

The Role of the IAU Gleaned From Oral Histories of Individuals Involved in Astronomy in South Africa

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Abstract. The South African Astronomical Observatory (SAAO), formerly known as the Royal Observatory, Cape of Good Hope, will be 200 years old in 2020. Also, South Africa (SA), formerly a British colony known as the Cape of Good Hope, will celebrate her 100-year anniversary as an International Astronomical Union (IAU) member in 2020, following the IAU centenary in 2019 that this IAU Symposium 349 celebrates. In light of all this, particularly in anticipation of the 200-year anniversary of SAAO in 2020, the *SA National Research Foundation* (NRF) has developed a Roadmap for the History of Astronomy in South Africa. As part of this we are conducting an oral history of astronomers to complement the historical celebrations of the institutions and science relating to astronomy in SA, supported by the SA NRF. Primarily drawing on literature and setting the scene for this work, here we present a snippet of the on-going oral histories, to glean the role of the IAU in astronomy in South Africa and show the potential of the oral histories to inform and complement written history.

Keywords. Oral History, South Africa, Cape of Good Hope Observatory

1. Introduction

In 2020, the South African Astronomical Observatory (SAAO, Fig. 1) will have existed for 200 years; as, it was formed from the amalgamation of the Royal Observatory, Cape of Good Hope (Cape Royal Observatory), which was founded in 1820, and the Republic and Radcliffe Observatories, which were founded after World War II, and later merged with the Cape Royal Observatory. Furthermore, in 2020 South Africa (SA) will celebrate its 100-year anniversary as an International Astronomical Union (IAU) member, following the IAU centenary in 2019 that this IAU Symposium 349 celebrates. In 1920 when SA joined the IAU, she joined as the Cape of Good Hope, a British colony, and her major astronomy activities were at the Cape Royal Observatory.

In light of these centenaries, particularly in anticipation of the 200-year anniversary of SAAO in 2020, the *SA National Research Foundation* (NRF) has developed a Roadmap for the History of Astronomy in South Africa led by Dr Ian Glass, formerly a staff astronomer and now science historian at SAAO. As one of the major activities of this Roadmap, an oral history of astronomers is underway to complement the historical celebrations of the institutions and science relating to astronomy in SA (Leeuw *et al.* in preparation), supported by the SA NRF. Coincidentally, Ian was the first to be interviewed for the project.



Figure 1. *Top Left:* Cape Royal Observatory, photo circa 1842; *Top Right:* the South African Astronomical Observatory (SAAO), recent photo of the left one; *Bottom:* The SAAO Telescope Plateau in Sutherland, South Africa, with both SAAO and international hosted telescopes (SAAO 2018).

A snippet of this on-going oral history project is presented here, to show the potential of the oral histories to inform and complement written history, and in so doing, glean the role of the IAU in astronomy in South Africa. This presentation primarily draws on literature and archives to give the oral history project context, because at this stage the oral histories are in the early stages of being acquired, archived and analysed.

The reading and analysis presented here points to the fact that while early modern astronomy in South Africa was driven to spur development by facilitating navigation using stars and time-keeping for the Cape of Good Hope and British Empire, using astronomy to spur and inspire development continues to be at the centre of investment in this science in modern South Africa. The IAU is at the heart of that continued development through its partnership with South Africa, by having South Africa host its office of Astronomy for Development, among the growing and world leading astronomy activities by the country; and, of significance is that many individuals who are involved in Astronomy in South Africa are also involved in the IAU, even if just as members in some cases.

It is worth noting that it has now been announced that the IAU General Assembly (GA) in 2024 will be held in Cape Town, South Africa, the first such IAU GA meeting to be held on the African continent in the soon to be 100 years of IAU history; and, South Africa will be proud of her participation in the IAU over its 100 years and now selected to host this prestigious international astronomy meeting.

2. Timeline of Historical Episodes in South African Astronomy

The history of modern astronomy in South Africa can be described in episodes that are depicted in Fig. 2. This timeline will be used as a framework for presenting the narrative of our paper; and, the episodes will be described in more detail following the timeline, including mention of the denoted international and national historical events in which these episodes happened.

