

# HISTORIES INTERTWINED: TRACING THE EVOLUTION OF THE SOUTH AFRICAN ASTRONOMICAL OBSERVATORY LIBRARY AND INFORMATION SERVICE WITHIN THE HISTORICAL DEVELOPMENT OF ASTRONOMY IN SOUTH AFRICA

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**Abstract:** This paper explores, in detail, how library and information service provision to the South African Astronomical Observatory (SAAO) evolved in the context of the historical development of astronomy in South Africa. It is based on empirical research that collected data through the examination of literature, SAAO archival material as well as via semi-structured interviews with a purposefully selected sample of individuals who are experts in the field of astrophysics or astronomy libraries. The study collected information on the role of library and information services in astronomy and documented the historical significance of the library in the context of astronomical research at the SAAO.

This paper aims to contribute toward the existing literature covering the history of the SAAO, close the gap in the literature covering the history of its library and information service, as well as to contribute towards the international history of astronomy. The paper suggests a future library and information service that remains closely tied to exciting developments in astronomical research within an electronically connected research landscape.

**Keywords:** Library and Information Science; South African Astronomical Observatory; astronomy libraries; SAAO Library history; astronomy heritage,

## 1 INTRODUCTION

The South African Astronomical Observatory (SAAO) is proud to be known as “... the oldest scientific institution on the African continent ...” (Glass, 2015: 8). The SAAO is one of five research facilities of the National Research Foundation (NRF), an independent statutory body financed by the Government of South Africa. On 21 December 2018 the South African government declared the Cape Town site of the SAAO a National Heritage Site, recognising that it is of special national significance in South Africa. This site includes the SAAO Library: its holdings, artifacts, and archival material. The SAAO’s celebration of its bicentennial anniversary, which includes its library, took place on 20 October 2020, coinciding with that of the Royal Astronomical Society, in London, in the same year.

This paper presents a critical examination of the circumstances informing the formation and evolution of a special astronomical library at the SAAO and its development in parallel to the research being produced there. It first provides a brief outline the history of astronomy in South Africa and the role of the library and information service (LIS) at the SAAO. It then outlines the key data sources from a research study conducted in 2021 that gives evidence to the fact that the library and information service evolved alongside astronomical research at the SAAO. It goes on to give an historical analysis of documentary evidence using a centuries-framework,

to reveal the nature of the astronomical LIS. Finally, it offers a brief look into what this means for the future of LIS at the SAAO to continue supporting astronomical research.

## 2 HISTORY OF ASTRONOMY IN SOUTH AFRICA

Mackenzie (1941: 89) recorded the earliest astronomical observations in South Africa as dating back to 600 BCE when Herodotus, a renowned ancient Greek historian and philosopher, recorded how Phoenician sailors rounded the Cape on their way to the Far East. In 1685, Fr. Guy Tachard, a French Jesuit priest, made the first serious astronomical observations at the Cape after setting up a temporary observatory in the Dutch East India Company Gardens in Cape Town. He set out to “... determine the longitude of the Cape by using the eclipses of Jupiter’s satellites ... he also discovered the duplicity of Alpha Centauri.” (Cillie, 1973: 60). One of Huygens’ clocks was tested on a voyage to the Cape in 1686. In 1705, the first official astronomer, the German Peter Kolbe, was dispatched to the Cape to “... observe celestial phenomena ...” (Moore and Collins, 1977: 26) with his observatory based at the Buren bastion of the pentagonal shaped Castle at the Cape of Good Hope. The idea of establishing a permanent observatory at the Cape of Good Hope followed the pioneer work done by Abbe de la Caille (Glass, 2012) in 1751 who compiled a substantial catalogue of stars in the Southern Hemisphere, a catalogue (Figure 1) that can be

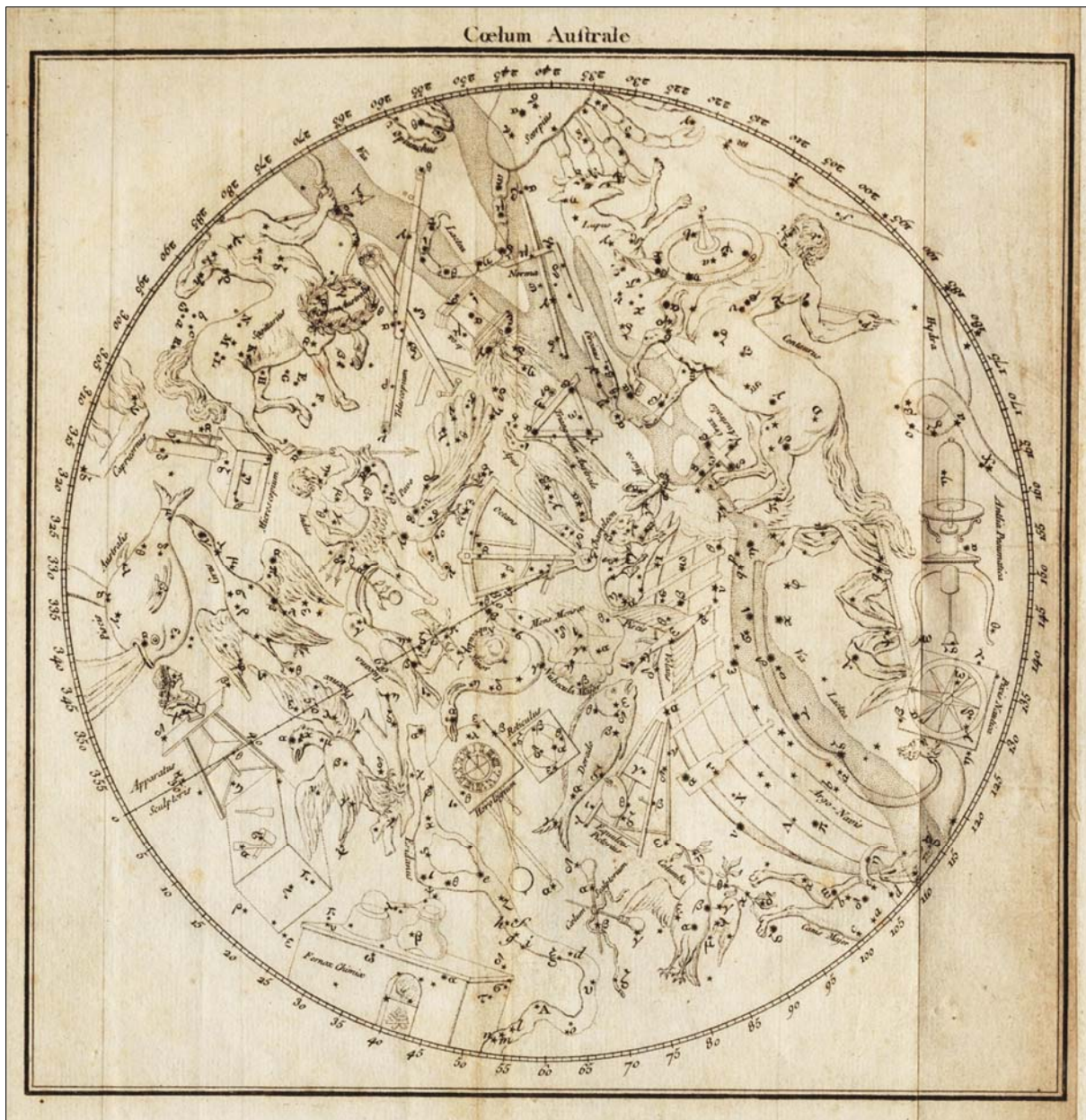


Figure 1: A page from Nicolas de la Caille's *Coelum Australe Stelliferum*, 1763 (courtesy: SAAO Library).

found within the SAAO Library's rare book collection, and measured an Arc of Meridian for the first time in the Southern Hemisphere (Gill, 1913: v). These visits and the final establishment of the Royal Observatory at the Cape of Good Hope in 1820 clearly mark the beginning of European astronomy in South Africa.

The historical development of astronomy in South Africa from 1820 to the present is extensively documented. Key refereed papers such as those published by Buckley (2019), Cillie (1973), Dubow (2018), Feast (2002), Whitelock (2004) and Glass (2023), as well as several monographs (e.g., Glass, 2015; Warner, 1983; 1995) written about the SAAO, capture these developments. On 20 October 1820 the institution was formally established by the British

Board of Longitude after an Order in Council issued in Great Britain. This was significant for the history of astronomy in South Africa as Gill (1913: v) concludes: "The Cape of Good Hope is intimately associated with the history of astronomy in the Southern hemisphere." However, the reasons for its establishment went beyond the need for an astronomical observatory in the Southern Hemisphere. It also provided time signals for mariners on ships docked at the Cape (Kinns, 2021); a meteorological service; as well as the mapping of the Southern skies in the same way in which the Royal Greenwich Observatory mapped the Northern skies. The Royal Observatory at the Cape of Good Hope remained British owned for 151 years, from 1820 up until 1971 when, due to

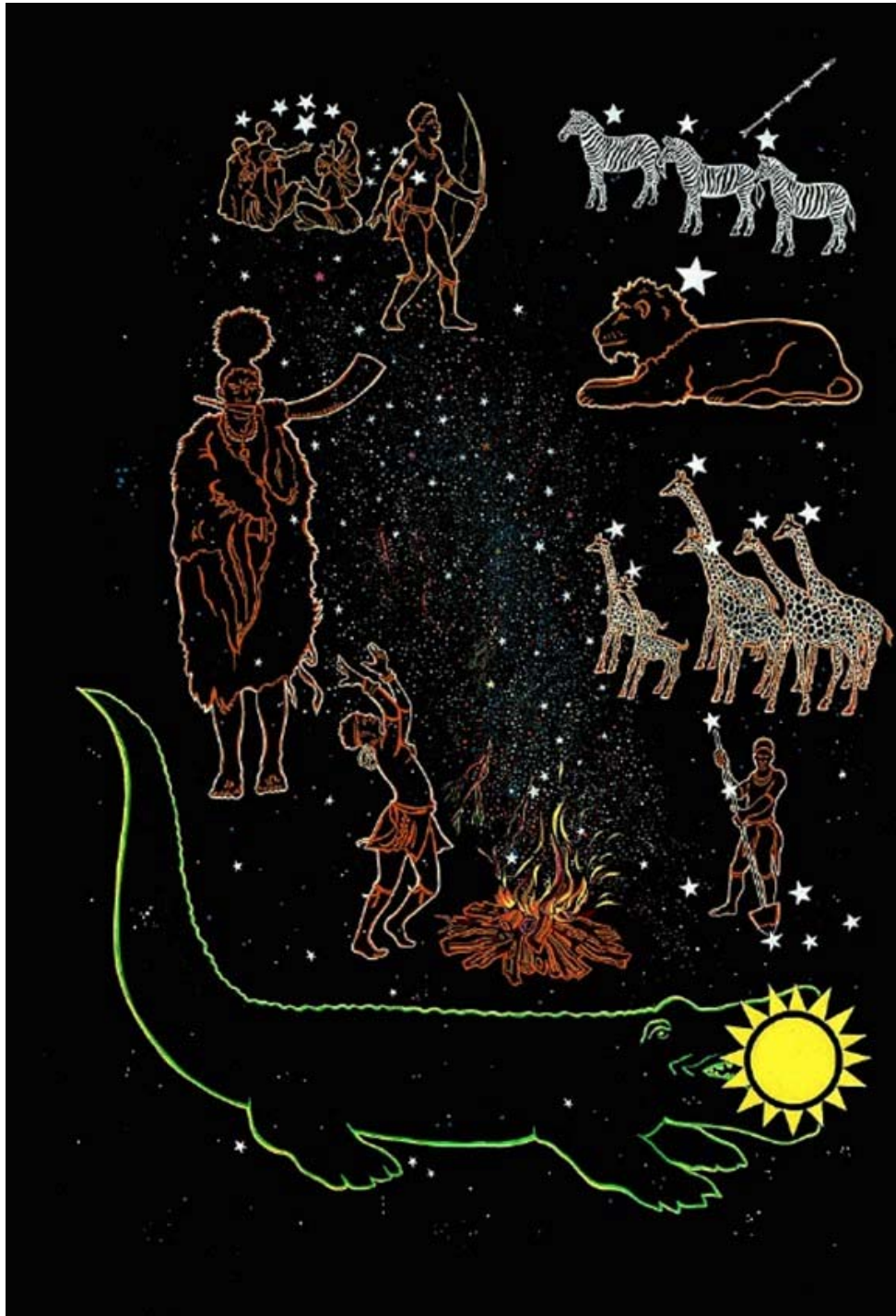


Figure 2: "Starlore of Southern Africa" created for the first South African "Year of Science and Technology" by C. Rijsdijk in 1968 (courtesy: SAAO Library).

political and other factors, it was handed over to the government of the Republic of South Africa. It merged with the Republic Observatory to form the South African Astronomical Observatory (SAAO) in 1972, with its headquarters at Observatory in Cape Town.

