

The South African Astronomical Observatory

A treasure house of history and biodiversity

By Penny Mustart, and Gavin W. Maneveldt, Department of Biodiversity & Conservation Biology, University of the Western Cape



The entrance to the South African Astronomical Observatory in Cape Town. Photo: Gavin Maneveldt.

Founded in 1820, at the convergence of the Black (Salt) and Liesbeek Rivers, the Royal Observatory Cape of Good Hope, today known as the South African Astronomical Observatory (SAAO), became the first scientific institute in sub-Saharan Africa. The Observatory, the grounds surrounding it and the associated buildings that have sprung up over the past 180 or so years, are paid scant attention by urban passers-by as they speed through the suburb of Observatory in Cape Town. Yet, delving into the history of its establishment reveals a wealth of historical and botanical findings.

The first Astronomer at the Cape, the Reverend Fearon Fallows, was instructed to choose a suitable, dust-free site within close proximity of, and in direct line of sight of, Table Bay so as to pass on accurate visual time signals to ships anchored in the bay. The location also needed to be sufficiently east of Table Mountain so as to have a clear view of the sky. After investigating the (dust-free) Tygerberg hill, it was deemed unsuitable as it was prone to mists. The current site was chosen as it fulfilled most of the requirements, and also due to accessibility of water from the nearby Liesbeek and Black (Salt) rivers. It was described as 'stony' with 'wild brushwood' by the then carpenter of the building operations, Alexander Tait. Fallows reported that 'whilst we were digging for the foundations among the hard, pot clay an innumerable number of snakes were thrown up by the workmen' giving meaning to the original name of Slangkop (Snake Hill) for the site. The low brushwood referred to might well have been *Renosterbos*, *Elytropappus rhinocerotis* or some other *renosterveld* shrub.

Construction of the Observatory only commenced in 1825 and it became operational in October 1828. Anecdotes, related by astronomer David Gill who directed the Observatory 50 years after Fallows, give it that Reverend Fallows established a school for children from the neighbouring farms. The 'tuition fee' asked of each farmer was one load of soil per lesson. It is assumed that this soil was used for vegetable gardens near the main building which housed telescopes in the central

domain, and staff in the east and west wings. On application to the Admiralty for financing to plant trees for protection from the ferocious south-easterly winds, Fallows was told to 'beautify it himself'. In 1835 an assistant to astronomer Thomas Maclear was appointed – hence the arrival of sixteen year old Charles Piazzi Smyth from England. This intrepid and hard working (up to 18 hours a day) young man confounded the neighbouring farmers' taunts that he would not be able to grow anything on the site due to its paucity of soil – 'little more than a bare whinstone rock, and has not enough soil for the roots of any plant ... it is dry as a brick ... the wind is so violent', they said. Piazzi Smyth constructed a wind-driven pump that supplied a constant stream of water from the Black (Salt) River below to a garden on the east side of the main building. In this way he was able to cultivate a lush garden. Piazzi Smyth writes, 'meanwhile the scanty soil on the top of the hill had been sown with seeds of the *Pinus pinea* and *Pinus pinaster* ... the seedling firs ... rose slowly, but surely against the sweeping wind, which cut the tops as level as a bowling green. When they had reached some little height, a space was cleared in the midst of them, and here was introduced the fountainhead of the windmill pump ... and all the more tender trees of a warm climate – orange, lemon, figs, vines, guava, cypress, myrtle, roses and oaks. Indeed so completely was the character of the hill altered from its dried and windy condition, to its sheltered and watered state now, that bananas, of all trees requiring most water and shelter, grew, and produced fruit. "Almagtig! how is it possible" said one boer. "But then you have water now" said another.' This wondrous garden that Piazzi Smyth created can be seen in one of his photographic calotypes as reproduced in Warner's (1983) book on Piazzi Smyth's period at the Cape. By establishing this garden the ingenious Piazzi Smyth initiated a process of succession whereby the pine saplings provided shelter for later growing plants – in this way facilitating the accumulation of organic material, and to a certain extent the build-up of soil.

The flora

Starting from Fallows's period, it is clear that there was an interest in the bulbous flora of the Observatory site and the surrounding areas. In 1824 a letter by Fallows to his father stated that 'I have this day forwarded two cases of bulbs and seeds indigenous to the Cape ... there are 53 different species of bulbs and fifty of seeds'. Sir John Herschel, a self-financed astronomer, who lived in Wynberg (later to become the suburb of Claremont) from 1834-8, collected, painted and cultivated many bulbous plant species that he found growing at the Cape. In reality, he drew the flowers and his wife, Mary, painted them. *Moraea aristata* is one of such beautiful illustrations and is designated as from Observatory. It is deduced that Sir John observed the species on his visits to his friend and colleague, Thomas Maclear, at the Observatory.