2.1. *The Episode of Establishing Modern Astronomy in South Africa*

The first episode, that of establishing modern astronomy in South Africa and improving star positions for navigation (and also geodesy) in the southern hemisphere, started on Oct 20, 1820, when the Royal Society in Britain authorized an observatory to be erected at Cape of Good Hope, now South Africa (SAAO 2018). It is worth noting

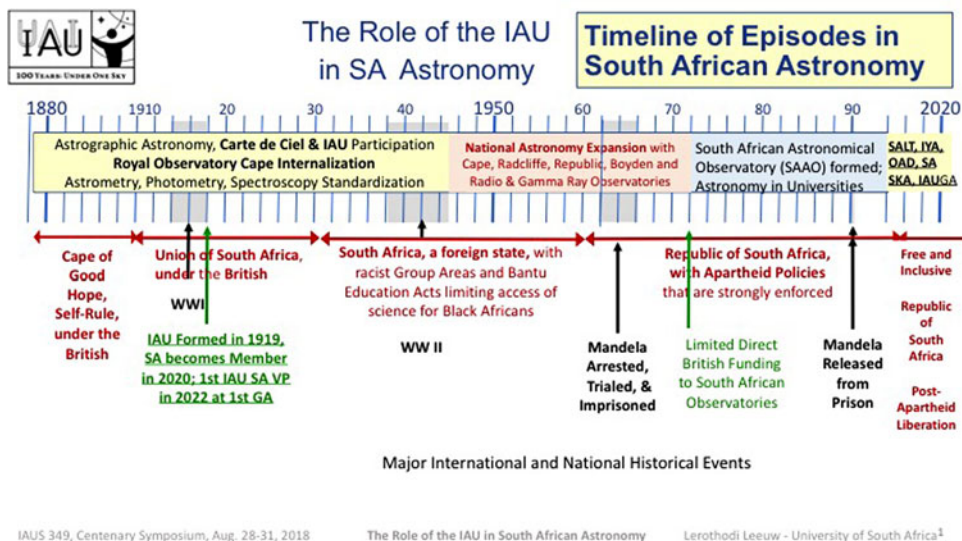


Figure 2. Timeline Depicting Historical Episodes in South African Astronomy. The timeline is adapted from a talk by Jean-louis Bougeret at this Symposium.

the Royal Observatory, Greenwich, was commissioned in 1675 for the northern hemisphere under the same reasons; and, the Royal Observatory, Cape of Good Hope (Cape Royal Observatory), was to be its southern hemisphere counterpart. The first resident astronomers (or Her Majesty's Astronomers) sent to establish the Cape Royal Observatory and begin its primary task of improving star positions was Reverend Fallows and his wife Mrs Fallows, followed by Thomas Henderson, Thomas Maclear and then Edwin Stone. Mrs Fallows is listed here because she also undertook astronomical observations and discovered a comet; and she is in fact considered to be the first female astronomer in modern astronomy in South Africa (SAAO 2018).

2.2. *The Episode of Observing Star Positions as Efficiently as Possible from South Africa, Using Astrophotography*

The second episode, that of observing star positions as efficiently as possible for that time, using astrophotography or astrometric photography, as it was known previously, started with the arrival of Sir David Gill in 1889 at the Cape Royal Observatory, and the introduction of photographic techniques that he used in astronomy. He was Her Majesty's Astronomer Cape of Good Hope from 1879 to 1906, during which time he conducted astrophotography, astrometry and geodesy and made cutting-edge photographs of the Moon and stars, as well as the comet of 1882 that partly spurred his use of obtaining star positions from astrophotography (SAAO 2018). His innovations found him co-organizing and co-leading the international 1887 Paris Meeting on the Great Star Map Project or *Carte du Ciel* (Turner 1912), that would lead to the creation of the IAU, putting South Africa right at the heart of the formation of the IAU. Sir David Gill also co-founded the Star Mapping Project itself and the Cape Catalogue of Stars. However, he died in 1914, before the formation of the IAU in 1919, and he was therefore never a member of the IAU.

Sir David Gill was succeeded at the Cape Royal Observatory by Sir Sidney S. Hough, who was His Majesty's Astronomer from 1907 to 1923 and continued the Star Mapping Project and the Cape Catalogue of Stars that Gill was doing (SAAO 2018). He was an IAU Vice-President of the Executive Committee from 1922 to 1925 (IAU 2018), and

therefore in the second ever IAU Executive Committee, underscoring the significant involvement of South Africa in the IAU from the very beginning of the IAU.

