peoples create a platform for engagement. This research demonstrated how narratives could bridge the divide between ancient indigenous knowledge systems and one of the most advanced technology and astronomy projects in history.

Disclaimer statement

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