Astronomical observations in South Africa were not only made from a European perspective. There is a strong argument that the origins of astronomy in South Africa can be traced back

much further to at least 26,000 years ago, long before modern astronomy and the colonisation of the Cape of Good Hope. In this context, [Medupe \(2015: 1032\)](#) summarised how the ancestors created depictions of comets and other astronomical events through Khoisan rock art (cf. [Warner, 1996](#)). [Figure 2](#) provides scenes of several constellations, illustrating how ancient Southern African stories were depicted from stars in the night sky. This makes a case for the

history of astronomy in South Africa dating back much further than 1820, and the European history that comes with the establishment of the Royal Observatory at the Cape of Good Hope.

### 3 LIBRARY AND INFORMATION SERVICES IN ASTRONOMY

When the first Astronomer Royal, Fearon Fallows (1788–1831), arrived at the Cape of Good Hope he already valued a library service and wrote of the Cambridge University library where he had studied:

... I have never felt happier than at present, possessing a competency from my fellowship [and] an excellent Library, furnished with the best editions of books in every science ... (Feast, 1996: 7).

Scientific institutions like observatories have

... treasures, such as archives, libraries and scientific instruments, whose historical and scientific value is huge. (Mandrino et al., 2007: 361).

These treasures reflect the science taking place at the institution, with the library acting as an information repository for the research and a source of information for astronomers as well as for the public. As concluded by Brunetti and Gasperini (2010: 38–39):

The extraordinary richness of scientific information that an astronomical library is able to manage permits a dual function of specialization and is able to satisfy the needs of professional astronomers. At the same time, it can play the role of mediation between astronomers and the general public.

A role of the scientific library at an observatory would therefore be to provide access to the latest publications covering the entire field of astronomy. This requires a blend of traditional library tasks and skills needed in an electronic environment (Brunetti and Gasperini, 2010: 34).

The library and information service of the SAAO is seen as an integral part of the facility as it provides the research staff with access to essential information and tools that allow them to function as informed professionals within their academic community (Bennett and de Young, 2015: 4). The physical library itself was established in 1828 only once the main building was completed. It is the oldest library in South Africa after the National Library South Africa which was founded in Cape Town in 1818 (NLSA, 2024). Also, no other institutional library in South Africa has been housed in the same building for longer than that of the SAAO Library. Brief papers in the *Monthly Notes of the Astronomical Society of Southern Africa*

(MNASSA) give snippets on the historical significance of the library and information service at the SAAO. One such paper by Glass (2001: 15) describes the use of the library by astronomers:

... the other main astronomer at the Royal Observatory was Joe Churms, who headed the parallax programme ... his office was always piled high with papers, and he had about 300 books on almost permanent loan from the library at any given time.

Glass (2015) also tells of the purchasing of key astronomy books in consultation with, or at the request of, astronomers.

The SAAO Library's collection includes journals (electronic and print), books, electronic databases, atlases and catalogues, pamphlets, periodicals, slides, posters, and media collections, all based on topics relating to astronomy and astrophysics in both the Northern and Southern Hemispheres. The historic records housed in the library's archive include ledgers, letters, observations, photographs, photographic plates, surveys, and artifacts. Rare books of infinite value to understanding the history of astronomy not only in South Africa but globally too, are kept in the SAAO Library. Snedegar (1995) pointed out this historical significance in his article about the oldest book in the SAAO library, Ptolemy's *Almagest* dated 1515 (Figure 3), and how this reflects the rich history of astronomy to be found in the SAAO Library.

### 4 EVIDENTIAL DATA

The evidence supporting the arguments in this paper is gleaned from a study undertaken in 2021 that collected data via semi-structured interviews with a selected sample of individuals associated with astronomical research in South Africa and beyond; a review of literature dealing with astronomical LIS; as well as a review of primary source documents housed in the SAAO Library's archive. The participants who were interviewed, both local and international, have vast experience and expertise in the fields of astrophysics or astronomy libraries. They testified with authority to the fact the library and information service developed as a research tool in parallel with, and as a response to, astronomical research. The literature sources consulted revealed the importance of access to journals as fundamental for conducting astronomical research and reflected the value that astronomers place on having access to scientific literature to keep abreast of current developments. Primary documents reviewed include annual reports, directors' letters and communications, accession registers, astronomers'

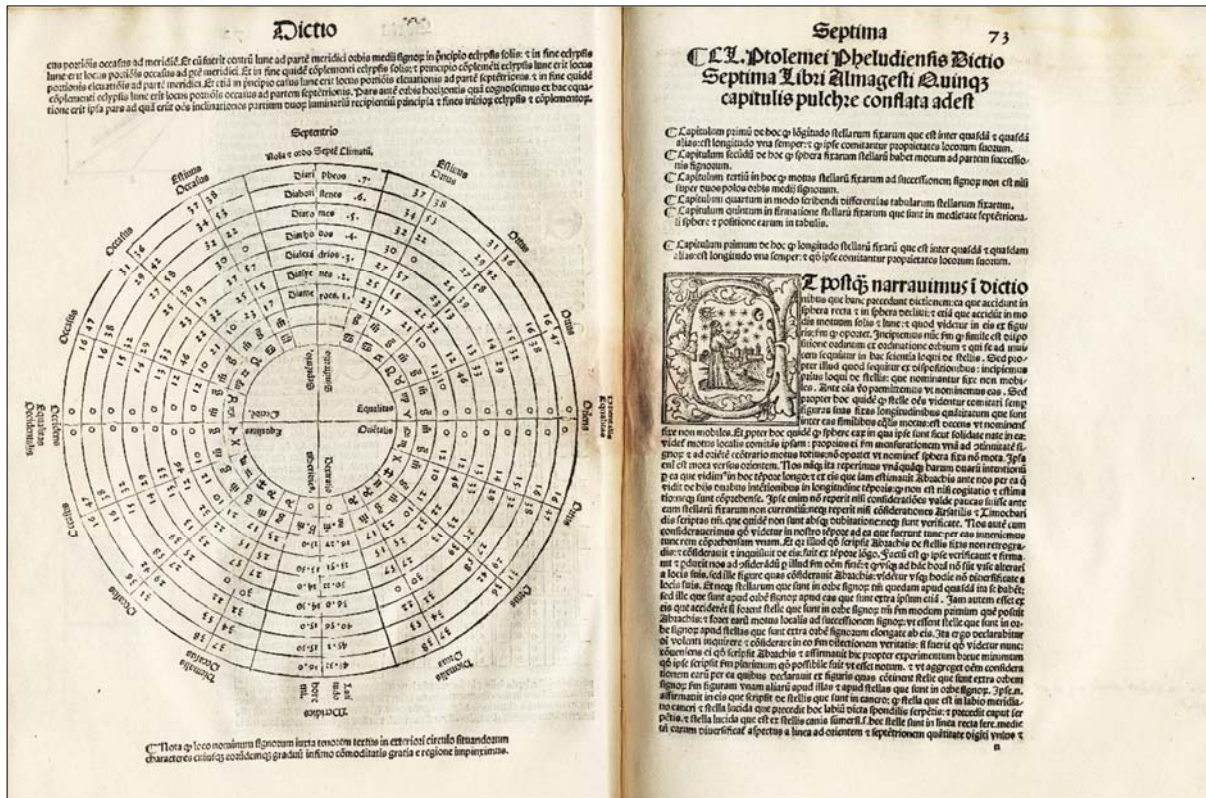


Figure 3: Two pages from the oldest book in the SAAO Library, Ptolemy's *Almagest*, dated 1515 (courtesy: SAAO Library).

notebooks, and previous librarians' files and documents pertaining to the day-to-day running of the SAAO since its establishment in 1820. These evidential data sources uncover important findings in understanding how the LIS at the SAAO developed within the context of the history of astronomy in South Africa, as will be revealed further in this paper.

**5 KEY MILESTONES**

Milestones in astronomical research in South Africa, and at the SAAO, including its LIS, are identified using the data sources already mentioned. These milestones capture a snapshot of how important astronomical research was accomplished as well as how the SAAO Library evolved over a two-hundred-year historical period. This paper outlines these milestones using periods, in centuries, as a framework with key evidence from the data to show parallel development. Based on the evidence, it is safe to claim that these milestones were possible to achieve because astronomers had the correct tools, including a relevant library collection and access to the latest research.

**5.1 The Nineteenth Century**

The evidential data fully disclose the scientific achievements that were attained by the Royal

Observatory Cape of Good Hope during the colonial period. The earliest science produced by the Royal Observatory was the work of its first Astronomer Royal, the Rev. Fearon Fallows, who arrived at the Cape in 1821 and mapped the southern stars. He submitted his star catalogue to be published in the *Philosophical Transactions of the Royal Society* in June 1823 (Warner, 1979: 9). This was the start of the now over four thousand SAAO publications on the database today. On his arrival at the Cape, Fallows, who later became a trustee of the Cape Town Public Library (Cameron-Swan, 1931: 2), brought with him his telescopes and his books and in so doing established the SAAO Library's special collection that now boasts a few rare books including Ptolemy's *Almagest* (the oldest book in the collection) and Jeremiah Horrocks' *Opera Posthuma*, dated 1673 (Figure 4), with the earliest journal volume being volume one of *Mathematique et de Physique*, dating to 1692. The earliest inventory of the library's holdings is dated 30 June 1831, and is in a memorandum book of Thomas Henderson (1798–1844), the second Astronomer Royal who served at the Cape. It has the heading "A catalogue of books belonging to the Library of His Majesty's Observatory Cape of Good Hope left by the Rev Dr Fallows Astronomer"