It is worth noting Jakob Karl Ernst Halm, who was Chief Assistant to His Majesty's Astronomer at the Cape of Good Hope from 1907 to 1927. Among many of his recognized contributions to astronomy, he discovered the Mass-Luminosity Relationship of stars, that was cited among the major discoveries in astronomy by Prof Malcolm Longair in his invited presentation at this Symposium. Halm also made major contributions in solar and stellar dynamics, and his work is among those done from South African that represent major contributions to modern astronomy and needs to be accounted more fully.

Sir Sidney S. Hough was succeeded at the Cape Royal Observatory by Sir Harold Spencer Jones, who was His Majesty's Astronomer at the Cape of Good Hope from 1923 to 1933 (SAAO 2018). On the IAU online register he is listed as a UK rather than SA IAU member. He was an IAU President of Commissions 6, 9, 31, 34 in the period 1928 to 1948 (IAU 2018), covering the time when he was at the Cape of Good Hope. While in SA he also led the Star Mapping Project with 24 international observatories and he spearheaded the photography of Eros, obtaining 1153 images that led to the best Sun distance (SAAO 2018). After his time in SA he was the Astronomer Royal, Royal Observatory, Greenwich, UK, from 1933 to 1955 and during that time was IAU Vice-President of the Executive Committee from 1935 to 1938 and IAU President of the Executive Committee from 1945 to 1948 (IAU 2018).

2.3. The Episode of Deep Investment in Science and Technology Post World War II

As in many developed countries around the world, post World War Two (WWII) many countries invested nationally in science and technology, having witnessed that the war was won by science and technology. South Africa too was a beneficiary of this with national expansion of observatories beyond the Cape. Around this time the following observatories were constructed – the Radcliffe, Republic and Boyden Observatories, as well as activity in radio and gamma-ray astronomy in South Africa. It would be amiss not to mention that with the lessons learned around the world about the power of science and technology, the South African government of the time then legislated through the Bantu Education Act and its implementation, that its black people should have limited education in science, one of its most devastating policies against black people with the legacy of negative consequences today. The black people responded with political activities against the government, with the government implementing ever more repressive measures, including the trial and imprisonment of Nelson Mandela in 1964.

Sir Richard H. Stoy, a South African IAU Member, was His Majesty's Astronomer at the Cape of Good Hope from 1950 to 1972 (SAAO 2018), and he was thus one of the observatory directors in South Africa with the most senior IAU involvement in the post WWII episode. He was IAU Vice-President of the Executive Committee from 1958 to 1964 (IAU 2018), again signifying South African involvement in the IAU during this episode. Later, when the UK funds to the Royal Cape Observatory became limited, and the optical observatories in the northern parts of South Africa also had to scale down, Stoy assisted in the site selection of an observatory that would merge all the national observatories. He also explored the site possibilities in southern Africa of what was later to become by the European Southern Observatory (ESO).

2.4. The Episode of Consolidating Investments in Optical Astronomy Observatories in South Africa

When the Royal Cape Observatory merged with the optical observatories in the northern parts of South Africa to form the South African Astronomical Observatory (SAAO),

Sir Richard van der Riet Woolley, a UK IAU member who was retiring as the Astronomer Royal, UK, was asked to be its first director to help continue develop dark-sky optical astronomy in South Africa with local funding (Lynden-Bell 1987). SAAO was opened by SA Prime Minister Vorster and UK Minister Margaret Thatcher, initially with a third of the observing time for visiting astronomers from the UK (McCrea 1988). Woolley had been IAU Vice-President of the Executive Committee from 1952 to 1958, and his coming to South Africa continued the strong legacy of astronomy in South Africa and the IAU. Woolley was the SAAO director from 1972 to 1976.

Richard Woolley was succeeded by Michael Feast, who was the director of SAAO from 1977 to 1992. Feast was born and educated in England during WWII, and came to South Africa to work at the Radcliffe Observatory from 1952 to 1974, and then worked at SAAO, becoming director from 1977 to 1992 (ASSA 2018). He is known for his work on the cosmic distance scale using variable stars, including early distance measurements to the Galactic Centre, a topic covered in the special lecture at this IAU GA in Vienna. Deeply involved in the IAU, he was President of Commission 27 from 1973 to 1976 and Commission 29 from 1967 to 1970, and Vice-President of the Executive Committee from 1979 to 1985 (IAU 2018).

