The Wind Tower at the Royal Observatory, Cape of Good Hope

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Abstract: A small building known as the ”Wind Tower” existed at the Royal Observatory, Cape of Good Hope, from about 1840 to 1965. Though used for several purposes during its history, it is most famous for hosting the telescope used to make the Cape Photographic Durchmusterung, the first sky catalogue made using photography.

Early years as a magnetic observatory

Fig 1. The Wind Tower as it appeared after 1882. (SAAO Archives P3612)

The Wind Tower was built about 20 years after the foundation of the Royal Observatory as part of a Magnetic Observatory (Glass, 2015). It was one of a number set up in British colonies to study the nature of the Earth’s magnetic field in space and time. It comprised several buildings. At first it did not form part of the Royal Observatory and was manned by members of the Royal Artillery

The main buildings of the Magnetic Observatory proper were made of non-magnetic materials. It was fully equipped with standard instruments for measuring the various components of the Earth’s magnetic field. The Wind Tower was built as a weather station, presumably to see if weather conditions affected the magnetic readings. Its internal diameter was just 9 feet (2.7m).

The head of the small group that ran it was Lieut Frederick Marow Eardley-Wilmot (1812-1877). A two-room cottage, the only one of the buildings that still exists, though considerably extended, had been built for him to occupy but he ceded it in favour of Captain Clerk, an assistant, who had a family to take care of. He himself then lived in the Wind Tower. “I need hardly say that this, though apparently a small evil, is, when continued for four years, a very disagreeable sort of habitation” (Eardley-Wilmot, F.S., 1879).

In its original form, the Tower had a flat lead roof and was surmounted by a large wind vane connected to a frame with a diaphragm at one end. The diaphragm always faced the wind and was deflected by wind pressure. It was linked to a pencil that wrote on a moving piece of chart paper. Other pencils recorded the wind direction and the rainfall. This early automatic weather station was invented in 1835 by A.F. Osler (1808-1903).

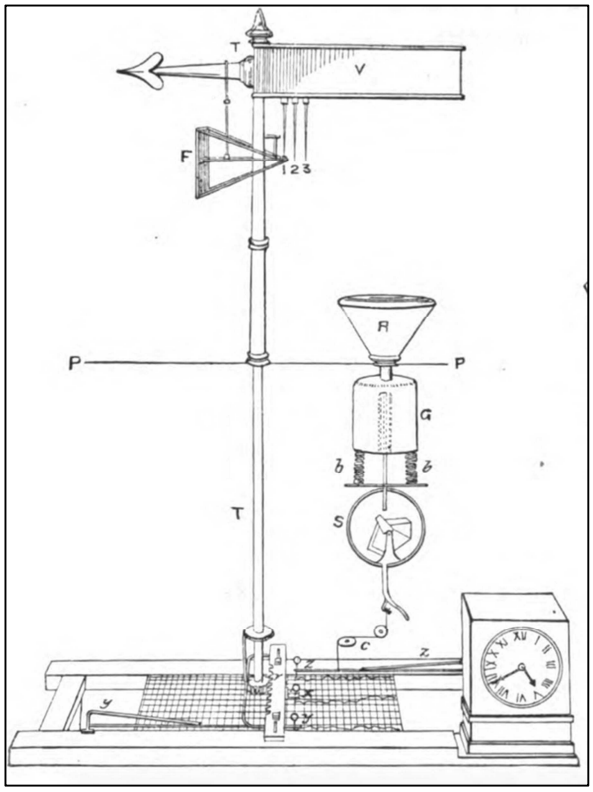


Fig 2. Osler self-recording wind and rain apparatus (Abbe, 1888, Fig 48).

After a few years the running of the Magnetic Observatory was handed over to the astronomical observatory, then under the direction of Thomas Maclear. It was regarded as a distraction from the proper activities of the staff and, unsurprisingly, less attention was paid to magnetic work thereafter. In fact, it was abandoned after about 1869 when Maclear retired (Warner, 1979), although meteorological observations continued.

It is presumably due to this that the Royal Observatory and its successor, the South African Astronomical Observatory, has the longest series of weather records in South Africa (Glass 2018).

