

Gardenwise



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The iconic Swan Lake Gazebo in the morning sun at the Singapore Botanic Gardens.
(Photo credit: Benjamin Aw)

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Message from the Director

We opened the refreshed Heritage Museum on 25 Jun 2023. After more than a year of working on the project, the project team comprising colleagues from all branches of the Gardens is pleased to showcase a revamped Museum that presents a richer and more comprehensive account of the Gardens' history, its contributions to the social, environmental and economic history of Singapore, and its continued relevance to the development of Singapore. Given the significant contributions of the Gardens to the greening of Singapore, it is also timely that we opened the refreshed museum in 2023 to mark the 60th anniversary of the greening in Singapore. This comes ten years following the opening of the museum in 2013 to celebrate the 50th anniversary of the greening of Singapore.

Why did we initiate this Museum revamp? Beyond the obvious points—much has taken place over the past decade that should be incorporated into the museum contents, including our UNESCO World Heritage Site listing, additions of new facilities and amenities such as Tyersall-Gallop Core, Seed Bank, Ethnobotany Centre and Garden, etc—enhancing our interpretation of the history of the Gardens to visitors, stakeholders and even our staff serves several aims.

First, understanding our history reminds us of our responsibility to ensure that the Gardens continues to be one of the great botanic gardens in the world. Having a long history does not guarantee greatness or continued relevance, as there are numerous examples of botanical gardens, heritage gardens, historical buildings and artefacts that have faded into oblivion worldwide. History, or more specifically an interpretation of our past, is an important means for us to convey the Gardens' achievements, its trials and tribulations, and why its work is important to society and, in broader terms, to humanity. Having a museum dedicated to telling the Gardens' story through refreshed and interactive interpretations is a powerful way to reach out to our visitors and stakeholders with the message that this legacy can be lost if not constantly remembered and nurtured.

Second, the Gardens' history is a rich source of contents and context for reflective practice, a process of reflecting on our thoughts and actions to bring about learning and development from the personal to the organisational level. Narrating the Gardens' history through interpretations brings these to bear. For instance, we learn from our archives and accounts of our history of Henry Ridley's constant struggle with the Gardens' management committee and the colonial government on the directions



and resourcing for the Gardens' work more than a hundred years ago. As the Gardens' first director, Ridley openly clashed with administrators on the mismanagement of Singapore's Forest Reserves and the lack of resources for the Gardens' scientific mission, for which he has accorded a primacy role among others. I submit that these clashes, misalignment of vision and struggle with resources have been repeated throughout our history since Ridley's directorship. In other words, these issues do not disappear but resurface in different forms and under different contexts as perpetual challenges. As a learning organisation, we should and can draw from past episodes and experiences to manage them. It is also clear that in looking back, the Gardens' first transformation happened when it began to focus on botanical studies, and it grew in stature as a respected botanical institution because of its sustained contributions to science. Our scientific work must thus continue, but history tells us that we will falter if we fail to recognise that sustaining this endeavour is totally dependent on our ability to engage and communicate with our stakeholders. Our history is thus our reference book if we study it wisely.

Third, history serves to inspire. The Gardens has been blessed with numerous illustrious individuals and staff who quietly did their work, all of whom had served with dedication and distinction. Together, they have made the Gardens an internationally recognised botanical institution and one of the most beautiful botanic gardens in the world. Bringing these people to life in the Museum reminds us of who they are and what they did, and encourages us to question why they have dedicated their careers to the Gardens. In fact, the dedication of our staff to the Gardens has not changed much over our history. Most, if not all, of the Gardens'

staff do not see their work as just a regular job, but as work they believe in and enjoy. Recognising some of these individuals and the collective work of the Gardens in the Heritage Museum will hopefully inspire our staff and motivate more people to join our ranks. Therefore, our history not only links us to the past, but also casts a common identity for everyone who has worked here, in the past, present and future.

It is for these reasons that I have explained to the team undertaking the refresh of the Heritage Museum that their task is an important one for the Gardens. The Museum is much more than just a place to look into the past—if we are wise in using it, it will guide us to shape the future. I hope that our visitors will learn from their visits to the Museum.

Although this is only recent history, it is also proper that we also pay tribute to Mr Kenneth Er, former CEO of the National Parks Board who after a very successful nine years helming the organisation, has taken up a new position at the Ministry of National Development HQ on 1 June 2023. A firm believer in the importance of the Gardens to Singapore, Kenneth has supported and guided the expansion of the Gardens' space and scientific work with remarkable outcomes. An accomplished ecologist, he has personally guided our young scientists to complete several innovative and exciting research projects on our native flora. The Gardens thanks him wholeheartedly for his care, guidance and contributions.

Tan Puay Yok
Group Director
Singapore Botanic Gardens

Revisiting the history of the iconic Swan Lake Gazebo

The cast iron Gazebo overlooking Swan Lake is a familiar sight to visitors and forms an integral part of the Gardens' heritage. Initially thought to have originated from the 1850s, a plan drawing of the Gazebo found recently in the National Archives of Singapore suggests the mid-1900s instead.

The Admiralty House off Grange Road

The gazebo was first mentioned in the Gardens' 1969 Annual Report as "transferred from the old Admiralty House in Grange Road" to its new location "in front of the Orchid Enclosure", where an old summer house once stood. The Admiralty House at Grange Road is not to be confused with the other Admiralty House at Old Nelson Road, which still exists in Sembawang, north of Singapore. The former was demolished around 1970–1971 to make way for Raffles Institution's then-new campus, now a premise belonging to the Ministry of Education.

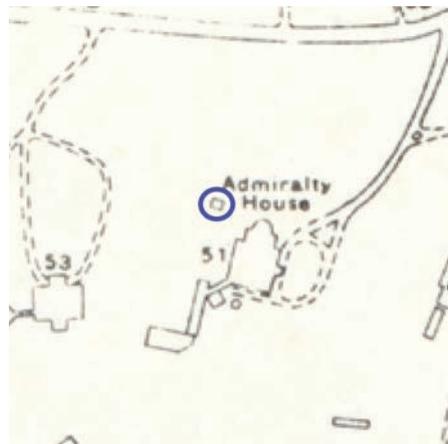
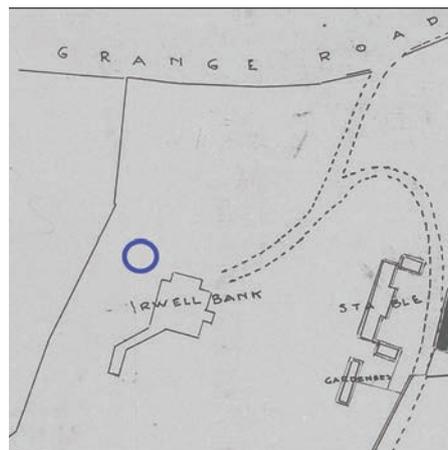
A search through Singapore's newspaper archive indicates that the old Admiralty House in Grange Road was likely a guest house and an official residence since 1946 for high-ranking Royal Navy Officers (Rear Admiral or Admiral; hence its name "Admiralty House"). The Royal Navy likely continued to occupy the ground after the Second World War with numerous social events organised there, including fundraising events by welfare organisations and hosting of visiting British dignitaries to garden parties and receptions. A Straits Times article dated 12 Sep 1948 mentions a naval flag hoisted at the address "Admiralty House, Irwell Bank, 51 Grange Road", confirming that the Admiralty House also went by the alternative name "Irwell Bank". This alternative name appears in pre-war maps of the area. An oral interview examined at the National Archives of Singapore of the former Curator of the Gardens, George Alphonso, reveals that the Japanese field marshal, Count Hisaichi Terauchi, occupied this property during the Second World War. A handover of the

house to the British forces after the war likely explains how the Royal Navy became the eventual occupants.