Feast was interviewed for the Oral History project mentioned in this paper. When asked about the IAU and its role in his career and astronomy in South Africa, he said in the past the IAU helped organize international observing campaigns, with the international observatory directors. He said that now IAU's role has changed: it has the *Office of Astronomy Development* (OAD), amongst its many activities. His instructive comments helped frame this paper and to dig deeper into the literature, to learn about the role of the IAU in modern astronomy in South Africa.

2.5. *The Episode of Inclusive and Non-Racial Participation in Science*

Prof. Michael Feast was succeeded by Dr Robert (Bob) Stewart Stobie, who led SAAO until his unexpected death in 2002. Stobie inherited the task of building a 4-m optical telescope for SAAO, to keep SAAO internationally competitive; and, he surpassed that by getting an 11-m spectroscopic telescope built for SAAO in partnership with international institutions in Poland, Germany, USA, UK and New Zealand.

Stobie achieved this in a new era of South African governance, with the country having had its first democratically elected president, Nelson Mandela, in 1994. Following his release from prison in 1992, Mandela and his government began a new era, or episode in our frame for this paper, of inclusive governance, openness to the international community, and with no legal barriers in the pursuit of science, for all South Africans, without regard to race. The 11-m telescope was called the Southern African Large Telescope (SALT, see Fig. 3) and was not only to do astronomy but also have a collateral benefits plan to benefit both the community in which SALT was built and also the larger South African community through dedicated outreach and community engagement.

After Stobie died, Prof. Patricia Whitelock and Prof. Peter Martinez were acting directors of SAAO, respectively from 2002 to 2003 and 2003 to 2004, until the appointment of Prof. Phil Charles from 2004 to 2011. Phil Charles was succeeded by Prof. Patricia Whitelock in 2012, and subsequently by Prof. Theodore B. (Ted) Williams and Prof. Petri Vaisanen, respectively from 2013 to 2017 and 2018 to the present (ASSA 2018). SAAO being more open to the international community and having good government support post-1992, grew in hosting international telescopes, in addition to those of its own, at the Sutherland optical astronomy observing site. SAAO also grew its dedicated astronomy outreach and community engagement.

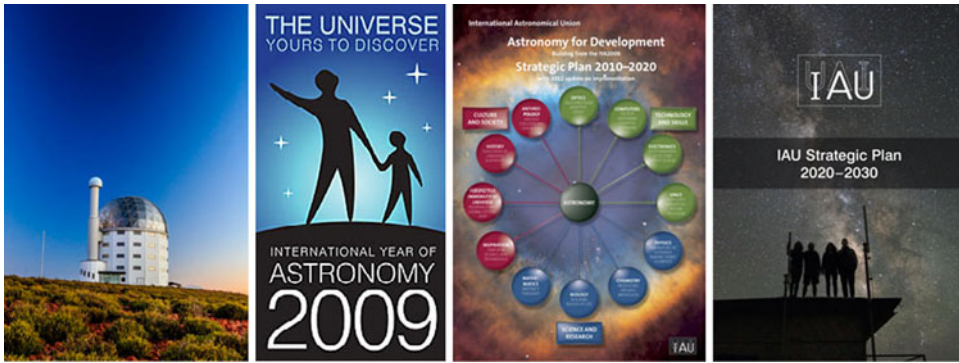


Figure 3. Left to Right: The Southern African Large Telescope (SALT) that has the SALT Collateral Benefits Plan (SAAO 2018), IAU's International Year of Astronomy and IAU's Strategic Plans for 2010–20 and 2020–30, documents which included plans for the Office of Astronomy for Development (IAU 2018).

Kevin Govender, who was interviewed for the oral history programme discussed here, was hired to lead the SALT Collateral Benefits Plan. Soon after this got going, the IAU embarked on the plans for *International Year of Astronomy* (IYA, see second panel in Fig. 3) 2009, and Govender joined the IAU team that bid to the United Nations (UN) to declare the year accordingly and support its activities. He also led the related activities during that historic year, putting South African astronomy at the heart of this international IAU activity, not just about astronomy but also its inclusive broader societal benefits in line with the South African government's mandate.