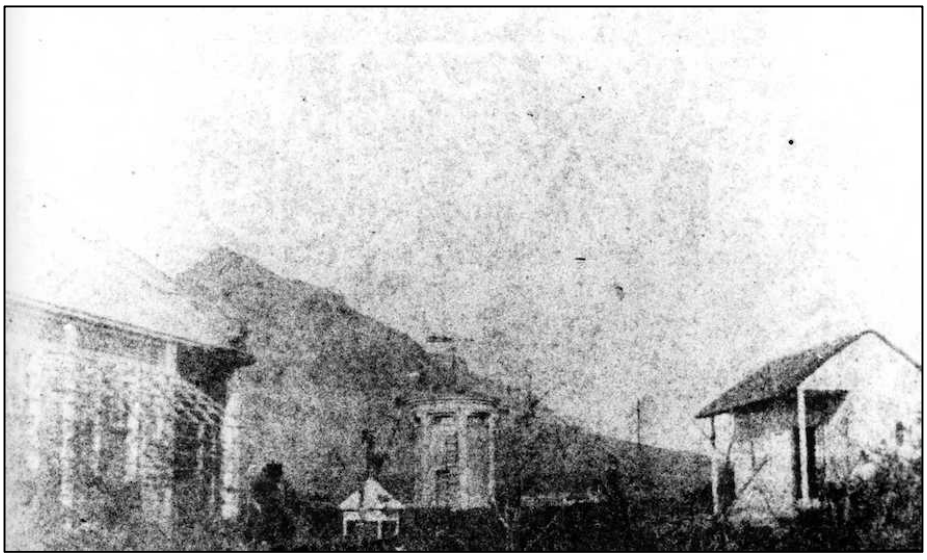


Fig 3. Calotype of the Magnetic Observatory taken by C P Smyth, from the East and with Devil's Peak in the background, shortly after its completion, around the end of 1841. Above the Wind Tower (in the centre) can be seen the large wind vane of the anemometer. This is one of the first photographs made in South Africa (SAAO Archives. P6702. Original: Museum of the History of Science, Oxford).

The Wind Tower under Gill

David Gill (1843-1914) arrived as HM Astronomer in May 1879 and immediately began to reorganize the Royal Observatory which had become somewhat disorganized and neglected.

One of his first actions was to order a new 6-inch (15-cm) telescope from Howard Grubb in Dublin for use during the Transit of Venus that was due to occur on 6 December 1882. The only other equatorially mounted telescope then at the Observatory was the 7-inch (18-cm) Merz of 1849 which was in poor condition and required extensive refurbishment.

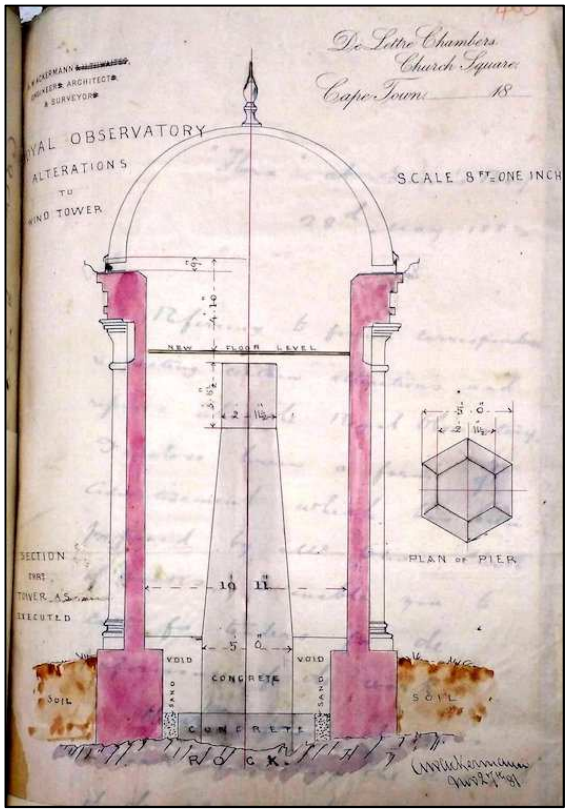


Fig 4. Ackermann's design for the modified Wind Tower, dated Nov 27, 1881 (SAAO Archives, A0011, p. 463).