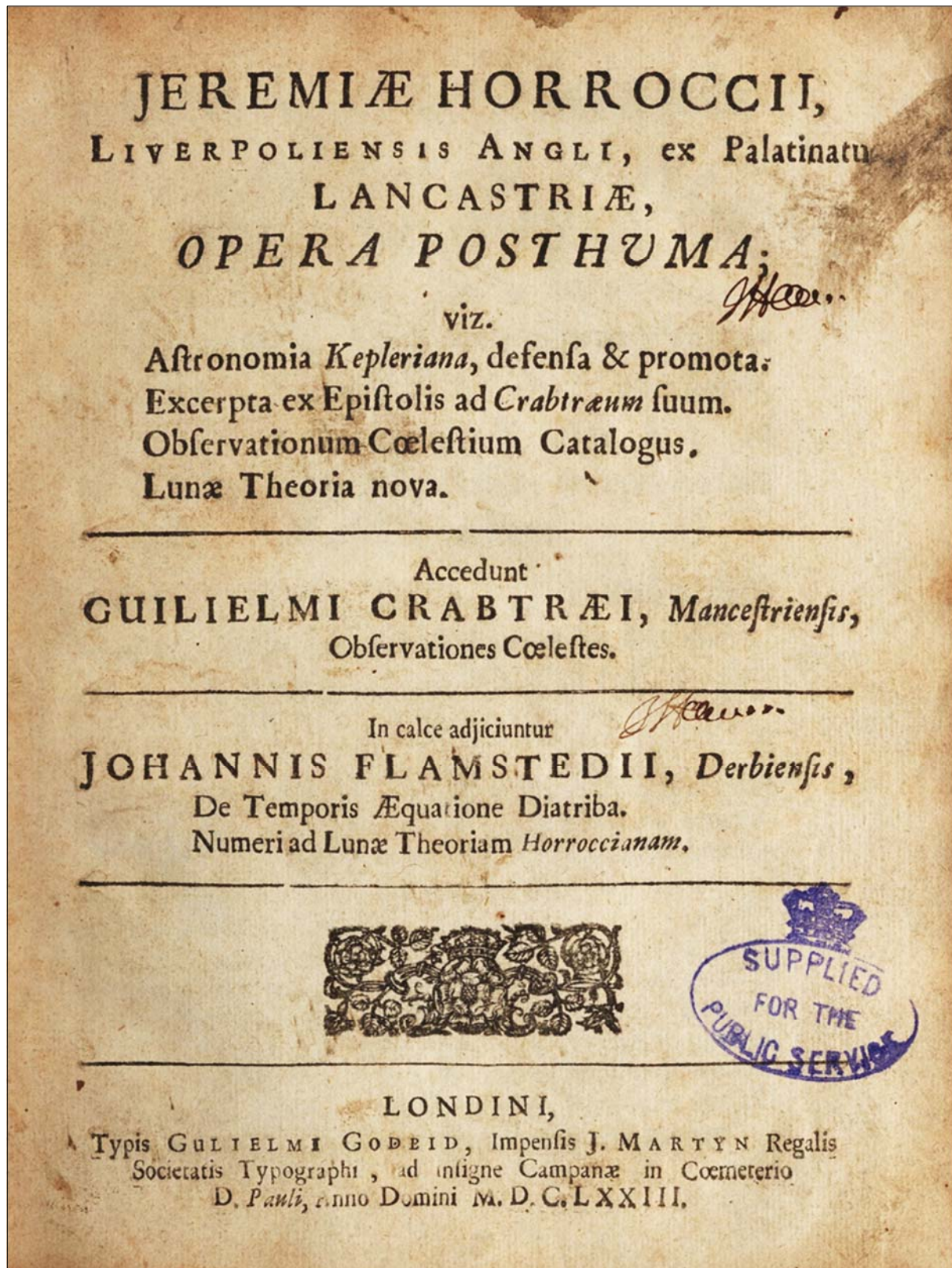


Figure 4: Jeremiah Horrocks' *Opera Posthuma*, dated 1673 (courtesy: SAAO Library).

(Figure 5). This memorandum book is rich with information about the early assets of the Royal Observatory and the presence of much-needed reference library material. A comment by one of the research study's participants evidenced the

the need for a LIS in the early years when they noted that

... the SAAO or the Royal Observatory as it was then ... was so far away from the major centres of this field, which were

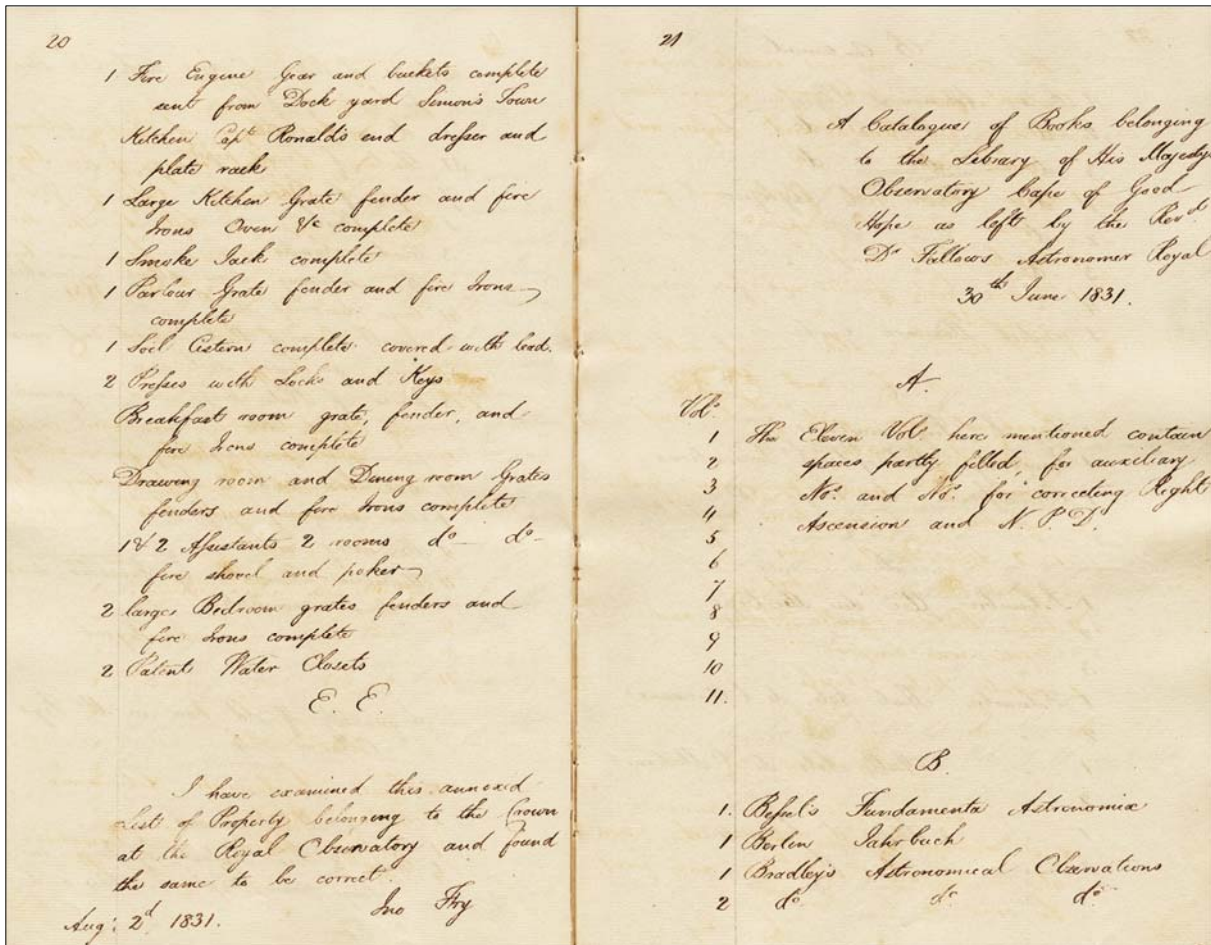


Figure 5: The memorandum book of Thomas Henderson containing the earliest inventory of the library's holdings, dated 30 June 1831 (courtesy: SAAO Library).

more in Europe ... so us being far away it was, I think, having a library historically here, had an even more elevated role in making sure that not only the records were kept, and you know, our own records, but you had access, obviously to the other people's research ...

The second Astronomer Royal, who served at the Cape from 1831 to 1833, Thomas Henderson, demonstrated the calibre of astronomical science and research produced by the Royal Observatory when he made the first observations that led to calculations of the distance of a star other than the Sun (Alpha Centauri) to the Earth (Glass, 2008). This is a measurement that astronomers had been trying to determine since the time of Copernicus (1473–1543), the great Polish scientist who proposed that the planets revolved around the Sun.

Thomas Maclear (1794–1879; Figure 6) the third Astronomer Royal at the Cape of Good Hope, from 1833 to 1870, was also responsible for keeping a record of the tides as well as "...

Figure 6 (right): Thomas Maclear (courtesy: SAAO Library).



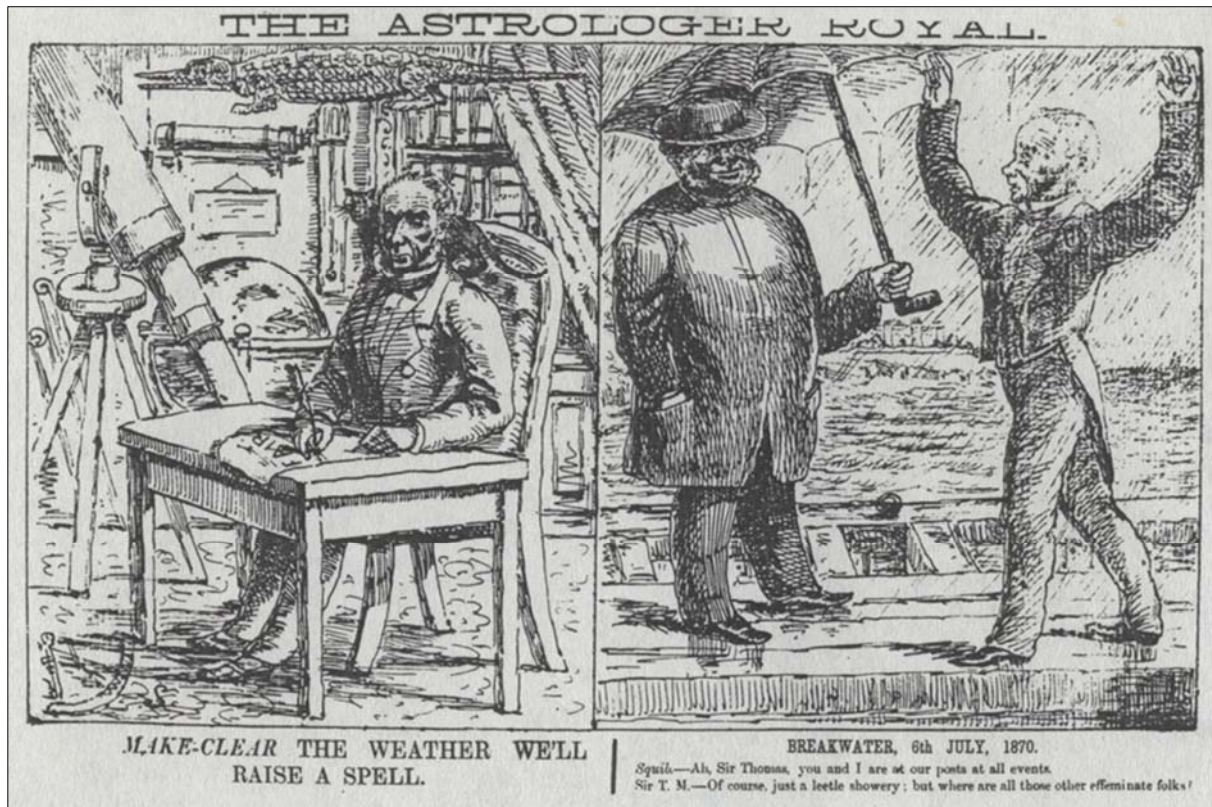


Figure 7: Maclear as weather wizard, in a cartoon from *The Squib* (a Cape Town newspaper), July 1870 (courtesy: SAAO Library).

magnetic dip and deviation ...” (Laney, 1996a: 96). He founded the Meteorological Commission in South Africa, and made the first accurate weather surveys in South Africa which involved the recording of meteorological information (Laney, 1996a: 96). Maclear became famous in Cape society at the time for his responsibility of keeping record of the weather at Cape Town’s main weather station, the Royal Observatory. The cartoon in Figure 7 shows his popularity as a weatherman in a local newspaper. These weather records date back to 1842 (Figure 8) and are now a part of the library’s inventory. The century closed off with the Royal Observatory at the Cape of Good Hope under the leadership of the fifth Astronomer Royal, David Gill (1843–1914; Figure 9), who served from 1879 to 1907.