The Irwell Bank property

A map of Singapore Residency dated around 1860 recorded Irwell Bank as a property occupied by a person named J. Young. As the property was owned by the well-known European mercantile firm Boustead & Co., the occupant of Irwell Bank was likely Jasper Young, one of the company's senior partners. In 1872, Young was one of the committee members of the Agri-Horticultural Society, which operated the private garden that eventually became the foundation of

the Singapore Botanic Gardens today. Later, newspaper records and colonial government gazettes indicate that the property was occupied until 1883 by various clerks, merchants and partners of Boustead & Co. Then it changed hands several times amongst wealthy business owners in Singapore until around 1911, purchased by the Jewish entrepreneur Joseph A. Elias. As Elias was a racehorse owner, he built stables and coach houses on Irwell Bank, which was well suited when it was used as a riding school for children by F.L. Harding in 1935. An eviction notice issued to the Harding family in 1940 and later mentions of interest by the Royal Air Force to acquire the property in 1937 in the newspapers indicated



(Clockwise from top left): The 1911 site plan of Irwell Bank shows no gazebo in the property and as a square building with rectangular extruded north- and east-facing facades before a semicircular structure was added to the north-facing balcony. A dark blue circle indicates the likely position of the gazebo in comparison to subsequent drawings and maps; The circa 1930s town map showing Irwell Bank and the gazebo (indicated in dark blue circle); 1957 aerial photo showing the Gazebo (in dark blue circle); The 1958 town map showing the Admiralty House off Grange Road and the gazebo (in dark blue circle). ((top left & top right) courtesy of the National Archives of Singapore. Town map reproduced with permission from the Singapore Land Authority; (bottom left) © Urban Redevelopment Authority. All rights reserved; (bottom right) courtesy of the National Archives of Singapore. Crown copyright.)

that Elias still owned Irwell Bank until at least before the Second World War. By 1946, Irwell Bank was used (and thus likely acquired) by the Royal Navy as the residence of the Flag Officer (Malaya) Rear Admiral H.J. Egerton and hence the “Admiralty House” at Grange Road.

The earliest known building plan of the property is dated 8 May 1911 with the title *Proposed Balcony to [the] North Side of Irwell Bank Residence*. Comparisons between building plans and maps published subsequently confirm the north-facing balcony as semi-circular after the 1911 alteration. The east-facing balcony remained rectangular throughout, and no gazebo existed in the north-western part of the property in 1911, but it was present later. Based on the evidence gathered and examined, the gazebo appeared on the property between 1911 and 1930.

Records and Plan Drawings of the Swan Lake Gazebo

This gazebo first appears in photographs of the Admiralty Building off Grange Road from the 1960s, when funfairs were held at its compound to raise funds for the Spastic Children’s Association of Singapore. The gazebo was situated at the northwest corner of the main building.

An extensive search through historical building plans in the National Archives of Singapore yielded only two drawing plans that illustrate the same gazebo design dating back to August 1906, much later than the initially presumed date of the 1850s. These two drawings were prepared nine days apart by the firm Tomlinson & Lermit (Engineers, Architects, Surveyors and Valuation), which was run by Samuel Tomlinson and Alfred Lermit. The latter was a

Ceylonese surveyor who was active in municipal matters then, while the former was the municipal engineer for Singapore before May 1904.

The first plan drawing was titled *Proposed Kiosk for N. Reuben at 105-E Orchard Road*, located around present-day Lucky Plaza along Orchard Road. The name “N. Reuben” likely suggests Nassim Reuben, a broker of the firm Reuben & Guston, which was dissolved in 1914. In the same year the firm was dissolved, auctions of items in his home were advertised in the *Singapore Free Press and Mercantile Advertiser* on 24 April 1914. In Nassim Reuben’s obituary article dated 3 October 1935, published in *Straits Budget*, he was described as “one of the leaders of the local Jewish and business communities”. The second plan drawing, *Proposed Kiosk for N.N. Adis (Nassim Nissim Adis)*, was commissioned by Nassim



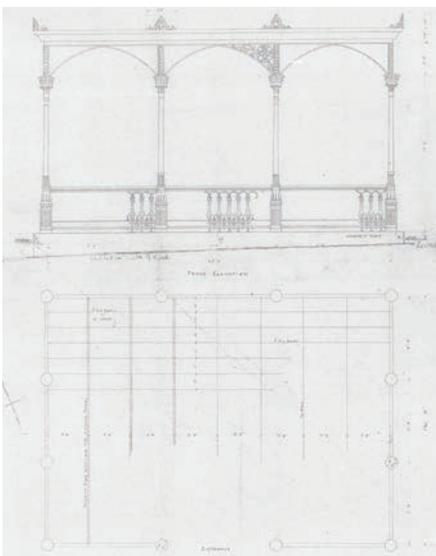
(Left) The gazebo (indicated in red square) at the Old Admiralty House was given a makeshift roof, seen in this photo on 30 Mar 1968 at an event held on its grounds. (Right) A sliver of the gazebo is visible in the distant top left corner, seen in this photo of former President of Singapore Yusof Ishak standing at the north-facing balcony, delivering his speech during the opening of “Wonderland Fun Fair” at the Admiralty House on 26 Mar 1966. (Courtesy of the National Archives of Singapore)



The Admiralty House off Grange Road in 1968. (Left) Unlike the north-facing balcony, the east-facing balcony (to the left of the photo) was rectangular and faced a porched driveway instead of a lawn. (Right) The semicircular north-facing balcony in which former President of Singapore Yusof Ishak delivered his speech during the opening of “Wonderland Fun Fair” in 1966. The east-facing balcony is to the far left of the photo. (From the Lee Kip Lin Collection. All Rights Reserved. Lee Kip Lin and National Library Board, Singapore 2009).



The cast iron gazebo, later known as the Swan Lake Gazebo, seen at the old Admiralty House off Grange Road in 1968 before it was moved to the Botanic Gardens in 1969. (Left) The gazebo is seen here with a single entrance and terminal motifs along the eaves above each column. It had no roof, as the background is partly visible through the vine-laden cross beams. (Right) A close-up view of the ornate railing of the Gazebo. (From the Lee Kip Lin Collection. All Rights Reserved. Lee Kip Lin and National Library Board Singapore 2009)



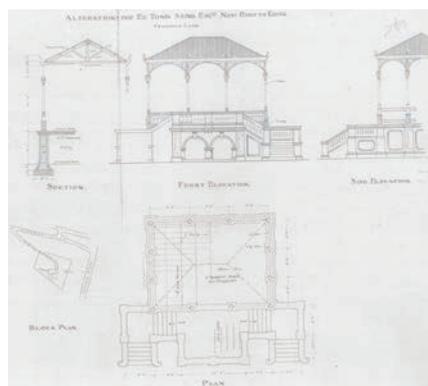
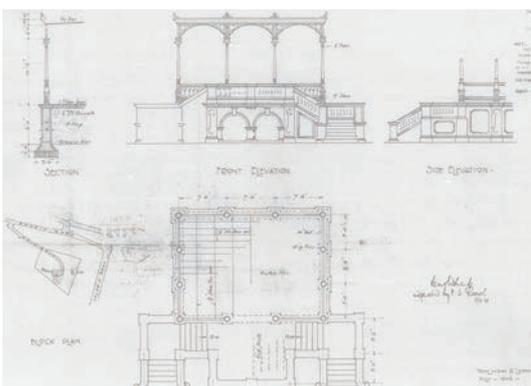
The building plan of the proposed kiosk (gazebo) for N. (likely Nassim) Reuben prepared by Tomlinson & Lermitt in 1906. The measurements on the plan drawing match the current measurements of the Swan Lake Gazebo: columns length spacing 7'4" (2.23 m) apart and breadthwise 5'4" (1.625 m) apart. In addition, it also matches the Swan Lake Gazebo based on its rectangular floor profile and lack of a hip roof. (Building Plan 8442/1906 from the National Archives of Singapore)

Nissim Adis for his residence, Adis Lodge, at Mount Sophia. It was built opposite the southeastern facade of the building based on the matching footprint to a map dated 1911. The gazebo was subsequently roofed in 1913. Later, Adis Lodge was sold to Eu Tong Sen, and it was demolished to make way for Eu Villa in 1914. In a drainage plan of Eu Villa dated 1916, the location where the gazebo once stood had converted into a lawn, indeed confirming it was dismantled during or soon after Eu Villa was built.