Piazz Smyth describes the ground around the Observatory as being 'gently undulating ... very dry; generally farmed, in the months June, July, August, very green; in September, October partly covered with the multitudes of exquisite wild flowers: rest of the year brown, except where there are trees'. Little escaped his keen eye and mind. He gives a precise description of renosterveld, tallying with our understanding of it today. Piazz Smyth's 'exquisite flowers' would undoubtedly have included species growing in the Observatory property such as *Moraea aristata*. Piazz Smyth's talents also extended to the arts – his collection of sketches includes one of Rhinoster bosch (sic) which he calls *Stoebe rhinocerotis*. At one stage, we read, the wife of astronomer Edward Stone (1870-1879) kept pigs that devoured many of the arum rhizomes as well as numerous bulbs of other plant species.

What do we find on the Observatory site today, and how should it be managed? To confound the issue a recent survey in 2006 describes the site as Cape Winelands Shale Fynbos (with associated large proteoid shrubs). However, historical references to the environment clearly depict a renosterveld landscape with clay-rich soils, and a low, shrubby vegetation. Areas surrounding the site farmed wheat, including the farm of Mr Mostert (of current Mostert's Mill fame). Numerous cattle invaded the site presumably to graze its grassy pasturage. These are further pointers to the site being of renosterveld origin. This apparent error of vegetation-type designation has been rectified in a subsequent survey in 2008 by the City of Cape Town whereby the Observatory's rightful vegetation type is given as mainly Peninsula Shale Renosterveld occurring on Malmesbury Shale substrata. A tongue of sand on the property's eastern flank would have originally supported Cape Flats Sand Fynbos.

The northern and eastern sides of the Observatory property have been altered by land in-fillings during the past 40-50 years in order to prevent flooding of low-lying areas next to the Black River. However, on

the west side is an area that to all appearances is close to the original renosterveld and this area has been set aside as the SAAO's Conservation Area. It is here where the White Peacock Moraea or Blouooguintjie, *Moraea aristata* grows. The common names refer to the beautiful, dark metallic blue nectar guides on each of its three large white tepals, resembling the 'eyes' on a peacock's tail feathers. This geophyte is one of six peacock moraeas, all of which are threatened with extinction, largely because of habitat loss. *Moraea aristata* is an endangered species and is considered one of the rarest plants in South Africa because it is found naturally only within the confines of the Observatory. However, its survival is ensured through cultivation at Kirstenbosch as well as in gardens in Europe, where it is known as *Moraea glaucopsis*, and elsewhere. In parts of Australia it is an invasive weed! Besides *M. aristata*, many other bulbous and herbaceous annuals grow in the observatory's Conservation Area. These include the Viooltjie *Lachenalia mediana*, Blue Satin Flower *Geissorhiza aspera*, Soldier-in-a-box *Albuca canadensis*, Pink Romulea *Romulea hirsuta*, Peacock Flower *Spiloxene capensis*, Grand Duchess Sorrel *Oxalis purpurea*, as well as annuals like Marigold *Ursinea anthemoides* and Cape Rain Daisy *Dimorphotheca pluvialis*.

Unfortunately the Conservation Area is also inundated with alien, annual winter grasses such as Wild Oats *Avena fatua* and Rye Grass *Lolium multiflorum*. Another alien plant competing with the local plants



ABOVE: The rare White Peacock Moraea or Blouooguintjie *Moraea aristata* only occurs naturally in the grounds of the Observatory. BELOW LEFT: Cape Weed or Botterblom *Arctotheca calendula* and Button Daisy *Cotula turbinata*. BELOW: The Peacock Flower *Spiloxene capensis* occurs in both yellow and white forms. Photos: Gavin Maneveldt.





for light and other resources is Tufted Vetch *Vicia cracca*, a legume that sends out tendrils from the tips of its leaves to secure it to other plants, thereby smothering them. SAAO is currently investigating ways of eliminating these problem plants.

The fauna

In addition to the floral diversity, the Observatory grounds are frequented by many faunal species including 59 species of birds, five species of amphibians (Cape Rain Frog, Cape River Frog, Clicking Stream Frog, Common Platanna and Western Leopard Toad) and four species of snakes (Boomslang, Brown Water Snake, Cape Cobra and Slug Eater).

The most popular animal to be associated with the Observatory is the Western Leopard Toad. Originally known as the August or Snoring Toad (suggesting when it is most active and what sounds the males make during mating), this attractive toad is the largest South African toad (females can reach 14 cm in length), is endemic to the fynbos and is currently endangered due to habitat fragmentation. As a consequence, private gardens along the central Western Cape Peninsula have become one of the most important habitats throughout its range. The population at the Observatory represents the northernmost limit of the distribution of this toad and for various human-made reasons, notably the construction of the M3, this population is now completely separated from the southern populations. This toad bears two bronzy-red parotids or poison glands, one behind each eye and is poisonous to small animals, but not to large animals and humans.