Another milestone from Maclear’s time was the re-measurement of the Arc of Meridian, originally measured by Nicolas-Louis de la Caille, a French astronomer who visited South Africa from 1751 to 1753, in order to determine the size and shape of the Earth (Gill, 1913: v). De la Caille’s instruments were affected by the gravitational attraction from two mountains that skewed his calculations and led to him finding the Earth to be slightly pear-shaped (Glass, 2012). Maclear (the father of geodetic surveying in South Africa), through his geodetic work, solved the mystery by re-measuring the Arc

between 1840 and 1841, proving what most astronomers suspected—that both hemispheres of the Earth were the same. His work therefore also helped provide data “... vital for accurate maps of the ground.” (Dubow, 2018: 665). An additional milestone was Gill’s calculation of the measurement of the distance to the Sun, determined from the Royal Observatory, and this “... remained the standard for nearly half a century.” (SAAO: 2024a).

Warner (1995) maintains that astrophysics began at the Royal Observatory during the time of the innovative David Gill. Gill became famous for his photographs of the great September comet of 1882 as is mentioned in numerous literary texts (e.g. see Glass, 1989: 118; Kapoor, 2020: 354; Koorts, 2004: 51; Orchiston et al., 2020: 641). These photographs led to “... the realisation of the potential of photography for astronomy in general and for mapping the sky.” (Warner, 1995: 2). This heralded the beginnings of the use of photography in astronomy, or astrophotography, with Gill pioneering the photographic preparation of star catalogues. Both Laney (1996b) and Feast (2002) agree with Warner (1995: 6) that South Africa took the lead in photometrically-based astrophysical work being done in the Southern Hemisphere and that in the nineteenth century, astronomy at the Cape revolutionised the field by introducing





Figure 10: A photographic plate dated 20 March 1892 of the Eta Argus stellar system (courtesy: SAAO Library).

is also recorded how Gill, when he took charge of the Royal Observatory, ensured that the numerous books in the library were catalogued

and arranged so as to place the Library "... on a respectful footing ..." (Figure 12) and that suitable shelving accommodation was provided in the central hall for what he called the "... valuable library." (Gill, 1913: cxlvi). By the end of the century, atlases, astrographic catalogues and a pamphlet collection were added to the library's holdings, which already consisted of reference books, the periodical collection, and the books collection. Correspondence and reports by the Astronomer Royal at the Cape of Good Hope to and from the British Admiralty also give ample evidence about the growth of the library collection, listing books acquired through donations (Figure 13) as well as procurement through the offices of the British Admiralty (Figure 14), and a list of journal volumes sent to be bound (Figure 15). The archival documents, as did the literature, referred to operational issues such as the need for extra space as the collection expanded.

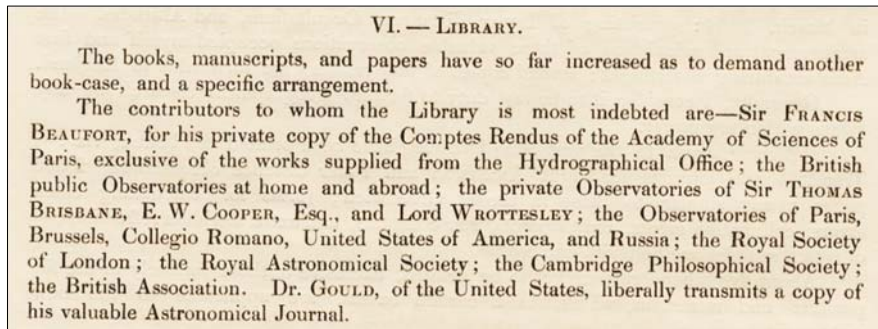


Figure 11: An excerpt from the *Annual Report of Her Majesty's Astronomer at the Cape of Good Hope for the Year 1854 and Part of 1855*, recording how Maclear requested another bookcase and acknowledged donors (courtesy: SAAO Library).

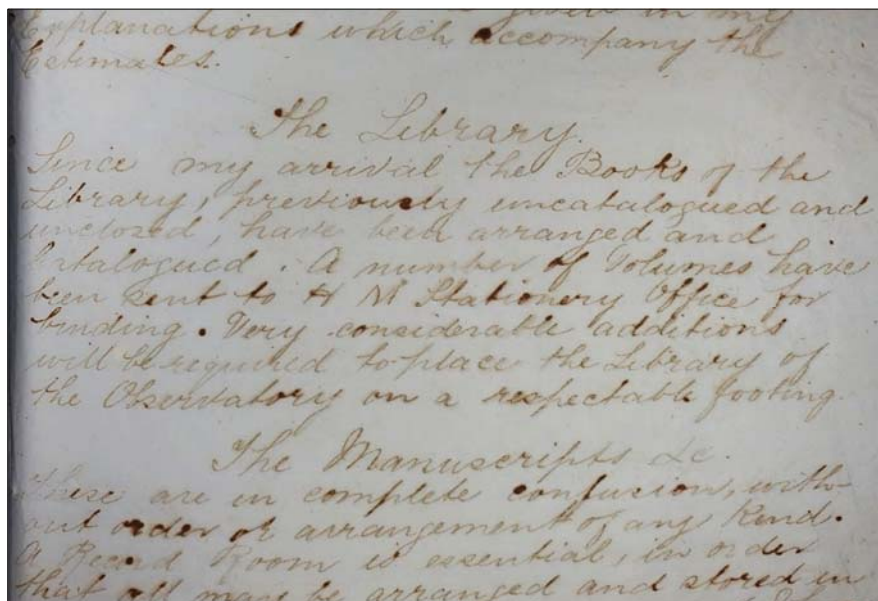


Figure 12: David Gill's report on the state of the library after taking over as Astronomer Royal at the Cape of Good Hope in 1879: extract taken from the *Royal Observatory Cape of Good Hope Stationery & Printing Volume C 1870 to 1900* (courtesy: SAAO Library).

( 13 )

BOOKS AND PAMPHLETS PRESENTED TO THE LIBRARY  
OF THE ROYAL OBSERVATORY, CAPE OF GOOD HOPE,  
DURING THE YEAR 1894.

- Backlund, O., Ephéméride de la Comète d'Encke 1894 Oct. 28-0-1895 Mars 29-0. ... 8vo., *St. Pétersbourg*, 1894.
- Baxendell, J., Report and results of Meteorological Observations (at Southport) for the year 1893. ... 4to., *Southport*, 1894.
- Bobrinskoy, Comtesse Nadejda, Détermination de l'orbite de la Comète 1890 VI. ... 8vo., *St. Pétersbourg*, 1894.
- Brédikhine, Th., Sur quelques cas du morcellement des Comètes ... 8vo., *St. Pétersbourg*, 1894.
- Campbell, W. W., Spectra of the great Nebula in Orion and other well known nebulae. ... 8vo., *Northfield, Minn.*, 1894.
- The Wolf-Rayet stars ... 8vo., *Northfield, Minn.*, 1894.
- Davidson, G., Variation of latitude at San Francisco, 1891-92 ... 4to., *Boston*, 1894.
- Döllen, W., Stern-Ephemeriden auf das Jahr 1894 zur Bestimmung von Zeit und Azimut mittelst des tragbaren Durchgangsinstrumentes im Verticale des Polarsterns ... 8vo., *Dorpat*, 1893.
- Dreyer, J. L. E., Micrometric Observations of Nebulae made at the Armagh Observatory. ... 4to., *Dublin*, 1894.
- Fabry, L., Etude sur la probabilité des Comètes Hyperboliques et l'origine des Comètes. ... 4to., *Marseille*, 1893.
- Field, Commr. A. M., Longitude of Malacca, Straits Settlements, determined by means of telegraphic signals exchanged with Singapore ... fol., *London*, 1894.
- Folie, F., Du sens et de la période du mouvement Eulérien ... 8vo., *Bruzelles*, 1894.
- Essai sur les variations de latitude et calcul des constantes de la nutation, aberration, aberration systématique, nutation diurne, parallaxe de la polaire ... 12mo., *Bruzelles*, 1894.
- Glazenapp, S., Observations Astronomiques faites à Abastouman : deuxième série des mesures d'étoiles doubles ... 8vo., *St. Pétersbourg*, 1894.
- Gruey, L. J., La formule de Encke pour les erreurs de rectification du sextant, simplement démontrée et complétée ... 8vo., *Paris*, 1893.
- Gylden, H., Traité analytique des orbites absolues des huit planètes principales. Tome I. ... 4to., *Stockholm*, 1893.
- Hale, G. E., The Solar faculae ... 8vo., *London*, 1894.
- Hasselberg, B., Ueber das Linienspectrum des Sauerstoffs ... 8vo., *Stockholm*, 1894.
- Untersuchungen über die Spectra der Metalle im electrischen flammenden Bogen  
I. Spectrum des Chroms ... 4to., *Stockholm*, 1894.
- Holetschek, J., Über den Kometen des Jahres 1689 ... 8vo., *Wien*, 1891.
- Javelle, —, Catalogue de nébuleuses découvertes avec le grand équatorial de l'Observatoire de Nice, I, II. ... 4to., *Paris, N.D.*

Figure 13: The Annual Report of Her Majesty's Astronomer at the Cape of Good Hope for the Year 1894, showing how the library collection grew through donations (courtesy: SAAO Library).

The evidential data point to the importance of access to scientific information throughout the nineteenth century at the Royal Observatory, as well as internationally, and throughout the evolution of library and information service provision at astronomical institutions. One example from the literature is [Orchiston \(2004: 94\)](#)

who in his paper on John Tebbutt, the renowned nineteenth century Australian astronomer, commented on the importance of a library as a research tool for astronomers historically: "One of Tebbutt's successes as a researcher and populariser was that he could fall back on an outstanding private research and

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Admiralty,  
23<sup>rd</sup> January, 1882.

Sir,

I am commanded by My Lords Commissioners of the Admiralty to acquaint you, that a letter has been received from the Stationery Office, in which it is stated that you have applied to be furnished with the back numbers of the "Astronomische Nachrichten", which are not in the Library at the Cape of Good Hope, viz N<sup>o</sup>. 264 to 1801; and that, in reply to an enquiry addressed at your suggestion to the Superintendent of the Observatory at Kew, he has stated that the books cannot be spared from that establishment, but that they are advertised for sale as second-hand in a Foreign Catalogue at a cost of 1200 marks (£60). My Lords are not however prepared to sanction this expenditure.

I am,  
Sir,  
Your obedient Servant.

David Gill Esq  
r. r. r.  
the Observatory,  
Cape of Good Hope.

Robert Wall

Figure 14: A letter from the Admiralty dated 1882 responding to David Gill's request for the procurement of specific issues of *Astronomische Nachrichten*: taken from the Royal Observatory Cape of Good Hope Stationery & Printing Volume C 1870 to 1900 (courtesy: SAAO Library).

reference library." Several other literary sources (e.g. Davis and Coetzer, 2010; Dorch and Petersen, 2021; Ellegaard and Dorch, 2022; Foderaserio and Randazzo, 1998; Lapteva, 1995; Sulistiale, 2015) placed emphasis on the fact that astronomers had a hand in not only building the library collection from scratch, but also in developing it in later years through recommendations as well as sharing and exchanging of library items amongst astronomical institutions around the world.