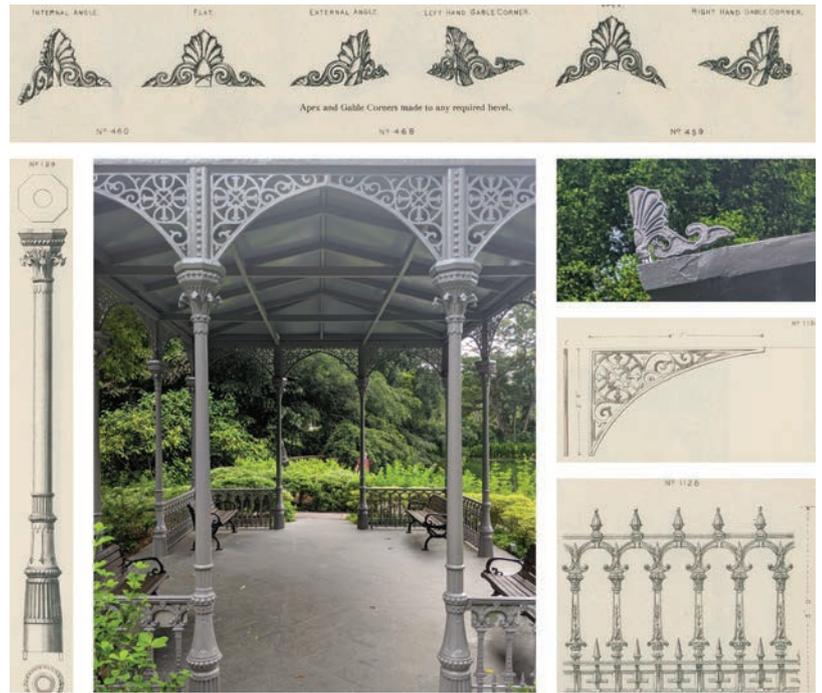
Of the two gazebos, the one at 105-E Orchard Road is likely the potential candidate transferred to Irwell Bank, based on the similar foundation construction and floor shape. Identical to this gazebo, the Swan Lake Gazebo initially lacked a permanent roof. It was only added around the late 1990s when it was moved from its old location, at the edge of the Gardens' rainforest opposite the Orchid Enclosure, to the present in the Gardens. In April 1914, newspaper advertisements were put up to sell items from Nassim Reuben's property, and the gazebo may have been sold to Joseph Elias during that time. A proposition for the gazebo may likely have occurred between them before the auction, considering the two families were close. Newspaper articles published in *The Singapore Free Press and Mercantile Advertiser* and *the Straits Budget* of an Elias family wedding held at Irwell Bank on 29 March 1914 were attended by the Reubens. In addition, 105-E Orchard Road also turns out to be relatively near the old Admiralty House at 51 Grange Road, facilitating a much easier translocation of the gazebo.

MacFarlane Design Motifs of the Swan Lake Gazebo

The illustrious Scottish foundry MacFarlane & Co. supplied much of its ironwork throughout the colonies in the British colonial period. Apart from standard designs offered in the *Illustrated Catalogue of MacFarlane's Castings*, customisation options were also provided upon request. The Swan Lake Gazebo is most likely a customised design with slight modifications by MacFarlane & Co., with its railings, roof terminal, pillar and arch motifs matching those offered in the catalogue from 1882. Besides, the column motifs of the Swan Lake Gazebo are similar to the column motifs of the Pumping Station

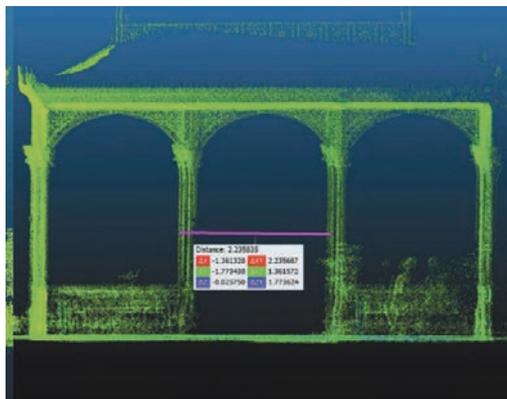
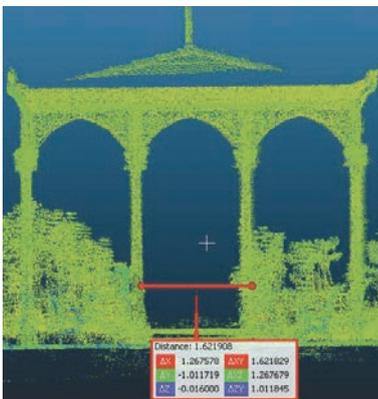


(Left) The plan drawing shows a proposed kiosk (gazebo) for Adis Lodge dated 22 Aug 1906. An annotation at the bottom right indicates this kiosk was found to be demolished when it was inspected on 7 Nov 1931. (Right) The 1913 plan drawing shows the later addition of a roof after the property had been bought by Eu Tong Sen. However, this design did not match the Gazebo at Irwell Bank, which had no roof. ((Left) Building Plan 8424/1906 and (right) Building Plan 961-1/1913, both from National Archives of Singapore)



The likely journey that the gazebo from 105-E Orchard Road (present-day Lucky Plaza) would have taken to Irwell Bank (present-day Ministry of Education premise at Grange Road) visualised on the 1957 aerial photo taken by the British Royal Air Force. (Courtesy of the National Archives of Singapore. Crown copyright.)

A collage of the Swan Lake Gazebo juxtaposed with their corresponding designs in the 6th edition of the Illustrated Catalogue of MacFarlane's Castings published in 1882. (Photo credit: Edmund Chia; Images from the catalogue courtesy of Public Domain)



LiDAR scans of the Gazebo from 2017, showing the distances between pillars along and across the Gazebo, which match the plan drawing lengths 7'4" (2.235 m) and widths 5'4" (1.625 m) of the kiosks (gazebos) at Adis Lodge and 105-E Orchard Road. (Photo credits: Edmund Chia)

The cast iron railing at the Plant House. (Photo credit: Tan Wan Xin)

at MacRitchie Reservoir, which the latter was reported in newspapers as a MacFarlane design. In addition, the Swan Lake Gazebo also shares the same railing design of bandstands made by MacFarlane & Co.'s foundry seen in Buenos Aires Zoo (EcoParque) in Argentina and John F. Kennedy Park in County Cork, Ireland.

Conclusion

While the transfer of the gazebo to the old Admiralty House will likely be unknown for now, the likely candidate

identified is the one from the Nassim Reuben property (105-E Orchard Road) that shares similar foundation construction, floor shape and non-roofed design. The design of the Swan Lake Gazebo was by Tomlinson & Lermitt in 1906, and it was the product of MacFarlane's Foundry based on matching designs found in the 1882 catalogue and similarities it shares with other architectural ironworks of MacFarlane's elsewhere. The origins of the Swan Lake Gazebo remain less of a mystery now, and while it was a product of Victorian ornamental cast ironwork (that began in the 1850s), this gazebo likely dates somewhat later

to 1906. Another MacFarlane's product in the Gardens is the cast iron fence at the Plant House (see *Gardenwise* 58, page 13).

Edmund Chia
Living Collections

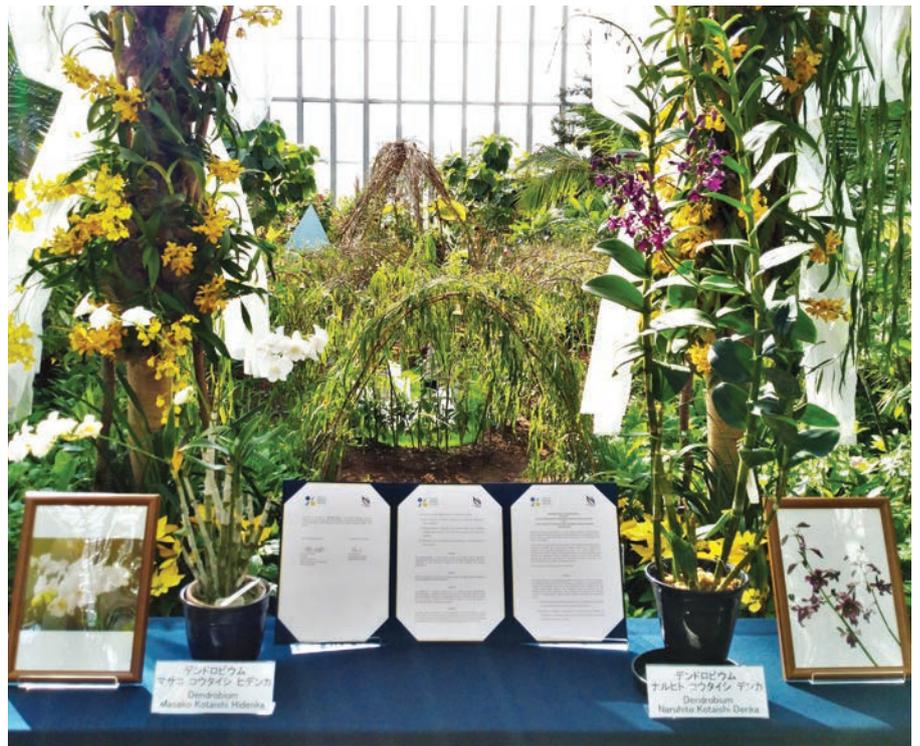
The author would like to thank Mr Teo Chan Seng for information about the relocation of the gazebo to Swan Lake and later modifications.