To house the new telescope Gill decided to make use of the Wind Tower. He engaged a local engineer and architect, A.W Ackermann, who produced the accompanying design (Fig 4). The original flat lead roof was removed, a strong pier was built and a wooden floor was inserted. Access was by means of a spiral staircase leading to a trapdoor. From Grubb he ordered a dome and guttering with specially designed lion-head spouts (Gill, 1913)

The 6-inch Grubb telescope was one of several ordered from Grubb by British Transit of Venus expeditions. However, on trying it out, Gill was dissatisfied with the stability of its mounting. (After some acrimonious correspondence with the maker, the latter was replaced in 1885 by a heavier one designed for an 8-inch [203-mm] telescope). This mount is still used for the 6-inch telescope in its present square building.

The Great Comet of 1882

Gill's plans were disrupted on 8 September 1882 when William Henry Finlay, (1849-1924) the First Assistant astronomer (1873-1898), discovered what became known as the Great Comet of 1882.

According to Gill's narrative (Gill, 1913, p. xlviii), "On the early morning of the 8th of September 1882 (civil time), Mr W.H. Finlay … when on his way to his house after observing an occultation of the star 5 Cancri, saw a bright comet-like object in the constellation Hydra, which proved to be the afterwards celebrated comet of that year. It appears that the Comet was seen by various less responsible observers several days before its discovery by Mr Finlay; but the fact remains that the accurate observation of this object which he secured, by returning to the observatory on the morning in question, are the first of any scientific value that exist".

Gill was then concentrating on observations of the minor planets Victoria and Sappho in order to determine the distance to the Sun as well as work on the preparation of several expeditions for the Transit of Venus. He could not afford to spend much time on other matters (Gill 1882)

Finlay and William Lewis Elkin (1855-1933), a young American who visited Gill from 1881 to 1883 as an unpaid assistant, made numerous visual observations of the comet using the 6-inch telescope in the Wind Tower and made sketches of its tail and nucleus [Elkin was later director of the Yale Observatory]. These formed part of the observations of the comet published by Finlay, Elkin & Gill (1886).

A few weeks later the Observatory received a dramatic wake-up call. On 3rd October at 0440, an amateur photographer, Mr William Simpson of Aberdeen, Cape, succeeded in taking a surprisingly good image of the comet using the dry plate process. Until a few years before, photography had been very insensitive and relatively little astrophotography had been undertaken. It was now realised that a powerful new technique had emerged.

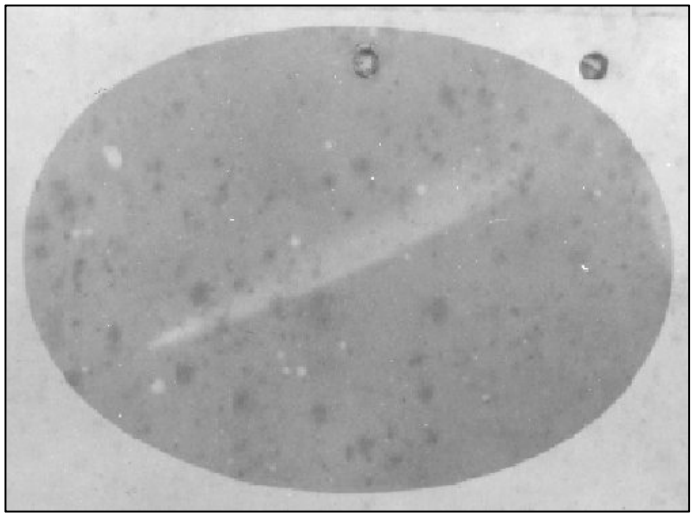


Fig 5. The photograph taken on 3 October 1882 by Mr William Simpson of Aberdeen and sent to Gill (SAAO Archives P4348).

Since he felt that he did not know enough about photography, Gill made contact with Mr Edward Haggar Allis (1849-1911), a professional photographer in the nearby village of Mowbray. Between them, they mounted a camera on the end of the declination axis of the 6-inch telescope so that the main telescope could be used as a guider to follow the diurnal motion of the comet. In this way they were able to take long time exposures without the danger of blurring.

The camera that they used had a 2¾-inch (7cms) diameter Ross rapid portrait lens of 11 inches (279 mm) focal length (made by Dallmeyer).

Fig 6. Ross lens borrowed from Allis and ultimately bought for the Observatory. (Astronomical Museum, SAAO; photo: author).