From an historical perspective, it appears that an exceptional library service was indispensable for astronomers to carry out their work and that astronomers took on the duty of ensuring that the service was available. This can be seen in an entry in a notebook circa 1879,

giving an astronomer library duty (Figure 16). One such astronomer was Robert T.A. Innes (1861–1933; Figure 17). Orchiston (2001; 2003) recounts how Innes was seen by Gill as a promising member of the Royal Observatory's staff. He was given special recognition by Gill for his ability to continue his commendable astronomical work part time, along with salaried administrative duties, which included the library (Figure 18). Innes became the founding Astronomer at the Transvaal (later the Union, then the Republic) Observatory when it was established in Johannesburg in 1912, and he went on to become famous for his discovery of Proxima Centauri in 1915, later confirmed to be the closest star to the Sun (Vermeulen, 2006).



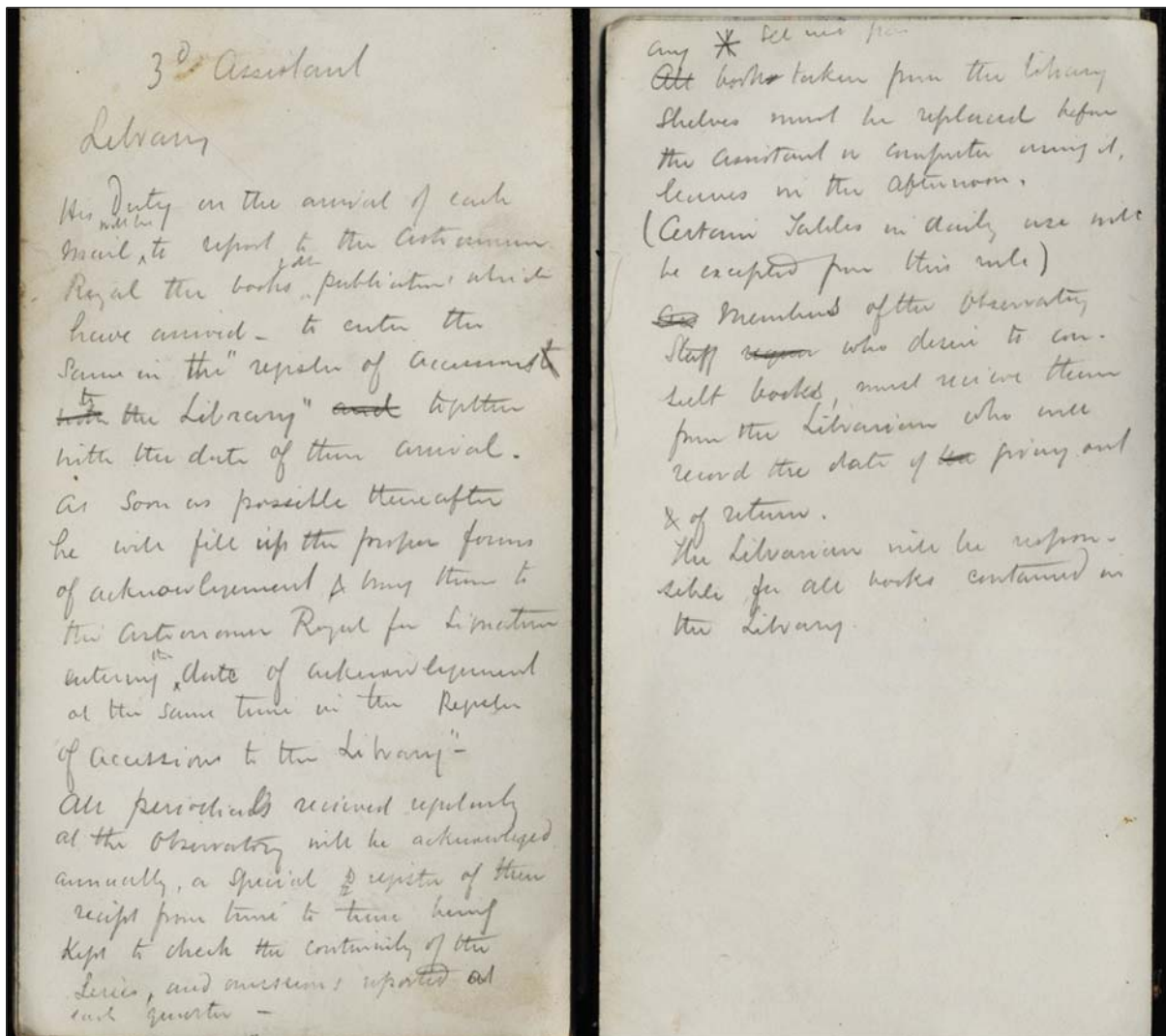
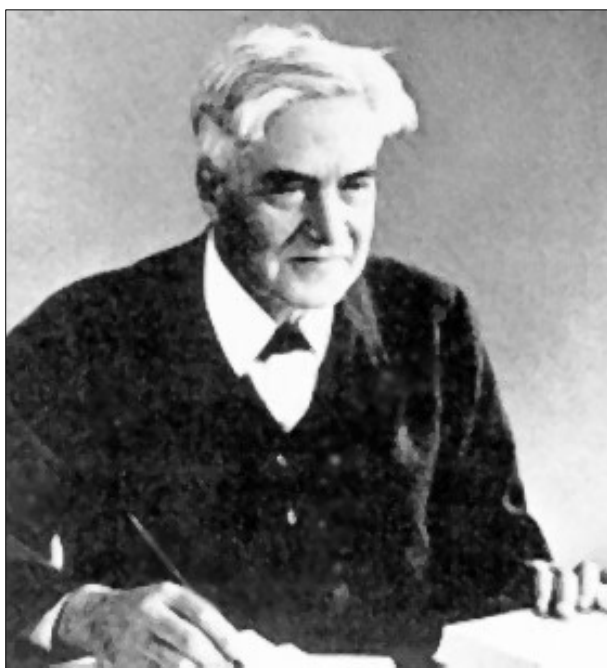


Figure 16: Library duties assigned to the 3rd Assistant Astronomer by the Astronomer Royal of the Royal Observatory Cape of Good Hope, from an Astronomer's Notebook circa 1879 (courtesy: SAAO Library).



It is abundantly clear from the evidence relating to the nineteenth century that astronomy libraries were built, started, managed and developed by astronomers whilst conducting astronomical research at the SAAO.

## 5.2 The Twentieth Century

The early twentieth century witnessed the continuing increase of astronomical activity at the Royal Observatory. New areas of astronomy emerged, besides the mapping of star positions and analysis of star images, areas such as photometry; spectroscopy; the study of variable stars, Large and Small Magellanic Clouds; and the exploration of the Milky Way. The role and function of the Royal Observatory in leading other important developments in South Africa also contributed additional milestones (not research related) during the twen-

Figure 17 (left): R.T.A. Innes (courtesy: SAAO Library).

In conclusion, I desire to record an expression of my satisfaction with the manner in which the officers charged with the Meridian and Photographic work have carried on their duties during my absence, and to remark on the earnestness and success with which Mr. Innes has applied himself to extra-meridian observations, in addition to the satisfactory performance of his duties as Secretary Librarian and Accountant.

I am, Sir,  
Your obedient Servant,  
DAVID GILL.

Royal Observatory,  
Cape of Good Hope,  
1897 *January* 15.

Figure 18: The Annual Report of Her Majesty's Astronomer at the Cape of Good Hope for the Year 1896: commends R.T.A. Innes on the way he performs his duties (courtesy: SAAO Library).

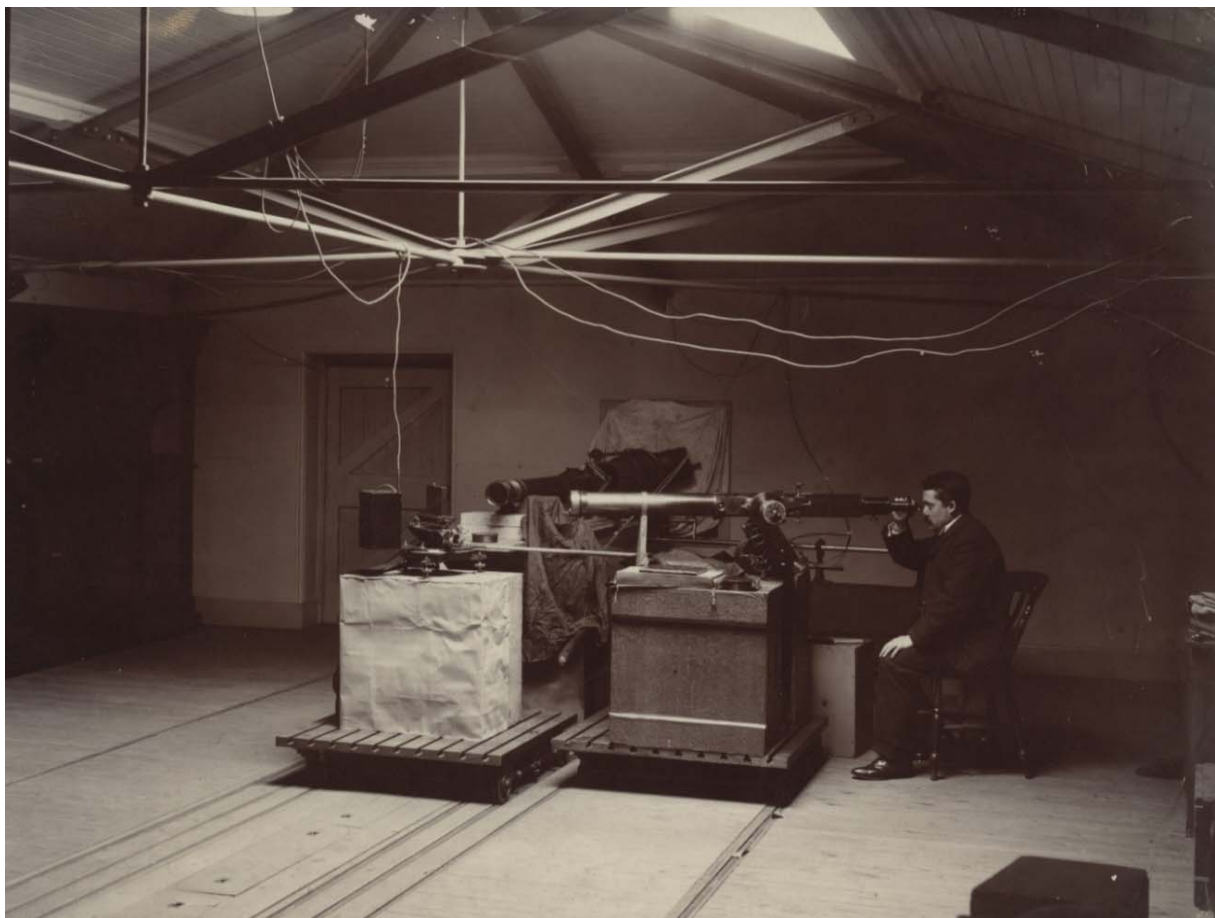


Figure 19: Joseph Halm (courtesy SAAO Library).

tieth century. For one, the Royal Observatory's role in the history of timekeeping is significant thanks to David Gill, the fifth Astronomer Royal, who lobbied successfully in 1903 for standard time in South Africa as timing was problematic on the South African railway system (Kinns, 2021; Laney, 1996b: 111). Valuable scientific astronomical milestones during the twentieth century included the discovery made at the Cape of the presence of silicon and europium in the spectra of stars by one of the Royal

Observatory Assistants, Joseph Lunt in 1905 and, in 1919 the relation between mass and luminosity in stars by the then Chief Assistant at the Observatory, Joseph Halm (Figure 19), making the Royal Observatory one of the pioneers of stellar dynamics (Glass, 2014; SAAO, 2024a).