Another tailless amphibian that is currently vulnerable due to habitat fragmentation and loss is the Cape Rain Frog or Giant Rain Frog, which is endemic to the south Western Cape. Rain frogs are unusual because unlike other frogs they spend most of their lives underground, only coming to the surface during rainy periods. Male Cape Rain Frogs are very much smaller than females and have

a unique mating behaviour to overcome this size variation. In order to hold on to the female, the male secretes a sticky substance from his belly and this glues him to her back. Rain frogs are unable to swim and so lay their eggs in special underground burrows in which their young develop directly from the eggs into perfectly formed baby frogs – there is no tadpole stage. In defence, when disturbed, rain frogs inflate their bodies; this behaviour makes them appear larger and menacing to would-be predators.

The future

To gain a better understand of the role of the Observatory in preserving biodiversity, it is important to place it and South Africa within the context of global biodiversity. After Indonesia and Brazil, South Africa is the most biologically diverse country in the world. While occupying less than 1% of the world's total land area, South Africa is home to about 10% of the world's plant, 5% of the world's reptile, 8% of the world's bird, 6% of the world's mammal, and an astonishing 33% of the world's tortoise species. Despite these attributes, South Africa has more than 1800 plant species threatened with extinction, the second highest number in the world. As Cape Town has expanded over the past two centuries, the natural veld, with its associated wildlife, has shrunk to occur in patches between suburban areas, factories and farm land. Today public open spaces represent important areas where indigenous plants and wild animals can flourish. The Observatory is therefore an important refuge for many remnants of our biological diversity. 🌿

READING:

Historical events were sourced from some of the many books written by Brian Warner, and are included below:
 Goldblatt, B. 1986. The moraeas of southern Africa. *Annals of Kirstenbosch Botanic Gardens*. Vol 14.
 Warner, B. 1979. *Astronomers of the Royal Observatory Cape of Good Hope*. Balkema, Cape Town.
 Warner, B. 1983. *Charles Piazzi Smyth. Astronomer-*

ABOVE LEFT: A juvenile Western Leopard Toad (45 mm) with characteristic large brown patches on a yellow background. Note the poison gland behind each eye.

Photo: Gavin Maneveldt.

ABOVE: The Beetle Lily *Baeometra uniflora* growing in the grounds of the Observatory. Photo: Gavin Maneveldt.

BELOW: The appearance of tall clusters of leafless flower stalks of the March Lily *Amaryllis belladonna* is a clear reminder of the approaching autumn. Photo: Gavin Maneveldt.

BELOW CENTRE: A female Giant Rain Frog with its mottled surface, inflated body and grumpy appearance. These little frogs are well camouflaged in their natural habitat.

Photo: Alan Channing.

BOTTOM: *Sparaxis villosa* occurs naturally in the grounds.

Photo: Gavin Maneveldt.



Artist. *His Cape Years 1835-1845*. Balkema, Cape Town.

Warner, B. & Rourke, J. 1998. *Flora Herschelliana. Sir John and Lady Herschel at the Cape 1834 -1838*. The Brenthurst Press, Johannesburg.

ACKNOWLEDGEMENTS

Anne Charles, Joe-Mark Lippert, Noel Miller and Brian Warner.

GET CONNECTED

Penny Mustart has a PhD in botany, and is a freelance botanist who is involved in various research projects, and is currently assisting the SAAO in developing a management plan for the conservation area. She has a special interest in making botany accessible to all, and is a member of the *Veld & Flora* Committee. She can be contacted at email: Mustart@telkomsa.net.

Gavin W. Maneveldt is Associate Professor of Biodiversity & Conservation Biology at the University of the Western Cape. His love of nature and interests in the outdoors has been the basis for his academic career. Gavin is committed and actively involved in environmental education and is passionate about biodiversity issues. He can be contacted at email: gmaneveldt@uwc.ac.za.

WHAT DOES THAT MEAN?

Renosterveld is an evergreen, fire-prone shrubland of the Fynbos Biome dominated by small, cupressoid-leaved, asteraceous shrubs (predominantly *Elytropappus rhinocerotis*) with an understorey of grasses and a high biomass and diversity of geophytes (principally Iridaceae, Amaryllidaceae and Hyacinthaceae).



TOP: Lady's Hand *Cyanella hyacinthoides*.

ABOVE: Grand Duchess Sorrel *Oxalis purpurea* is one of the largest of our indigenous sorrels.

LEFT: *Watsonia spectabilis*, one of many indigenous bulbs that occur in the grounds.

BELOW: Originally used as feed for cattle, Tufted Vetch *Vicia cracca* is now an invasive weed.

Photos: Gavin Maneveldt.