With it a number of photographs were taken, probably at first by Allis. Examples are shown in Fig 7. The originals of these photographs were sent to the Royal Astronomical Society in London and are now in the Science Museum (Plug, 2014). However, we have several positive copies made from Allis's negatives as lantern slides.

Fig 7. Examples of photographs taken with the Ross lens attached to the 6-inch telescope in the Wind Tower. The bottom left photograph was taken on 19th October 1882 (some of the blobs are artifacts); the top left on 21st, top right on 20th and bottom right on 7th November. The first three of these images are taken from lantern slides marked "From the original negative taken by E.H. Allis at the Royal Observatory C. of G. H." followed by the dates, Cape Mean Times and exposure times of 40-45 minutes (SAAO Archives, not yet catalogued).

Gill prepared a large number of prints of 6 typical photographs, spanning the period 19 October to 14 November and these were circulated to astronomers far and wide as well as included in Finlay et al (1886).

The presence of stellar images on the plates encouraged Gill to propose making a star catalogue using photography. During a visit to England in 1884 he obtained from T.R. Dallmeyer (1859-1906) a stock "Rapid Rectilinear" lens of 6 inches (152 mm) aperture and 54 inches (1.37 m) focal length. Though he conducted several experiments with other lenses, this is the one that was used for production of the Cape Photographic Durchmusterung.

Fig 8. The Dallmeyer 6-inch diameter Rapid Rectilear lens that was adopted by Gill for the Cape Photographic Durchmusterung. (Astronomical Museum, SAAO; photo: author).

The Dallmeyer Rapid Rectilinear consisted of two identical meniscus achromats with their convex sides facing outwards. There was a stop placed centrally between them. It was one of the most successful lens designs of its time (1866) and was probably arrived at empirically by combining two Grubb landscape aplanats from his patent of 1857 (Kinglake, 1989).

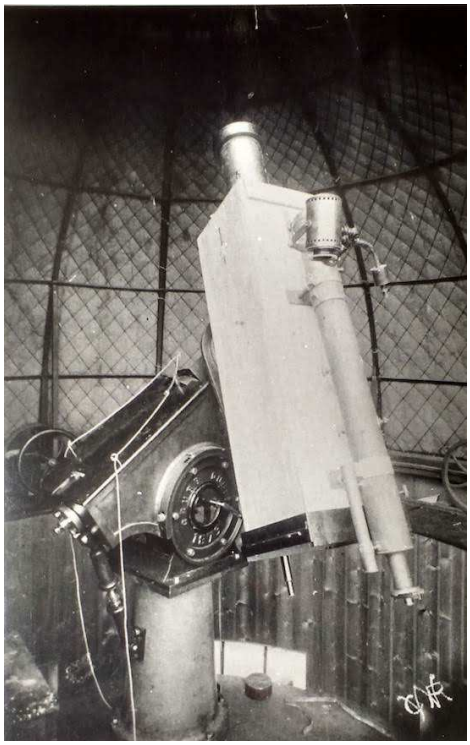


Fig 9: The CPD Camera in the Wind Tower, attached to the replacement Grubb mount. The body of the telescope was a wooden tube 12 inches (305mm) square. A versatile plateholder and focusing mechanism of Gill's design was attached (not shown here).
The guide telescope was an old Dollond telescope of 3½ inches (89mm) diameter with a rotatable micrometer eyepiece. A lamp was used to illuminate a kind of graticule in its focal plane. This photograph was signed at bottom right by C. Ray Woods (photo: SAAO Archives P5636).

Gill applied for and received grant of £300 for two years from the Royal Society in London to carry out photographic work (including some attempts at coronography on behalf of the pioneering astrophysicist William Huggins (1824-1910). From this grant he was able to hire C. Ray

Woods (1859-1920) as a photographer for the project in 1885. Though the photography took from 1885 to 1889, the grant was unfortunately not continued further and Gill had to finance the remainder from his own pocket (after getting his wife to agree!).

Fig 10: The Wind Tower in the late 1880s with the CPD camera just visible inside (photo: SAAO Archives P4295).

Measurement of the Plates

The measurement of the CPD plates was a formidable task and fortunately Jacobus Cornelius Kapteyn of Groningen came to Gill's rescue by offering to spend a few years on the project himself, not without Gill having dropped hints in his direction (van der Kruit, 2015).