In the late 1950s, the Royal Observatory continued its astronomical pioneering when astronomer Alan Cousins (Figure 20b) designed



Figure 20a (top left): Michael Feast (<https://www.news.uct.ac.za/article/-2019-04-01-professor-michael-feast-19262019>); Figure 20b (top right): Alan Cousins (courtesy: SAAO Library); Figure 20c (bottom left): Ian Glass (courtesy: Wayne Orchiston); Figure 20d (bottom right): Tom Lloyd Evans (<https://assa.sao.ac.za/about/council-and-officers/tom-lloyd-evans-1941-2014/>).

... a system for measuring the brightness of stars and obtained precise measurements of a set of standard stars in the Southern hemisphere. (SAAO, 2024a).

This 'Cousins photometric system' has since been adopted worldwide. Also, great pioneering work in multi-wavelength techniques was done between 1958 and 1965 at the SAAO by astronomer Michael Feast (Figure 20a) who made

... the first comparison of optical data on young stars with radio measurements of the hydrogen gas [that led] him to a new determination of the distance to the Galactic centre and an improved understanding of Galactic rotation. (*ibid.*).

The SAAO also made footprints in infrared astronomy in the Southern Hemisphere, such as the discovery of the period–luminosity relation followed by Mira variable stars in 1981 by Ian Glass (Figure 20c) and Tom Lloyd Evans (Figure 20d).

During this latter half of the twentieth century, as South Africa moved from being a British colony towards becoming an independent republic in 1961, the political flavour that came with the Government's policy of apartheid (separate development) was not to the liking of the international community. By the 1960s the Royal Observatory was no longer needed for navigation as it was originally intended and because of politics, the British began to withdraw from

South Africa to more more amenable astronomical sites in the Southern Hemisphere, in countries such as Chile (Feast, 2002: 154). Dubow (2018: 663) argues, to the contrary, that astronomy in South Africa became protected as a 'big science' in the apartheid period and became 'fully nationalised'. Dubow (2018: 680) also reveals the secret discussions and agreements that took place between the British and South African science and research councils from around 1968 to 1970. This eventually led to the creation of the South African Astronomical Observatory (SAAO), formed by amalgamating the Royal Observatory with the Republic Observatory (in what was then known as the Transvaal, now the South African Province of Gauteng) with a new site for the facility at Sutherland in the Northern Cape Province (Figure 21), to formalise the main research activities of the SAAO at that time. Initially, astronomers observed from this new site using high precision photometry and spectroscopy to study variable stars, as explained in detail by Glass and Catchpole (1986: 6):

Pulsating stars, ultraviolet, X-ray and infrared radiations from stars and galaxies, understanding how stars evolve and the physical and chemical nature of dying stars and the study of the Magellanic Clouds (the two nearest companion galaxies where violent activity is happening).



Figure 21: An aerial view of the SAAO site at Sutherland in the Northern Cape Province, South Africa, at the time of its inauguration in 1973 (courtesy: SAAO Library).

In the late 1980s the site at Sutherland was from where the very first spectrum of a bright supernova (SN1987A) in the Large Magellanic Clouds was obtained by astronomer John Menzies, leading to a comprehensive study of this supernova (SAAO, 2024a). Another international showcase coming from Sutherland was in 1994 when

... fragments of Comet Shoemaker-Levy 9 crashed spectacularly into Jupiter over the course of 6 days causing an international media frenzy, and images from an infrared camera on a 0.75-m telescope at Sutherland were broadcast around the world. (*ibid.*).

Some of these images are shown in Figure 22. This event led to numerous local and international requests to the SAAO Librarian for photographs of the impacts (see Figure 23).

As astronomical research escalated during the twentieth century, more papers were published, and in turn more journals were needed for current and future research. Evidence unpacked from the review of documents offers

some insight into the development of the library archives, increase in funding and budgeting for the library and constraints around library space. Clear instructions were given as to how donations were received, how journals should be bound, and how they were discarded. A new building was erected in 1931 to accommodate the expanding library, staff and to house more instruments (Figure 24).

Even during and after WWII (1939–1948), the number of journals multiplied to the point of hundreds being sent for binding (Figures 25 and 26). The need for library space began at the time of Gill and escalated to a point when, in 1975, the SAAO Director Michael Feast wrote to the South African Council for Scientific and Industrial Research (CSIR), the then administration, regarding the urgent need for order in the library and a system to find things. His letter (Figure 27) was written in support of Helen Kingwill (Figure 28) who at the time worked in the SAAO Library, and who would later re-organise the library material into Universal Decimal Classification (Glass, 2001: 19). Also,

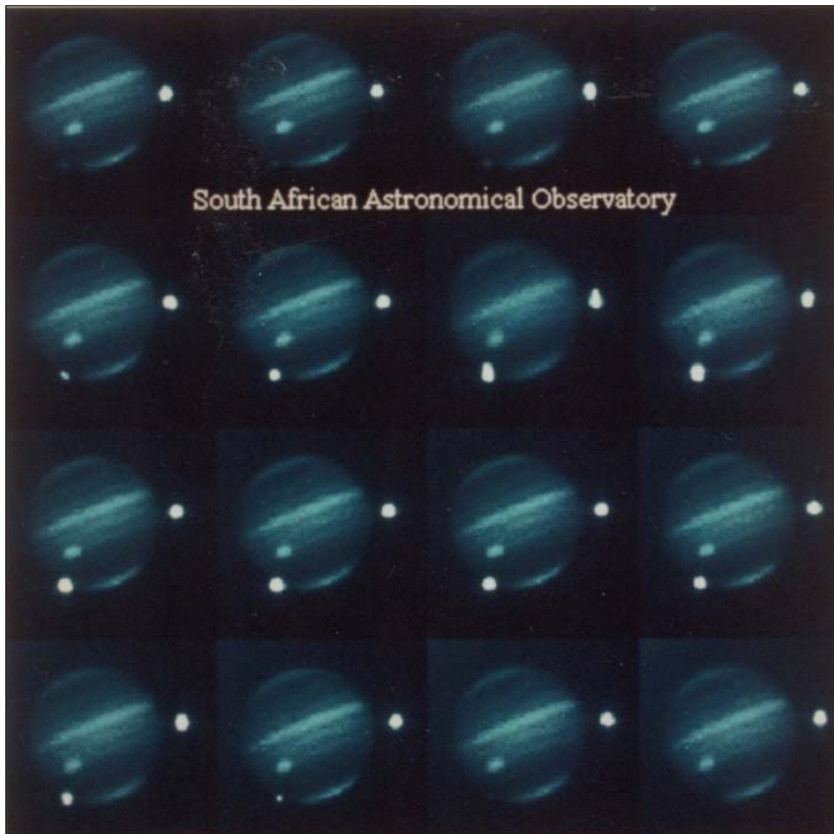


Figure 22 (left): A mosaic of Comet Shoemaker–Levy 9 impact A from the infrared CCD camera on the SAAO 0.75-m telescope that made world headlines (courtesy: SAAO Library).

once the obsolete Airy transit circle (an instrument that had been installed in 1855 to measure star positions) was removed in 1950 the circle area became part of the library (Figure 29).

The growing collection of periodicals was classified by the end of 1975; a card issue system was introduced; the books were arranged according to the Universal Decimal Classification System number; a system of circulating library material was set up; classification systems, cataloguing and circulation as well as preservation of the collection and ultimately its meta-data automation aspects were later to be developed under the responsibilities of professional librarians. By 1977, because of the rapid expansion of astronomical research, books had to be reclassified with help from the astronomers. The librarian at the time, Ethleen Lastovica (Figure 30) explained how the outdated classification schedules were revised (Figure 31).

This growth of the library is fully revealed in documents from previous SAAO librarians' files, illustrating the ongoing importance of the need for space throughout the evolution of LIS at the SAAO within the context of the historical development of astronomy in South Africa. A few examples are notes and correspondence indicating the need for a read-

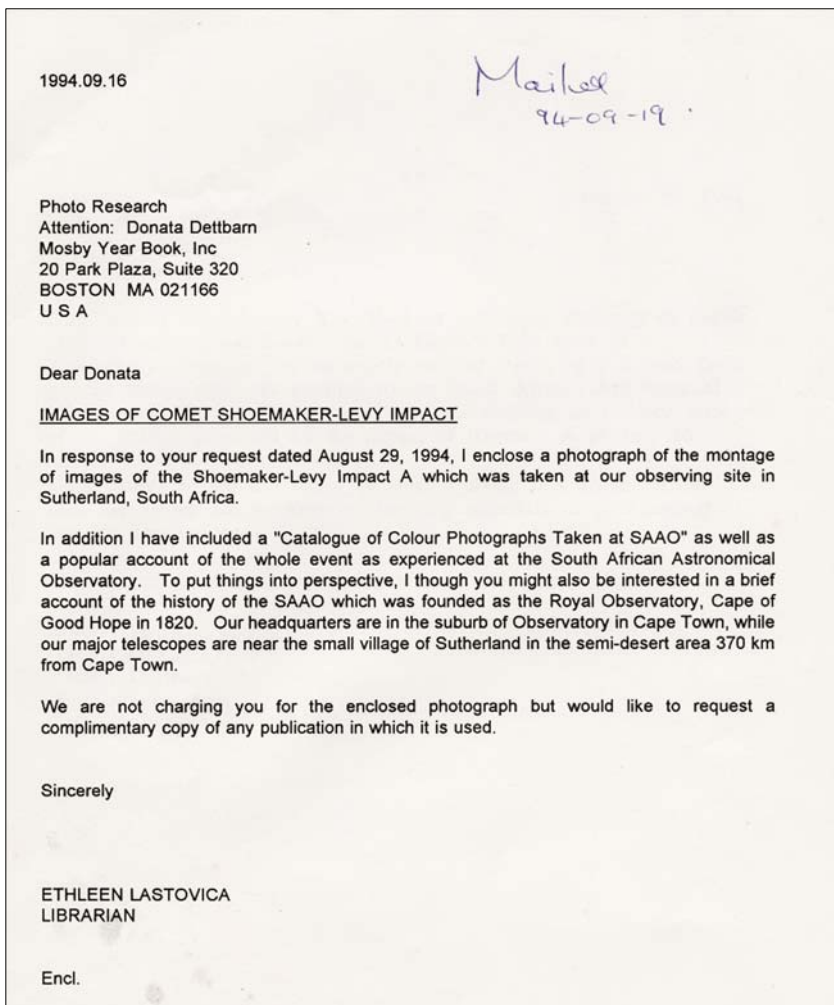


Figure 23 (left): One of the numerous responses to requests made to the SAAO Librarian for images of Comet Shoemaker–Levy 9, from the Library History archive file (courtesy: SAAO Library).