Forging New Ties and Strengthening Old Ones: Singapore Botanic Gardens signs an MOU with Japan's Awaji Greenhouse



Singapore Ambassador to Japan, Mr Peter Tan (Third from left), with (From left to right) Mr Hiroyuki Kamei (Executive Director of Branch Office of Hyogo Prefectural Government), Mr Junichi Inada (former Director of Awaji Greenhouse), Mr Yasuhiko Kado (Mayor of Awaji City), Mr Kouichi Ishii (former Director of Hyogo Prefecture Horticulture and Parks Association), Mr Yoshinobu Takimoto (Director of Awaji Greenhouse), and Ms Eri Imose (Assistant Director of Awaji Greenhouse) at the Awaji Orchid Festival 2021. (Photo credit: Eri Imose)

The Singapore Botanic Gardens signed a Memorandum-of-Understanding (MOU) with Awaji Greenhouse, a unit part of Japan's Hyogo Prefectural Horticulture and Parks Association, in October last year. Awaji Greenhouse, which opened in 2000, is one of Japan's largest greenhouses and features multiple thematically curated areas with various tropical and subtropical plants. It also hosts changing plant displays and international flower exhibitions. The Singapore Botanic Gardens has deep historical ties with Awaji Greenhouse that can be traced back to its sister garden, the Hyogo Prefectural Flower Centre, with whom a collaboration agreement between the two botanical institutions has been in effect since 1980. Moreover, Awaji Greenhouse's director from 2021 to 2022, the late Mr Junichi Inada, had close working ties with the Botanic Gardens, having played a role in the redevelopment and landscaping of the gardens during his tenure with the National Parks Board, Singapore, from the 1980s to 1990s.



The signed MOU was displayed alongside *Dendrobium Naruhito Kotaishi Denka* (Right) and *Dendrobium Masako Kotaishi Hidenka* (Left) during the official ceremony in 2022. (Photo credit: Eri Imose)



A display featuring the historical ties between the Botanic Gardens and Awaji Greenhouse alongside the Singapore and Japan flags. (Photo credit: Eri Imose)

The idea for a collaboration between the Singapore Botanic Gardens and Awaji Greenhouse was seeded by the former Ambassador of Singapore to Japan, His Excellency Mr Peter Tan, during his visit to the Awaji Orchid Festival in 2021. The proposal was further explored when the Hyogo Prefectural Horticulture and Parks Association Chairman visited Singapore to attend the Singapore Garden Festival in 2022. The newly signed MOU covers the exchange of horticultural practices, staff attachments and plant exchanges to promote mutual understanding and

strengthen both institutions' research and education capabilities.

In November 2022, an official ceremony was held in Japan to exchange the signed MOU agreements between the two institutions. Professor Tan Puay Yok (Director of Singapore Botanic Gardens) and Ms Whang Lay Keng (Curator of the National Orchid Garden) attended the ceremony, in which they presented Awaji Greenhouse with a VIP orchid, *Dendrobium* Naruhito Kotaishi Denka. This VIP orchid was brought specially



A showcase of the genetically engineered *Phalaenopsis* Blue Gene '311NR' at the Awaji Orchid Festival 2023. A team of researchers from Chiba University, Japan, developed the unique flowers through genetic recombination technology using the genes of the Asiatic dayflower (*Commelina communis*). (Photo credit: Eri Imose)

to Japan to be exhibited alongside *Dendrobium* Masako Kotaishi Hidenka, another VIP orchid gifted earlier to the Hyogo Prefectural Flower Centre. The Botanic Gardens named the VIP orchid pair in 1993 to commemorate the marriage of Emperor Naruhito and Empress Masako of Japan, then Crown Prince and Princess respectively.

The Awaji Orchid Festival 2023 was held at Awaji Green Hall from 21 January to 12 March 2023. The festival was warmly received and a great success, with the weekend footfall surpassing 500 visitors daily. To support the Orchid Festival, 80 orchids from the National Orchid Garden, comprising Singapore Botanic Gardens' hybrids and Singapore's heritage orchids, were gifted to Awaji Greenhouse. Visitors were treated to stunning displays of orchids from Asia and beyond, including a specially curated display using orchids from the National Orchid Garden to recreate the look and feel of Singapore's vibrant tropical orchid garden.



The specially curated display of orchids at the Awaji Orchid Festival 2023 features a replica of the National Orchid Garden sign (Top) and orchids from Singapore, including the National Orchid Garden. (Photo credits: Eri Imose)

Whang Lay Keng
Rachel Tan
National Orchid Garden

Rainforest Remedies: An Exhibition at the Centre for Ethnobotany

Humans have been using plants as medicines since prehistoric times. Archaeological evidence suggests that plants have been used for healing since the Palaeolithic age, while there are written herbal remedies from about 5,000 years ago.

Today, plants are some of the most important natural sources for the discovery of new medicines. Knowledge obtained from the rich human history of phytomedicines and herbal remedies can guide the selection of plant materials for research and development. Compared to other organisms, plants are relatively easy to collect and analyse. Plants synthesise chemical compounds known as secondary metabolites for their growth, reproduction and defence. These secondary metabolites have biological effects on animals and humans, and form the scientific basis for many traditional remedies. For example, since many secondary metabolites protect plants from pathogens, they often have anti-bacterial, anti-fungal and anti-viral properties.

It has been estimated that at least half of the world's known plant species are found in tropical rainforests. Many of our modern medicines have their origins in rainforest plants, with well-known examples from South America being quinine, obtained from trees of *Cinchona* species and used in the treatment of malaria, and tubocurarine, a muscle relaxant from the liana *Chondrodendron tomentosum*.

The traditional medicinal uses of plant species from the rainforests of Southeast Asia have been recorded in works such as those of I.H. Burkill, including *The Medical Book of Malayan Medicine*, *Malay Village Medicine* and *A Dictionary of the Economic Products of the Malay Peninsula*. For some of these species, further explorations in pharmaceutical and drug discovery research have shown that they have the potential for development into modern medicines that can be used to treat a variety of illnesses.

Trees of *Calophyllum* species (*bintangor* in Malay; Calophyllaceae)

are sometimes used as timber for house and shipbuilding. They are rich in secondary metabolites such as xanthenes, steroids and terpenes, while some species also contain compounds that have shown potential for treating AIDS. The leaves and twigs of *Calophyllum lanigerum* var. *austrororiaceum* contain calanolide A, a reverse transcriptase inhibitor which stops the replication of the HIV-1 virus. The latex of *Calophyllum teysmannii* is a source of calanolide B, which has similar but less potent anti-HIV activity. *Calophyllum inophyllum* (*penaga laut* in Malay) contains both calanolide A and calanolide B and is associated with many traditional medicinal uses. The leaves and roots have been used to treat sore eyes, heat stroke and headache, while the resin has been applied on wounds. Oil from the seeds has been used in Malay and Indian cultures against rheumatism and in Indonesia and Indochina to treat itch.

Most people are familiar with *Zingiber officinale* (Zingiberaceae),



Native *Calophyllum* species occurring in the Singapore Botanic Gardens Rainforest. (Left) *Calophyllum lanigerum* var. *austrororiaceum*; (Right) *Calophyllum teysmannii*; (Next page) *Calophyllum inophyllum* occurs naturally in coastal areas and is planted in the Eco-Garden and Healing Garden of the Singapore Botanic Gardens. (Photo credits: (left) X.Y. Ng; (right and next page) R.C.J. Lim)



the common ginger widely cultivated for its rhizomes which are used as a spice and in traditional remedies against gastrointestinal discomfort and inflammation. Traditional medicinal uses of other Southeast Asian *Zingiber* species from the rainforests have also been documented. *Zingiber griffithii* (*tepus merah* in Malay), native to primary and old secondary rainforests in Singapore, Malaysia and Thailand, has been used in a traditional cure for asthma. A poultice made from the flowers has been applied onto the head to treat giddiness, while the leaves have been rubbed on the body to treat fever. *Zingiber ottensii* (*lampoyang hitam* in Malay) has unusual rhizomes that are purplish inside with a pungent smell. In traditional medicine, the

rhizomes have been used as a poultice on the body after childbirth and as an ingredient in a sedative lotion. *Zingiber spectabile* (*tepus tanah* in Malay) is a large ornamental species found in Malaysia and Indonesia. The leaves have been used to make a poultice to treat swellings and in a cold-water infusion to treat swollen eyelids. *Zingiber* species contain oleoresins known as gingerols, paradols and shogaols. Gingerols have been shown in laboratory-based studies to have anti-microbial, anti-inflammatory, antioxidant, gastroprotective and anti-cancer properties.