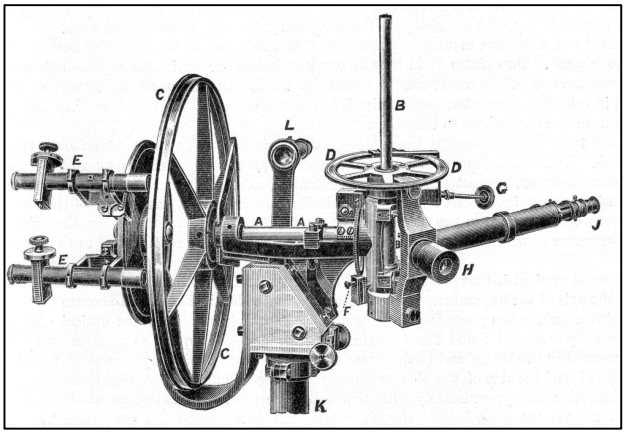


Fig 11. "Parallactic" measuring instrument devised by Kapteyn and Gill for the measurement of the CPD plates (Gill, 1913).

Kapteyn and Gill devised a unique instrument that was built by Repsold of Hamburg for measuring the CPD plates, which had been exposed in pairs. He mounted each pair of plates in a stand and placed the two-coordinate measuring device (Fig 11) at a distance from them equal to the focal length of the Dallmeyer lens. The position of each image as read on his instrument's circles then gave essentially the right ascension and declination directly, without having to do the extensive computational work that x,y coordinate measurements from the plates would have entailed.

To eliminate spurious images, the paired plates referred to were mounted slightly offset. Genuine images of stars were then distinguishable from false ones by being double. Measurement took from 1886 to 1898 and the results were published in the *Cape Annals* from 1896 to 1900. The total number of stars was 454875.

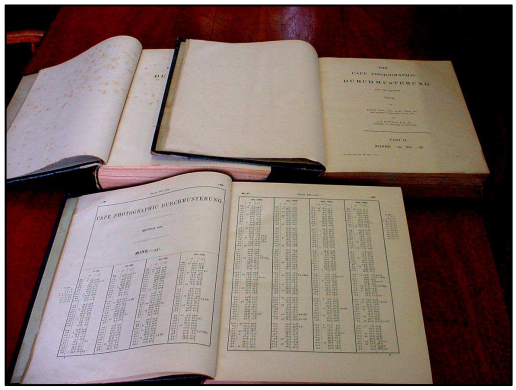


Fig 12. (Right) The CPD Catalogue (Photo: author).

Later history of the Wind Tower

Following the completion of the CPD in 1889 the 6-inch telescope was re-mounted in the Wind Tower.
Gill (1913) makes few references to it but it is clear that it was used for observations of comets and occultations. Finlay used it for the first observations of Comet 1886e (Comet 15P/Finlay) and also independently found Comet 1886f.

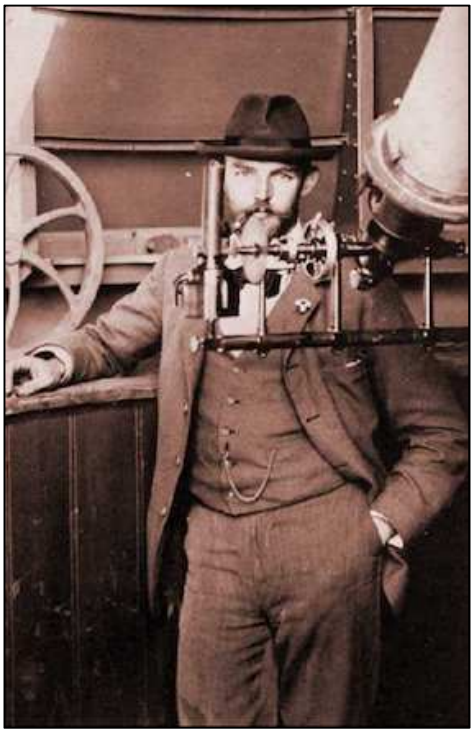


Fig 13. Willem de Sitter with a Zöllner photometer and the 6-inch telescope in the Wind Tower (Photo: unknown source).

In 1896 Willem de Sitter, a doctoral student of Kapteyn in Groningen, was invited by Gill to work at the Observatory to learn practical astronomy. During the years 1897 to 1899 he worked *inter alia* with a Zöllner photometer attached to the 6-inch telescope in order to compare the visual and photographic magnitudes of stars at different galactic latitudes. The effect being studied was a manifestation of interstellar extinction, then just beginning to be understood.