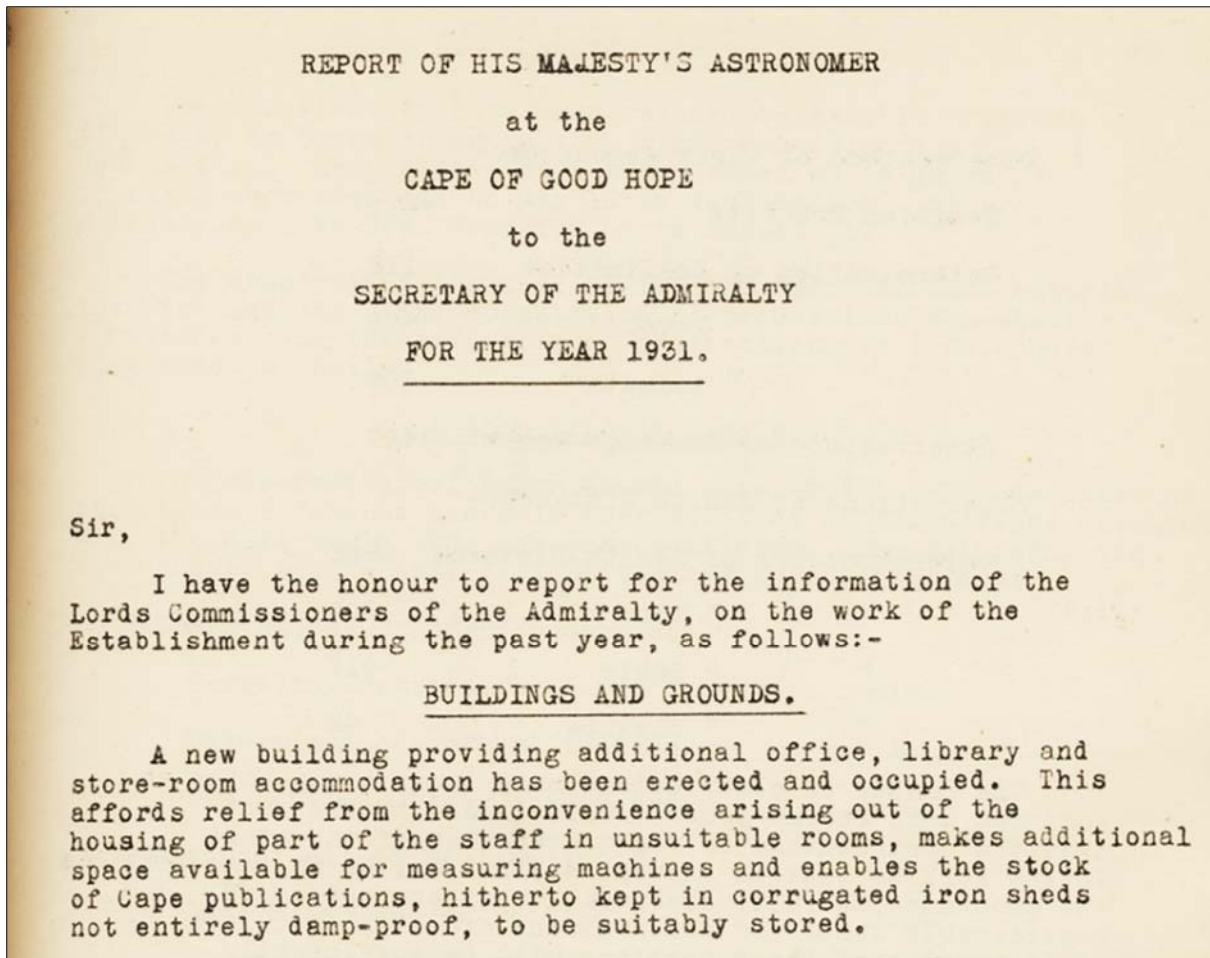


Figure 24: The Annual Report of His Majesty's Astronomer at the Cape of Good Hope for the Year 1931, reports of a new building to relieve the space problems (courtesy: SAAO Library).

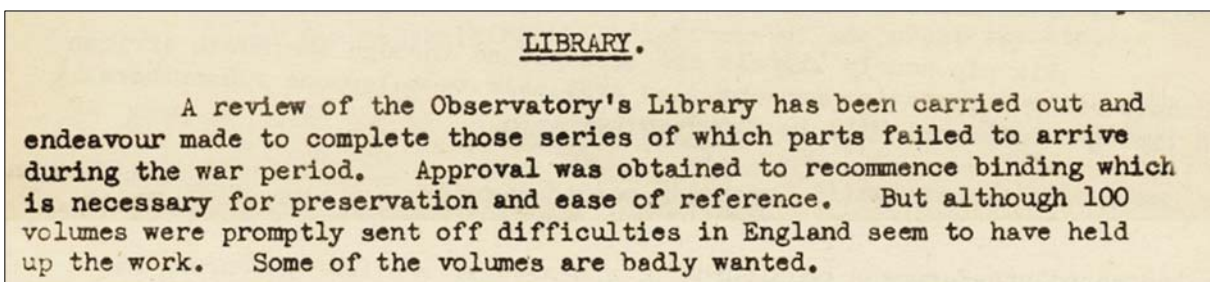


Figure 25: The Annual Report of His Majesty's Astronomer at the Cape of Good Hope for the Year 1947, showing the need for journals that had been sent for binding (courtesy: SAAO Library).

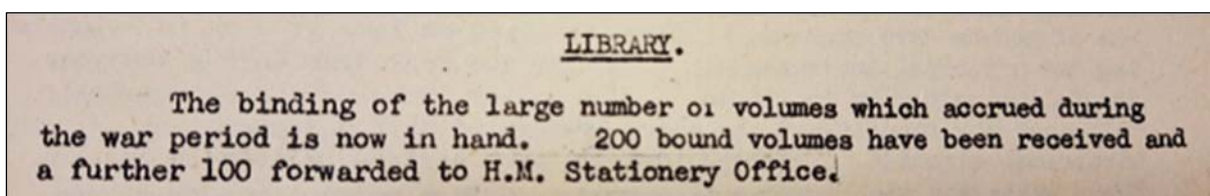


Figure 26: The Annual Report of His Majesty's Astronomer at the Cape of Good Hope for the Year 1948, showing the many volumes that were bound (courtesy: SAAO Library).

ing room; the need for space for students to work and the demands for more office space for staff, putting pressure on the library.

The importance of having a library during the burgeoning astronomical research in the twentieth century was also revealed during the inter-

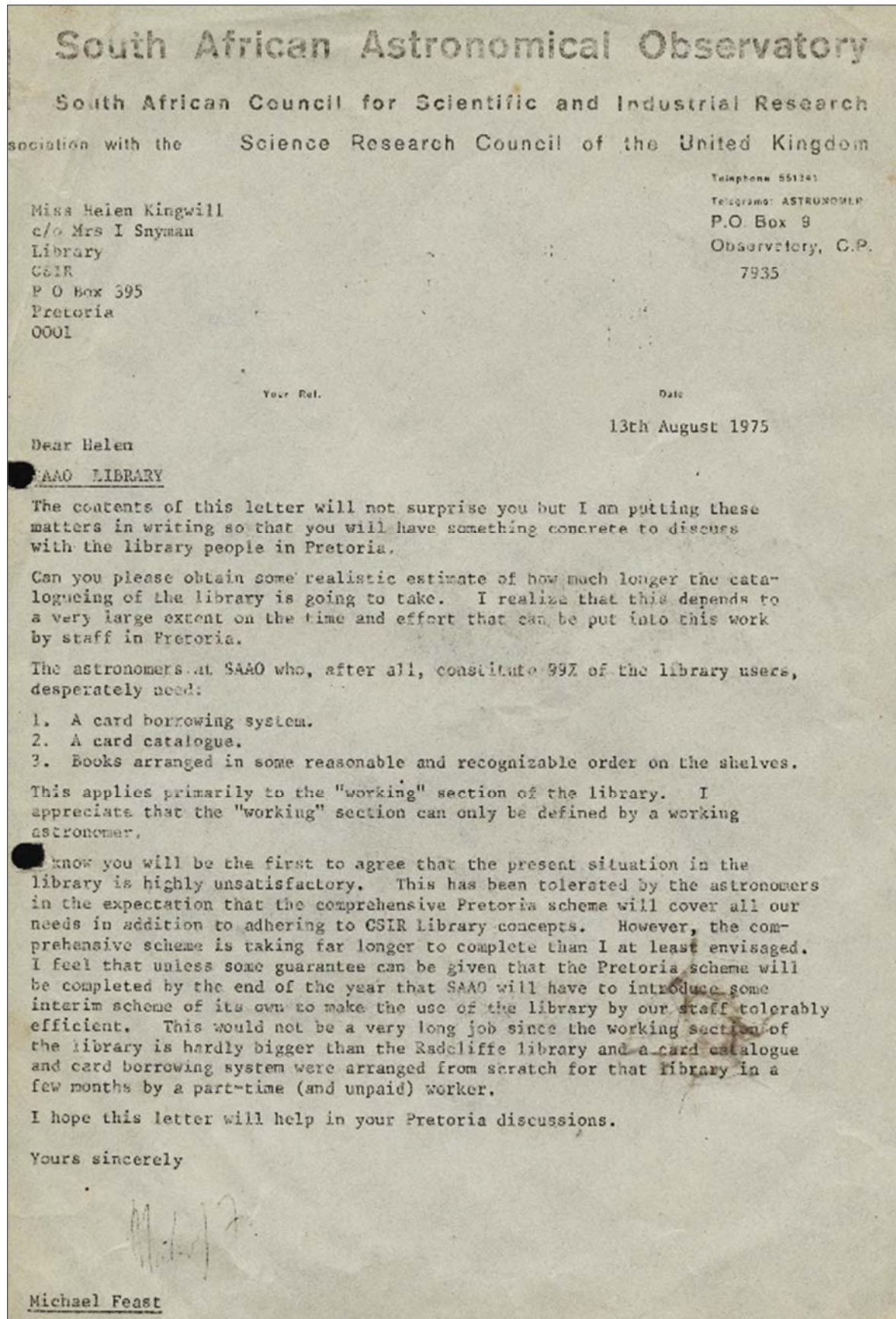


Figure 27: Director Michael Feast's 1975 letter to the South African Council for Scientific and Industrial Research (CSIR) regarding his concerns about the state of the library: taken from the Library History archive file (courtesy: SAAO Library).



Figure 28: Helen Kingwill who worked at updating the catalogue and organising the library material according to Universal Decimal Classification during the 1970s (courtesy: Hettie Glass).

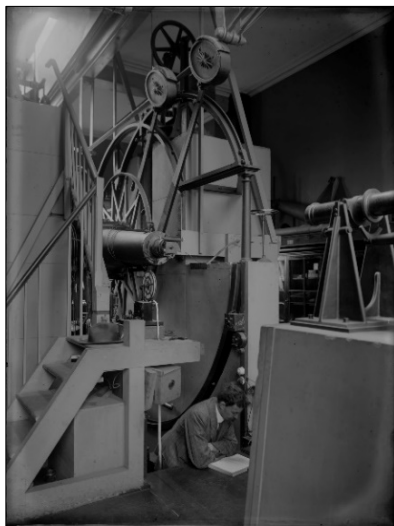


Figure 29: The Airy Transit Circle installed in 1855 (left) was removed in 1950 to make space for the expanding library, as shown on the right (courtesy: SAAO Library).

views conducted for the research study. One participant noted that scientific discoveries that had been made at the SAAO as a facility would not have been possible were it not for the resources offered by the library. Another recognised that in the past, before the internet,

... the library would have been really valuable in trying to find a specific equation that you need ... for all kinds of things and

would definitely have contributed to making research easier.

Astronomer participants in the research study acknowledged how important access to journals and the latest research provided by a library has been for astronomical research over the years. The literature sources especially highlighted the access to journals as fundamental for conducting astronomical research and re-



Figure 30: Ethleen Lastovica, the longest serving professional librarian at the SAAO, from 1979 to 2002 (courtesy: SAAO Library).

## 2. Reclassification of the books

We are using UDC classification schedules which were compiled in 1961. Owing to the rapid expansion of astronomical research these schedules are outdated. In 1977 a drastically revised 2nd ed was published which has a more modern and logical numbering sequence. New subjects have been assigned classification numbers eg. Black holes = 524.882, and in many cases a simple number is now provided for a subject that was formerly expressed as a combination of numbers eg. Ultraviolet astronomy

1961 =	523.8+535-31
1977 =	52-74

Figure 31: Extract taken from a memo sent by the librarian Ethleen Lastovica to Director Michael Feast, dated 27 April 1984, explaining how new subjects like black holes were being classified in the library: taken from the Library History archive file (courtesy: SAAO Library).

flected the value that astronomers place on having access to scientific literature through an astronomy LIS (Connor, 1950; Feast, 1996; Robbins and Kern, 2007; Sahu and Singh, 2013).