Tacca species (bat flower or Polynesian arrowroot; Taccaceae) are herbaceous plants of the tropical rainforest

understorey. Their large, unusual flowers are ornamental, while the roots contain bitter compounds that have medicinal applications. *Tacca leontopetaloides* (*lukeh* in Malay), a species native to Southeast Asia, was introduced to Austronesia and Polynesia as an important source of starch. In traditional Hawaiian medicine, the tubers are reportedly eaten raw to treat stomach problems, while parts of the plant mixed with water and red clay have been applied on wounds to stop bleeding. *Tacca cristata* (*keladi murai* in Malay) has been used in traditional medicine in Southeast Asia. The pulp of the tubers has been used to treat rashes caused by insects, or applied to snake bites and other external wounds. A decoction



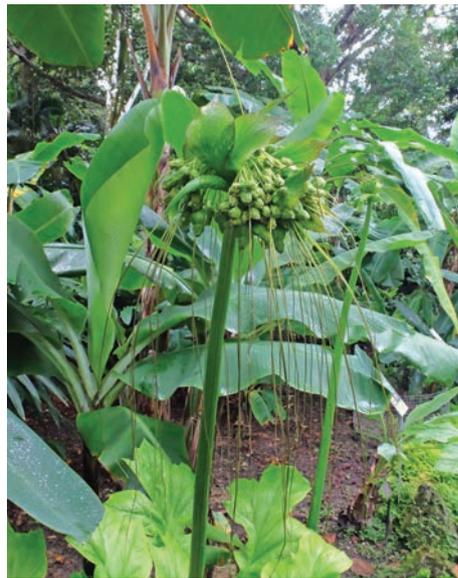
Various *Zingiber* species can be seen in the Singapore Botanic Gardens. (Top left) *Zingiber officinale* and (Top centre) *Zingiber griffithii* can be seen in the Ginger Garden; (Top right) *Zingiber ottensii* is commonly cultivated and used as an ornamental plant, and can be seen in the Ginger Garden and Healing Garden; (Bottom left and right) *Zingiber spectabile* can be seen in the Ginger Garden. (Photo credits: J. Leong-Škorničková)

from the tubers has been used against stomach or menstrual problems, fever and as an aphrodisiac. Moreover, *Tacca* species are a source of taccalonolides, a group of compounds known as microtubule stabilisers that can prevent cancer cell division. Nevertheless, their potential applications in cancer treatment are still under research.

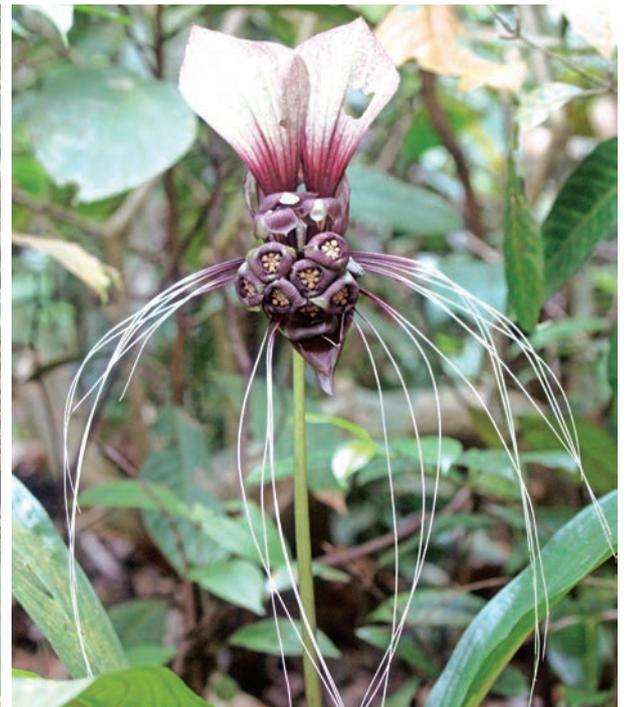
Labisia pumila (*kacip fatimah* or *selusuh fatimah* in Malay; Primulaceae) is a small understory shrub found in

the rainforests of Peninsular Malaysia, Singapore and Borneo. It is well-known for its many traditional medicinal uses related to female reproductive health. A decoction of the roots has been prescribed in the months before giving birth to induce and ease delivery. A decoction of the leaves and roots, often mixed with other plants in a traditional herbal preparation, is drunk as a protective postpartum tonic (such tonics to ward off illnesses after childbirth are known as *ubat*

meroyan in Malay). *Labisia pumila* has also been used to regulate the menstrual cycle and alleviate painful symptoms. The plant has been found to contain many secondary metabolites, including flavonoids, terpenes and steroids. A study has identified other compounds in this plant which have phytoestrogenic activity, acting like the hormone estrogen, therefore providing some support for the beneficial effects of this plant on female reproductive health.



Tacca leontopetaloides is grown in the Ethnobotany Garden, Ginger Garden and Eco-Garden, among other locations in the Singapore Botanic Gardens. (Photo credits: (left and centre) J. Leong-Škorničková; (right) R.C.J. Lim)



Tacca cristata is native to Singapore and can be found in the Bukit Timah Nature Reserve. In the Singapore Botanic Gardens, it can be seen in the Ethnobotany Garden, Jacob Ballas Children's Garden and National Orchid Garden. (Photo credits: X.Y. Ng)

The resins of some plant species also have a significant role in traditional medicine. One such important resin is benzoin, also known as gum benjamin, *kemenyan* (Malay), *sambrani* (Tamil) and *luban* (Arabic). Benzoin is obtained by making incisions in the bark of trees of *Styrax* species (Styracaceae) and allowing

the milky white sap to ooze out and solidify. There are two common kinds of benzoin: benzoin siam (from *S. tonkinensis*) and benzoin sumatra (from *S. benzoin* and *S. paralleloneurus*). Benzoin sumatra is darker in colour and more commonly available in Singapore markets. In traditional Chinese, Indian and

Middle Eastern medicine, benzoin has been used to treat various ailments, including respiratory problems, skin irritations and wounds. Benzoin has a fragrant aroma when burnt, so it is used as incense in churches, and Hindu and Chinese ceremonies. The Chinese incense is known as *an xi xiang*.



Labisia pumila can be found in the Ethnobotany Garden, Healing Garden and Jacob Ballas Children's Garden in the Singapore Botanic Gardens. (Left) Habit; (Right) Close-up of flowers. (Photo credits: X.Y. Ng)

Kapur camphor is a resin from trees of *Dryobalanops aromatica*, *D. beccarii* and *D. lanceolata* (Dipterocarpaceae). It is widely used in traditional medicine to relieve a range of conditions, including burns, cough, headache and rheumatism. It is also used in perfume, incense and food flavourings. In Hindu ceremonies, crystalline *kapur* camphor is ignited, and the flame is offered to deities in the ritual known as *aarathi*. *Kapur* camphor is recorded as one of the earliest economic products of

Southeast Asian rainforests. *Kapur* camphor from Sumatra was traded by Arabs as far back as in the 6th century and was mentioned by Marco Polo in 1299 when it was literally worth its weight in gold. The extraction of *kapur* camphor is destructive to the trees. *Kapur* camphor is first detected by drilling into the trunks of standing trees to look for hollows and then smelling the wood, and the trees must then be felled to obtain the camphor from within as crystals. As the *kapur*

trade has declined in modern times, the trees were protected and managed sustainably for timber production instead. In the early 1970s, much of the *kapur* forests were cleared and converted to plantation agriculture. Consequently, natural *kapur* camphor is rare, and the camphor obtainable from stalls in Little India and Kampung Glam in Singapore is often artificial camphor derived from turpentine.



Styrax benzoin. (Left) Leaves and fruits; (Right) Processed Sumatran benzoin resin from Gombong, Central Java. (Photo credits: (left) X.Y. Ng; (right) Wibowo Djatmiko, permission granted under the CC BY-SA 3.0 license)



Dryobalanops aromatica. (Clockwise from top left) A large tree with spreading buttresses; Close-up of the underside of a leaf; Winged fruits. (Photo credits: (top left) W.F. Ang; (top right and bottom) X.Y. Ng)

If you are keen to learn more about this topic, there is an ongoing exhibition at the Centre for Ethnobotany about the various ways in which plant species from the tropical rainforests of our region and beyond have traditionally been used for medicinal purposes.

Many of these species can be observed in the Singapore Botanic Gardens, such as at the Healing Garden, Ethnobotany Garden and Ginger Garden. This exhibition runs until January 2024. The Centre for Ethnobotany is open daily from 9 am to 6 pm, except for the last

Wednesday of every month. Admission is free, so do stop by on your next visit to the Gardens.