(The Zöllner photometer was an instrument used to compare the brightness of an artificial star with a real one).

Subsequent History

The *Reports of HM Astronomer at the Cape* for the remainder of the 19th century and the first half of the 20th make fairly frequent mention of the Wind Tower and the telescopes, starting with the 6-inch Grubb, that it contained.

"Searching for comets" and (Lunar) "occultations" were the most common entries. The two years of de Sitter's photometric observations were the main exception. Occasionally there is mention of something different such as the Transit of Mercury of 14 November 1907. From 1917 onwards the telescope was in use by various well-known amateurs of the time such as A.W. Long (1874-1939) and J.F. Skjellerup (1875-1952). After 1924 only Long's name appears and that for a few years.

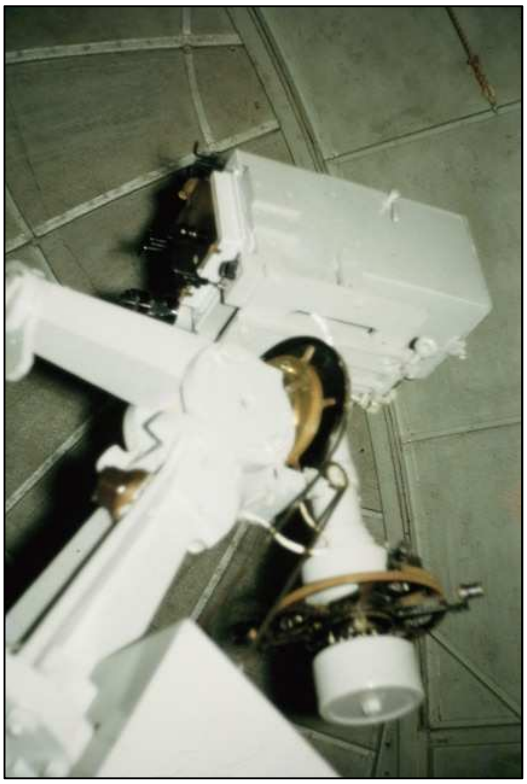
In the 1935 Annual Report it was stated that the 1885 mount was being used to carry two wide-angle lenses of 5 inches (127 mm) diameter and 35 inches (89 cm) focal length with a 6-inch (152 mm) guide telescope of 6½ feet (1.65 m) focal length. By the 1936 Annual Report both the mount and the 5-inch cameras had been moved to a new square building in 1935 [This is where the mount remains, though once again it carries the 6-inch Grubb telescope].

In 1937 the Observatory's Merz 7-inch (178 mm) telescope was placed on an old mount by J.H. Dallmeyer (1830-1883) that had been overhauled and installed in the Wind Tower. The mount in question had originally been part of a photoheliograph dating from 1875. Within a short time however the 7-inch was again moved and re-mounted in place of the Repsold heliometer on its stand in the NE dome.

In 1951 an "old Cooke 6-inch (152 mm) telescope" was placed in the Wind Tower on the Dallmeyer stand and was used for variable star work by A.G.F. Morrisby (? – 1988) who was then on the staff of the Royal Observatory. In the following year an S. Archer was mentioned.

In 1953, though it had been used for some occultation observations, the telescope was declared "not serviceable" as its lens needed re-polishing. There was no further mention of the dome until 1960.

Last Days (nights?)



In photographs taken around the early 1960s by Greg Roberts the Dallmeyer mount is seen carrying a small "box" telescope with a lens inscribed "Kodak AERO-EKTAR f:2.5 12 in. 305 mm 9x9N659 …". This type of lens was widely available as "surplus" after the Second World War, when it was used in aerial reconnaissance cameras. One of its unique features is that it makes use a radioactive thorium glass (emitting 2.6 MeV gamma rays!) for its useful optical properties of high refractive index and low dispersion.

Fig 14. The Aero-Ektar camera on the Dallmeyer mount in the Wind Tower in the early 1960s (Photo: Greg Roberts).

The camera still exists in a junk room at SAAO, as do parts of the Dallmeyer mount. A few 16 cm x 16 cm photographic plates labeled “Wind Tower”, dating from 1960-61, have been found in the SAAO Archives.