### 5.3 The Twenty-first Century

The year 2005 saw the official opening of the Southern African Large Telescope (SALT). Operating at the SAAO in Sutherland, in the dry Karoo area of South Africa, SALT (Figure 32) is the largest optical telescope in the Southern Hemisphere. It is a specialised spectroscopic telescope, thereby adding to the development

of astronomical research at the SAAO. Also contributing to the explosion in research activities were the SAAO's worldwide collaborations at a scientific level, hosting telescopes in Sutherland on behalf of partners, and in so doing continuing to fulfil the prime function of the SAAO, which is to

... further fundamental research in astronomy and astrophysics at a national and international level through the provision and use of a world-class astronomical facility. (Warner, 2001: 2927).

Research of note emanating from the SAAO included the investigation of "... the structure



Figure 32: The Southern African Large Telescope (SALT) at the Sutherland site (courtesy: Anthony Koeslag).

of our galaxy and ... deriving a new calibration for the extragalactic distance scale.” (SAAO, 2024a). This took place between 1997 and 2015 using a SAAO telescope. Another very notable astronomical milestone was the observation of the collision and explosion of two neutron stars for the first time ever, with the SAAO astronomers providing early data of the event in 2017.

The spinoff from these astronomical discoveries resulted in milestones not only around astronomical observations themselves and the papers these generated, but also of astronomy within society. The twenty-first century saw an increase of scientific engagement with society, including collaboration with schools and communities, as well as the establishment of the National Astrophysics and Space Science Programme (NASSP, 2024). In 2003, a programme aimed at astronomy students, with the mission

To empower South African and other African students to meaningfully participate in knowledge creation through the production of internationally recognised knowledge in astrophysics and space science by providing them with the necessary skills. (NASSP, 2024).

In 2011 the International Astronomical Union’s Office of Astronomy for Development (OAD) was

established, with its headquarters at the SAAO in Cape Town, to help

... mobilize the human and financial resources necessary in order to realize the field’s scientific, technological and cultural benefits to society ...

and to fund astronomy related projects in many countries (OAD, 2024).

Furthermore, as was mentioned on opening, the South African Heritage Resource Agency (SAHRA) declared the SAAO Cape Town site a national heritage site on 21 December 2018, recognising the contributions made to astronomy by the SAAO. As a result of this declaration, the importance of access to, and the preservation of historical records became pressing especially since the records had been neglected and displaced for many years, and were not being handled appropriately and in accordance with internationally accepted archival standards. This initiated the first phase of the digitisation of the library’s extensive heritage collection: the scanning of more than 96,000 pages of Meteorological Report books (dated 1842–1960); 350 Astronomers’ notebooks (dated 1844–1884; Figure 33); and the digitisation of more than 8000 photographs by the Centre for Astronomical History and Heritage (CfAH), whose mission is to “... record, preserve, and disseminate”



Figure 33: Astronomers' notebooks 1844–1884 (courtesy: Auke Slotegraaf).

inate information about, South Africa's tangible and intangible astronomical heritage." ([Centre for Astronomical History and Heritage, 2024](#)).

In 2019, as part of its new re-alignment plans, the SAAO expanded its observing capabilities by introducing the innovative feature of a remote African Intelligent Observatory (AIO), evolving along with the tremendous technological changes that came with the Fourth Industrial Revolution (4IR). The AIO enables astronomers to use the telescopes hosted in Sutherland remotely from a remote observing room in the Main Building of the SAAO in Cape Town through advanced connectivity using computer software and artificial intelligence as depicted in [Figure 34](#) ([SAAO, 2024b](#)). This SAAO-wide AIO initiative is a longer-term drive aiming to be ready for very fast-paced international observations in the future.

As the format of subscribed journals became more electronic with access through library subscriptions, the library could afford to offer its journal room (the same room that had previously housed the Airy Transit Circle) to house the remote observing room of the AIO ([Figure 35](#)). In exchange, the printed journals that are rarely used were relocated to another room in the main building into newly installed compact-

us units (moving shelves). And so, as has been the case over two centuries, the African Intelligent Observatory remote observing room (the astronomers' instruments) and the SAAO Library ([Figure 36](#))—another of the astronomers' 'instruments'—coexist in the Main Building of the SAAO.

Amid a rapidly evolving technological research landscape and the boosting of research output from the SAAO, pressure was put on the library to provide access to more electronic resources, keep track of statistics and provide metrics. The important contribution of the library to measuring research output emerged from the evidential data collected. These contributions were: keeping track of various kinds of research-related statistics; maintaining a staff publications database; and the importance of a repository. One astronomer's opinion on the importance of the library in keeping statistics was that it

... allows us to see ... how we're doing, gauge how we're doing and which directions we need to move in the future. So, I think that that's very important.

There evolved a need for electronic institutional repositories and open-source scholarly publishing was encouraged. This initiated the need for

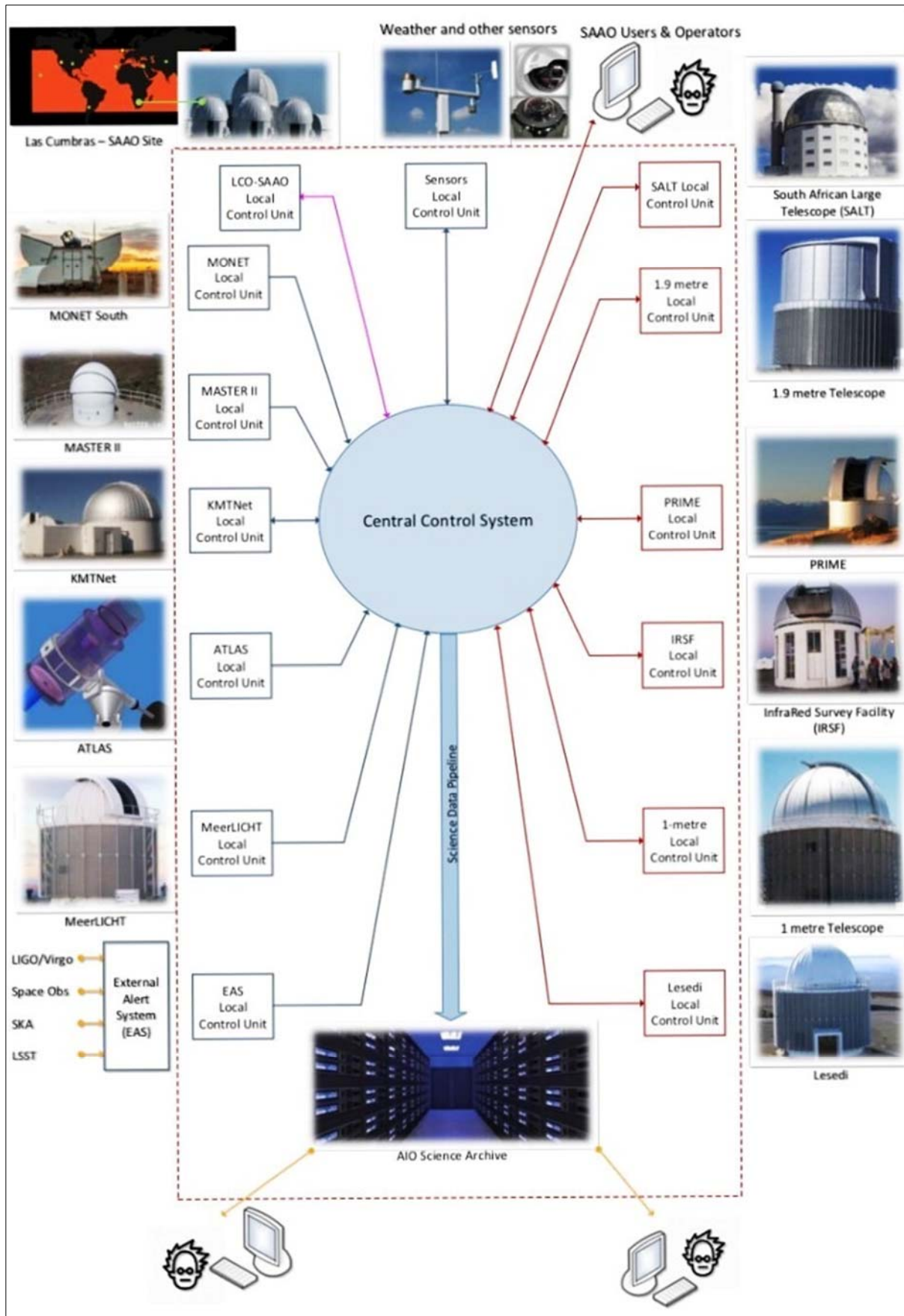


Figure 34: The African Intelligent Observatory control concept (<https://io.saao.ac.za/high-level-design-concept/>).



Figure 35: The African Intelligent Observatory remote observing room, located at the SAAO main building (after [SAAO, 2022: 53](#)).



Figure 36: The SAAO Library located in the SAAO Main Building (courtesy: Ian Glass).

a more integrated library system and the SAAO Library teaming up in a collaborative effort with other National Research Foundation (NRF) facilities libraries in acquiring a new state of the art library management system in 2019.

Open science and open access initiatives that emerged during the twenty-first century exposed the need to share data and information amongst astronomers, which in turn created the opportunity for a new role for libraries and librarians. Bouquin et al. (2018) and Genova (2018) pointed out the importance of libraries promoting the use

... of the FAIR (Findable, Accessible, Interoperable, Reusable) guiding principles for scientific data management within the current field of astronomical research ...

with Erdmann (2015) highlighting how librarians have been encouraged to become 'Data Savvy Librarians' by training in data science and in so doing giving themselves hands-on experience to help them transform their roles within the astronomical research community. This is an explicit example of astronomy librarians' involvement in data archiving in the current astronomical research landscape.

Today astronomical research at the SAAO is at the forefront of Big Data production, a signature of the 4IR and the digital information age. The South African astronomical community is taking the lead into the next era, starting with the hosting of the International Astronomical Union's General Assembly for the first time in Africa in August 2024. The library continues to support the astronomical research taking place, providing valuable sources of information needed. The twenty-first century clearly reflects a maturing in both the astronomical research as well as the library, in an electronic environment requiring twenty-first-century technology and tools.

## 6 CONCLUDING REMARKS

LIS provision at the SAAO evolved in parallel with the historical development of astronomical research in South Africa. This paper has showcased this by plotting its development at the SAAO alongside astronomical research milestones, drawing from an empirical research study to show how the two evolved and influenced each other. Although this paper is based on a study that was undertaken in South Africa, the trends emerging from it concur with international literature that astronomy libraries were begun and developed by astronomers until professional librarians took charge, a notion

aptly captured in the words of Olostro Cirella et al. (2015: 144): "The astronomical library collections are closely linked with the origins and development of the activities of each respective observatory." This paper shows this by highlighting how, throughout its 200-yr history, as the research at the SAAO developed over time, so did its LIS, and so their histories are connected and intertwined.

As time goes by, the inevitable development of new technologies means that other services are possible for the library to offer, particularly in line with the SAAO vision of an AIO and other such exciting developments in astronomical research in an electronically connected research landscape. As the Head of Astronomy at the SAAO noted during the research study interview:

... it's called the intelligent observatory, not called intelligent telescopes ... the Observatory is all that and ... the library ... the access to scientific literature for scientists is part of the Observatory.

Looking to the future interconnectedness of the library and information service and astronomical research at the SAAO, the African Intelligent Observatory brings the remote observing room and all its future research implications close to the library. And so the two are destined to physically co-habit in the Main Building of the SAAO, continuing the long history of the co-development of libraries and astronomical research instruments and telescopes.

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