Louise Neo
S.K. Ganesan
 Herbarium & Centre for Ethnobotany

A walk through the changing tropical forest sceneries of Singapore & beyond

T*ropical Forest Sceneries: Singapore & Beyond* was an immersive exhibition that led visitors through the changing forest sceneries in Singapore and its vicinity. This was the first time an exhibition at the Botanical Art Gallery followed a narrative. It was based on a trajectory many forests in the region underwent over time. The exhibition comprised four sections: *Lush Forests*, *Deforestation*, *Naturalists in Action* and *Nature Conservation*. Divided over two rooms on level one of the gallery, one hosted the children's activity corner and *Lush Forests*, while the other featured the remaining three sections.

The journey began with *Lush Forests*, featuring 19th-century sceneries of forest habitats depicted by Austrian diplomat-artist Eugen von Ranssonnet-Villez. Ranssonnet visited Singapore and Johor for seven weeks in 1869. Unlike most European travellers at the time, he was attracted to rural

and forested areas here. With great skill, Ranssonnet drew the sceneries he observed. Upon returning to Austria, he published the drawings as lithographic prints in his travelogue, *Skizzen aus Singapur und Djohor* [Sketches from Singapore and Johor]. Some of the sceneries showcased in the exhibition include freshwater swamp forests, lowland dipterocarp forests, coastal vegetation and forests along the roadside.

An original Ranssonnet print, *Path Across the Swamp (Changi)*, from the Garden's archives was featured in *Lush Forests*, while the rest were reproduced from digital images. The reproductions were hand-coloured by a local artist, Teo Nam Siang, guided by the detailed descriptions in Ranssonnet's travelogue. Where possible, plants featured in Ranssonnet's illustrations were also identified by botanists from the herbarium.

Apart from the Ranssonnet illustrations and other exhibits, this section also incorporated props, banners, as well as floor and wall stickers related to rainforests to create an immersive forest-like experience for visitors. The white marble flooring of the heritage building, which the Gallery occupies, was purposefully fitted with floor stickers featuring prints of brown leaf litter from the Bukit Timah Nature Reserve. This prevented light reflection and enabled visitors to focus on the featured exhibits. The banners featuring images of rainforest trees from Bukit Timah Nature Reserve served as space dividers between the *Lush Forests* section and the children's activity corner. In the latter, dried pendulous male inflorescences of *Plectocomia elongata*, a climbing palm or rattan, collected from the Garden's rainforest hung from the ceiling. At the same time, pandan mats were laid on the floor to enliven the space.

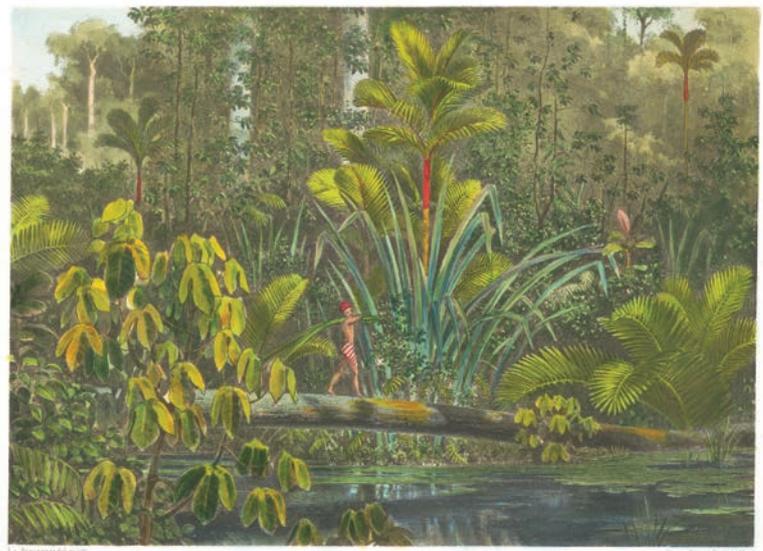


A set of banners featuring rainforest trees from the Bukit Timah Nature Reserve was used to separate the *Lush Forests* section from the children's activity corner.



The children's activity corner was enlivened by the showy inflorescences of the rattan, *Plectocomia elongata*, dangling from the ceiling and pandan floor mats.

These props complement well with the contents of the room. *Plectocomia elongata*, especially its braided hair-like and showy male inflorescences, left a deep impression on Ransonnnet. He went on to illustrate the palm in *Road Near Selita* [Seletar] (Singapore), which was also exhibited in this section. As for the pandan mats, Ransonnnet witnessed the ubiquitous use of table and floor mats woven from Pandanaceae leaves in 19th-century Singapore and Johor. The *Path Across the Swamp* (*Changi*) is a scene set in a freshwater swamp forest with a man depicted navigating across a fallen tree trunk and carrying long pandan leaves on his shoulder.



Weg durch den Sumpf (Tschangji)
Path across the swamp. Sentier à travers le marais.

***Path Across the Swamp* (*Changi*).** An original copy of the coloured lithograph print by Austrian diplomat-artist Eugen von Ransonnnet in the Gardens' archives. It depicts a scene captured in a freshwater swamp forest. (Source: Singapore Botanic Gardens Archives)

The other room featured the remaining three sections, *Deforestation*, *Naturalists in Action* and *Nature Conservation*, with the overall mood slightly different. This room imbued a sense of the beauty and tranquillity of forest landscapes. This was achieved using lighter and brighter paint colours on the wall and background fabric in showcases. Photographs and

paintings of forest landscapes, trees and palms, primarily associated with the exhibition's content, were enlarged to fill the entire length of wall panels and banners.

At the entrance to the room, visitors were greeted by a striking image of a riverine forest, enlarged over four banners, and a showcase. The photo

was taken by renowned botanist and former Assistant Director of the Gardens, Prof. E.J.H. Corner, during one of his numerous field trips in Peninsular Malaysia in the early 1930s. Similar to the experience of walking in the forest, this created a sense of mystery of what lay beyond the banners.



(Left) Pristine riverine forest captured by E.J.H. Corner in the early 1930s. (Right) The image was reproduced on banners and a showcase seen in one of the two rooms. (Source: (left) Singapore Botanic Gardens Archives)

Furthermore, a different exhibition layout was being experimented with at the Gallery for the first time. Instead of having most showcases positioned against the walls, they were aligned with banners in different parts of the room. These banners served as space dividers between sections, creating a flow through the exhibition for visitors. For instance, a set of translucent fabric banners was used to separate the two sections, *Deforestation* and *Nature Conservation*. The banners featured an imposing *Koompassia malaccensis* tree, or *Kempas* in Malay, that once stood at the Liane Road entrance to the Gardens' rainforest, near the Bandstand. The original photograph was also displayed in the showcase featuring the Gardens' rainforest.



A set of translucent fabric banners showing the *Koompassia malaccensis* specimen that once stood in the Gardens (centre) was used to separate the sections *Deforestation* and *Nature Conservation*.

The *Deforestation* section featured numerous illustrations depicting scenes of rainforests being cleared and the utilisation of deforested land. Images of coconut, pineapple, rubber, tobacco and oil palm plantations, mainly of photo postcards and photographs, were mounted on black matt board using photo corners. The postcards exhibited were from the collections of

Mr Lim Kheng Chye, a collector and architect, who donated them to the Gardens in 1994. Instead of the usual white-coloured mounting board used in past exhibitions, the black-coloured mounting board accentuated the features of the photo postcards and monochrome photographs well. With photo corners, no adhesive was applied directly to the artefacts, which helped

to ensure their long-term preservation. Since the postcards and photographs are much thinner than other artefacts, they were brought closer to the surface of the showcase glass so that visitors could have a better view.

Just as the impending loss of forests spurred Ransonnet to record the extant ones pictorially, the scenes of forest



Photo postcards and photographs showing rubber, coconut, pineapple, oil palm and tobacco plantations mounted on black matt board.

destruction also motivated botanists, such as Corner, to document, collect and study as many botanical specimens as possible before they disappeared.

In *Naturalists in Action*, scenes of forest destruction captured by Corner during his field trips were on display. It was not uncommon for botanical collectors to trail behind timber loggers and

collect specimens from trees as they were being felled. This *modus operandi* was especially useful to Corner since his studies focused on rainforest trees and fungi that may not otherwise be easily accessible. Corner's well-known primate field assistants, the *berok* monkeys (*Macaca nemestrina*), also facilitated him to collect herbarium specimens from tall trees without

felling them. As was the case during Corner's time, portraits of his primate collectors continued to be the star attraction for visitors.