In 1965 (Anon, 1965) it was discovered that the wooden stairs were badly affected by “beetle” or woodworm. Although repairs to the building were started, in August Richard Stoy (1910–1994), the HM Astronomer at the time, stopped the work and decided to demolish it.

The dome was used afterwards for a small telescope belonging to the Cape Centre of the Astronomical Society of South Africa. When this building was demolished it was purchased by an amateur, Mr Rainer Noack, who still owned it up to his recent death.

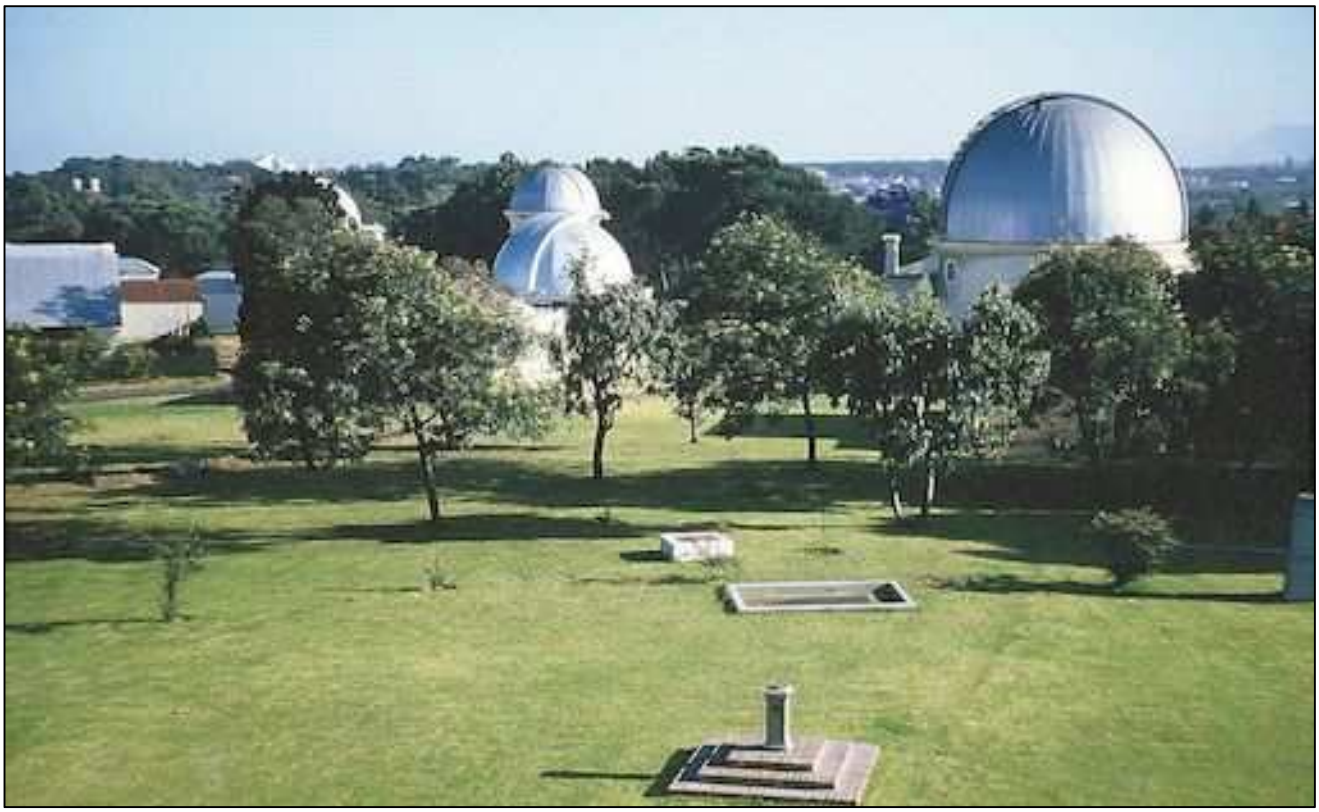


Fig 14. Last known photograph of the Wind Tower before its demolition, in the early 1960s, looking southwards. From left to right the domes are the Astrographic (largely hidden by a tree), the Wind Tower with the Steavenson 30-inch (0.75m) reflector in front of it and the McClean (Photo: Greg Roberts).

Acknowledgement

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