After the IYA 2009, came the IAU's Office of Astronomy for Development (OAD, see second panel in Fig. 3), and South Africa would win the bid to host this. Govender was hired competitively to lead that office as its director. In his interview, Govender speaks proudly of his contributions to the SALT Collateral Benefits Plan, the bid and launch of the IYA 2009, and laying the foundation of the OAD and eventually leading it. He also speaks excitedly about the IAU Strategic Plan 2010 to 2020 (see third panel in Fig. 3), where the OAD was born, and now the IAU Strategic Plan 2020 to 2030 (see fourth panel in Fig. 3), which aims to develop the Office of Astronomy Outreach (which is separate from the OAD) and launch the Office of Astronomy Education. This separation of tasks and the new IAU offices that will result from it will allow the OAD to focus on its mandated task of international astronomy for development projects, led by the OAD office from South Africa and in partnership with the South African government through the SA NRF and Department of Science and Technology. With the OAD office, the South African government has cemented a strong partnership with the IAU in this episode of inclusive and non-racial participation in science.

2.6. *The Episode of Unprecedented International Participation and Leadership in Radio Astronomy*

The episode of *Inclusive and Non-Racial Participation in Science*, described above, was anchored by national investment in science, with astronomy as one of its pillars. This investment was to become bigger than SALT, when Justin Jonas, a South African radio astronomer, and his colleagues proposed that South Africa become involved in the Square Kilometre Array (SKA), with a goal of becoming a host of this project. The aim of the SKA, an international project comprising of 12 leading radio astronomy nations, is to become the biggest radio telescope ever build on Earth. Therefore, South Africa's



Figure 4. The radio image of the Milky Way (*left*) recently made public as part of the opening of the Square Kilometre Array (SKA) precursor telescope MeerKAT (*right*) in South Africa (SKA SA 2018).

involvement in this will be a major undertaking that would see radio astronomy surpass optical astronomy in terms of funding and activity for the first time ever in the country.

The story of the SKA South Africa (SKA SA) deserves its own separate presentation; and, therefore, here it will only be mentioned because it would be amiss not to, and to at the very least highlight one of its major recent milestones: the SKA has been featured at the IAU GA, and one radio image of the Milky Way (see first panel in Fig. 4) was recently made public as part of the opening of its precursor telescope, MeerKAT (see second panel in Fig. 4) in South Africa. The image is considered to be the deepest image of the centre of the Milky Way Galaxy made by any telescope ever at radio wavelengths. It already shows MeerKAT to be at the forefront of radio astronomy world-wide for the foreseeable future (SKA SA 2018).

The SKA SA story has been in national SA news practically from the beginning of the project, first in terms of the bid for SA to win the rights for hosting the telescope, then the outcome of the bid, and recently through the construction and now official opening of the precursor telescope ‘MeerKAT’. It features nationally in its technological advances that will be undertaken and bring to SA, its human capital development and now also its scientific advances. It has really become the leading feature of technological investment and advances in SA, so that in a most recent visit by the president of China to SA, the presidents of the two countries posed before the image of the Milky Way Galaxy shown in Fig. 4. This was called not only important for development but also diplomacy (SKA SA 2018). The success of the SKA SA also has been manifest in its project leaders, who have won major international awards – most recently its former project leader Dr Bernie Fanaroff being awarded the Jansky Lectureship 2017 in the USA and the NRF Lifetime Award 2018 in SA.

Two hundred years ago astronomy was to improve star positions for navigation (and geodesy), which was central to development, primarily led by the British with their South African Cape Colony. Now astronomy is at the centre of development again in South Africa, through its digital, big data and scientific advances, as well as human capital development. All this is in sync with the strategy for the IAU 2020 to 2030, that spells out the reach of astronomy beyond its scientific outputs into the broader South African society, and coincidentally it has an image of navigators on its cover page, linking it back to navigation that spurred its modern establishment and growth in South Africa. Two hundred years ago astronomy was a critical part of the development of South Africa, albeit as a colonial endeavour, and today this still is true, but now it is more inclusive by fostering the participation of people of all backgrounds.

3. Discussion

ORCHISTON: Can you tell us if the study of indigenous astronomy is also being pursued in South Africa?

LEEuw: Yes, it is part of inclusiveness – but I had no time to discuss this in just 15 minutes.

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Some historical records presented here are critically adopted from the South African Astronomical Observatory (SAAO), Square Kilometre Array South Africa (SKA SA), Astronomical Society of Southern Africa (ASSA) and the International Astronomical Union (IAU) historical on-line pages, respectively perused at www.saa.ac.za, www.ska.ac.za, assa.saa.ac.za and www.iau.org in 2018.

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