Exhibited for the first time was a set of photographs that Corner left behind for his son, John Kay Corner, in a suitcase. These photographs proved challenging to work with as many



A series of photographs showing E.J.H. Corner and his primate field assistants, the *berok* monkeys. (Source: Singapore Botanic Gardens Archives)



One of the showcases featured photographs taken by E.J.H. Corner and orchidologist Cedric Errol Carr showing the beauty and tranquillity of forest landscapes. The eight pictures on the top left corner were from the suitcase Corner left to his son, John Kay Corner.

had been rolled up in the suitcase for years before John Kay Corner donated them to the Gardens. Some were also showing signs of deterioration, known as silver mirroring, and with minor tears. Before putting them up on display, a paper conservator was engaged to flatten, clean, repair and mount the photographs on a matt board.

Overall, Corner's photographs were stunning, with excellent depths of field.

They captured the beauty and grandeur of montane, riverine and lowland dipterocarp forests in Singapore and Peninsular Malaysia in the first half of the 20th century. Many of these forests, along with their beauty and richness in biodiversity, have since disappeared due to human intervention. This starkly reminds us of what we have lost over time and reinforces the need to conserve extant forests. In the last section, *Nature Conservation*, landscape drawings

by the Gardens' last in-house artist, Juraimi bin Samsuri, were featured to demonstrate the changing priorities of tree planting after the Second World War. These drawings are in a set of four panels, but only three were on display due to space constraints. After the Second World War, the government's priorities shifted from planting trees in forest reserves to planting them along roadsides and in parks. Private individuals were also encouraged to plant trees in their gardens.

Unlike in previous decades, studies on plants were no longer confined to identifying and describing new species or researching their economic value. They also included finding the most suitable trees for beautifying the city and providing shade along roadsides. Juraimi's drawings show the relative heights of mature specimens of both native and non-native trees, as well as the shapes of their canopy. Although these drawings were never published, they were probably commissioned to complement the 1963 manual, *A Guide to Tree Planting*, which acted as a tree catalogue issued by the Botanic Gardens' Director. The list of trees recommended for planting in the guide corresponds mostly to those depicted in this set of illustrations. The recommended trees, whose prices are advertised in the manual, were sold to the public at the Gardens' plant nursery.

To promote and attract visitors to visit the exhibition, a set of customised banners and standees were displayed around the Gardens. The illustrations featured on the banners were taken from Ransonnet's travelogue and placed in visually similar landscapes. An example is juxtaposing the illustration of the freshwater swamp forest in Changi against the backdrop of the Keppel Wetlands.

Tropical Forest Sceneries was held at the Botanical Art Gallery from 15 March to 17 September 2023. Most of the 136 artefacts featured in this exhibition belong to the Gardens' library and archives, including a volume of *Herbarium Amboinense* from 1741, to recent drawings by Waiwai Hove, Loh Xiang Yun and Teo Nam Siang. You may download a copy of the exhibition booklet, which includes a selection of the displayed artefacts, here:



Martina Yeo
Michele Rodda
Herbarium & Botanical Art Gallery

All photos by Martina Yeo and Michele Rodda, unless otherwise indicated.



Line drawings showing relative heights of native and non-native trees illustrated by the Gardens' last in-house artist, Juraimi bin Samsuri, displayed vertically in one of the showcases.



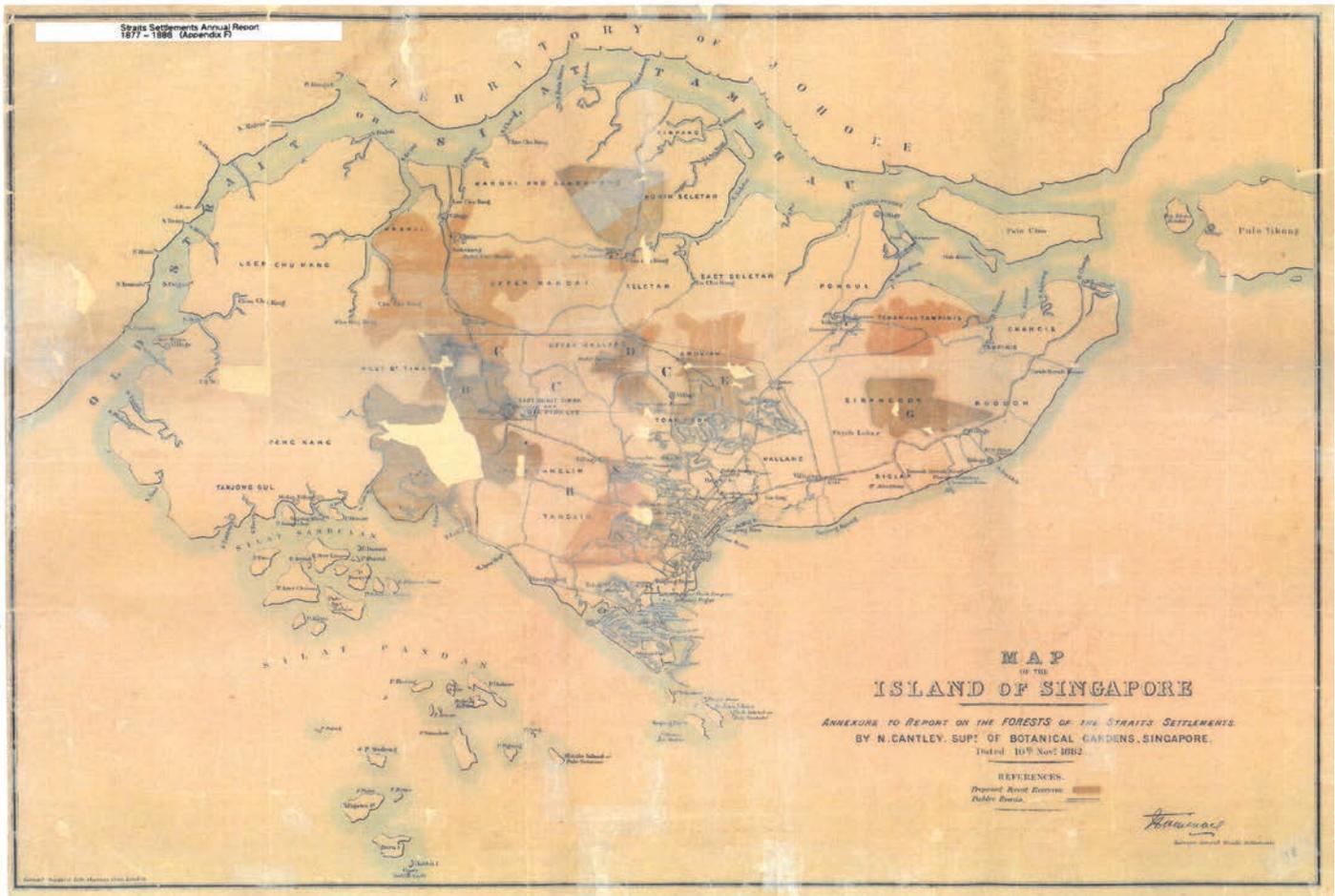
Ransonnet's illustration, *Path Across the Swamp (Changi)*, was reproduced on a standee and displayed against the backdrop of the Keppel Wetlands in the Gardens.

Forest research by the Singapore Botanic Gardens, from past to present

The Singapore Botanic Gardens is a 164-year-old tropical garden famous for its extensive collection of tropical plants from around the world and orchid cultivation. For the locals, it is a popular recreation site amidst well-manicured lawns and beautifully curated collections. Not many are

aware that the Gardens also manage a small but highly diverse tract of rainforest known as the Singapore Botanic Gardens Rain Forest. This 6.2-hectare forest is one of the few remaining patches of primary forest in Singapore.

Historically, however, the Gardens' forest management and conservation efforts were not limited to this small patch of forest, or even Singapore, but also included the Straits Settlements then, i.e., Malacca and Penang in present-day Peninsular Malaysia. In 1881, Nathaniel Cantley,



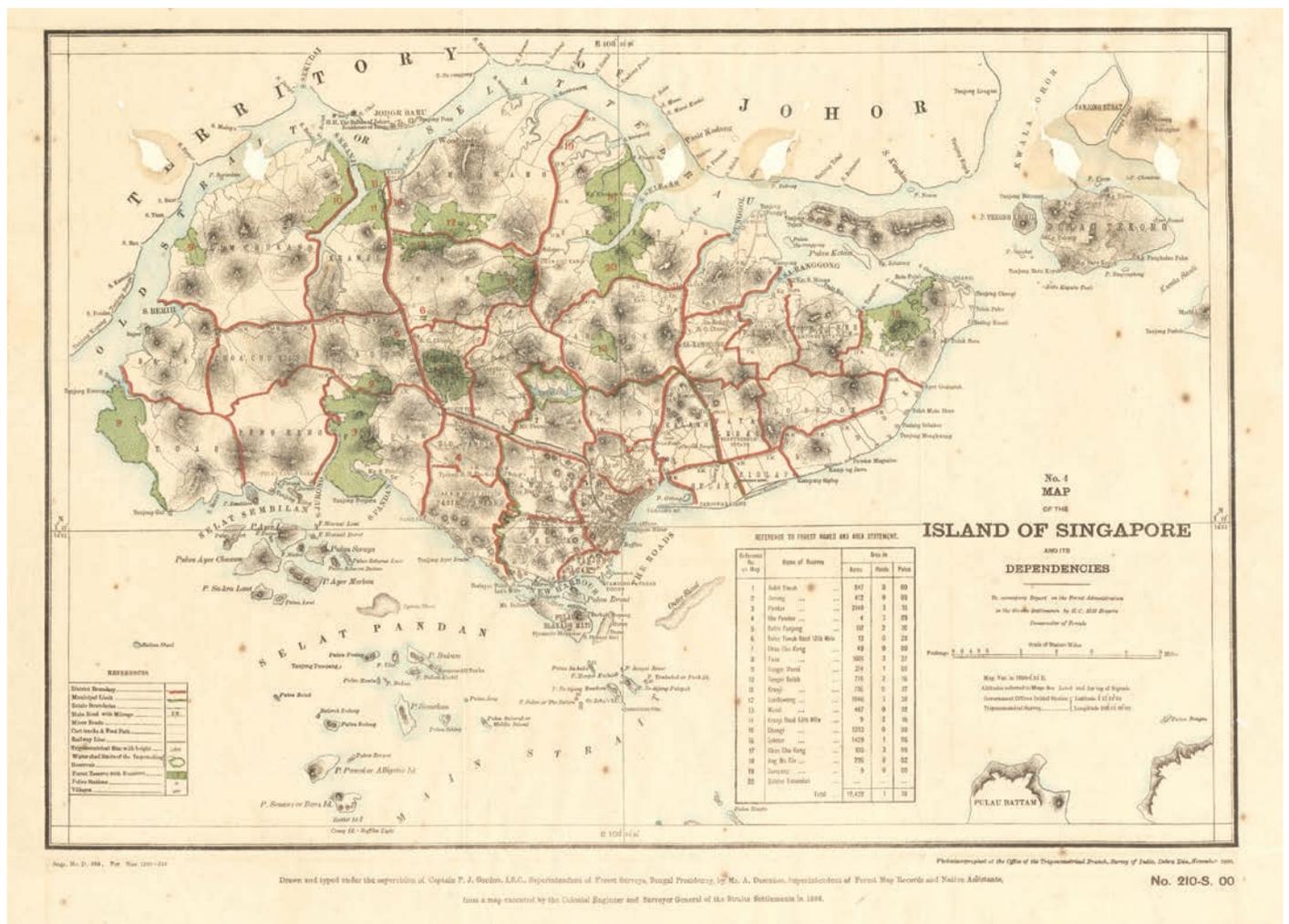
Map from Cantley's 1883 'Report on the Forests of the Straits Settlements'. Cantley proposed the establishment of forest reserves in Singapore to manage the supply of timber and other forest products and to protect water quality in the city. (Singapore Land Authority collection, image courtesy of National Archives of Singapore and Singapore Botanic Gardens Archives)

Superintendent of the Gardens, was directed by the colonial administration to prepare a report on the state of forests in the territories, along with measures that could be taken to preserve them. In the *Report on the Forests of the Straits Settlements* published in 1883, Cantley noted the dismal state of forests, with more than 90% of Singapore's original forest cover having already been cleared to make way for plantations and settlements. Gambier and pepper plantations were noted to be particularly destructive. As plantation owners moved on to the next available plot of land after exhausting soil nutrients on the

plot that they occupied, the highly flammable *lalang* grass (*Imperata cylindrica*) established on the abandoned land, inhibiting seedlings of native trees from establishing and regenerating forest cover. Cantley also ventured how the forests came to such a state, blaming short-sighted early colonial policies on land usage, and recommended preserving remaining forests in the Straits Settlements.

One of Cantley's recommendations was the formation of forest reserves and the creation of a department to manage them. In Singapore, this led to the gazettelement of eight forest reserves

in 1884, totalling about 3,200 hectares, or around five per cent of Singapore's land area at that time. In addition, a Forest Department was created in the Gardens. This marked the beginning of forest management and conservation efforts in Singapore. Meanwhile, forest reserves were also established in the other Straits Settlement territories of Penang and Malacca to be managed by this Forest Department. By 1886, Cantley reported on a total of 29 forest reserves established within the Straits Settlement territories, totalling 17,312 hectares.



A map from the 'Report on the Present System of Forest Conservancy in the Straits Settlements with Suggestions for Future Management' by H. C. Hill in 1900. It shows the location of the 20 forest reserves in Singapore, then already managed by the Land Office. (Courtesy of Singapore Botanic Gardens Archives)

However, the focus on forest conservation by the colonial government dwindled in the following years. Cantley's successor, Henry Nicholas Ridley, now in a post known as the Director of the Gardens, continued to manage the forest reserves in Singapore from 1888 to 1894, despite increasing budgetary constraints. The responsibility was eventually transferred to the Land Office, and the forest reserves in Singapore were gradually dismantled, eventually leading to their complete degazettement by 1936. Richard E. Holttum and E.J.H. Corner, then Director and Assistant Director, respectively, lobbied to reinstate Bukit Timah and other sites as forest reserves. In 1951, they came back under the purview and management of the Gardens when the Nature Reserves Ordinance was passed. A Nature Reserves Board was formed, with the Director of the Gardens as one of

the members. In 1975, the Singapore Botanic Gardens was merged with the Parks and Trees Unit to form the Parks and Recreation Department. In 1990, the National Parks Board (NParks) was created to manage the Singapore Botanic Gardens, Fort Canning Park and the nature reserves. Besides management, forest research was also conducted by NParks in the early 1990s. Mr Wong Yew Kwan, retired Commissioner of Parks and Recreation Department, was commissioned to survey trees in the Central Catchment Nature Reserve. He went on to establish 62 clusters of circular study plots distributed in both primary forest patches and secondary forest tracts of different stages of succession in the reserve.

On 13 March 2021, the Forest Discovery Centre at the OCBC Arboretum was officially launched in the Gardens. The Centre was

housed in the 125-year-old Gallop House No.5, also known as the Atbara House, and it highlights the wide variety of Singapore's forest habitats and ecosystems and their associated flora and fauna. At the opening of the Forest Discovery Centre, NParks also announced the setting up of a new Tropical Forest Ecology Research Programme, helmed by the Gardens. The anchor project within this research programme is a Long-Term Forest Ecological Monitoring (LTFEM) project, which consolidates and maintains a set of permanent study plots in the Central Catchment Nature Reserve. Under LTFEM, researchers will conduct studies on flora and fauna in the permanent plots, including monitoring the growth of seedlings, saplings and trees, observing selected trees for flowers and fruits, and even leaf litter trapping to estimate the forest productivity, among others. These study plots will be utilised by NParks



The Forest Discovery Centre @ OCBC Arboretum.
(Photo credit: Low Yee Wen)



A selection of equipment used on a typical forest survey trip. (1) Rubber mallet; (2) PVC pipe; (3) Raffia string; (4) Diameter tape; (5) Embosser; (6) Clamp; (7) Dendrometer band; (8) Data sheet; (9) Secateurs; (10) Transect tape; (11) Densimeter; (12) Measuring tape; (13) Compass; (14) Hypsometer; (15) GPS device; (16) Camera flash; (17) Telephoto lens; (18) Digital single-lens reflex camera; (19) Binoculars.

(Photo credit: Chan Pin Jia)

researchers, as well as collaborators from other research institutions within and outside the country. Data from various studies involving flora and fauna, microclimatic conditions and even soil biogeochemistry within the plots can be analysed collaboratively to understand the relationships between the various components of the ecosystem. Findings from this research programme can help guide forest management and conservation strategies and policies in Singapore and the region.

Since December 2021, forest ecologists from the Gardens have led the re-survey of the initial forest plots established in 1992 by Mr Wong in the Central Catchment Nature Reserve. Revisiting these plots after 30 years poses unique challenges. For instance, it was a daunting task for the team to locate the marker of each circular study plot installed in the 90s as it was an inconspicuous grey pipe amidst sometimes thick vegetation. Even with the aid of modern Global Positioning System (GPS) tools, researchers can take a fair bit of time

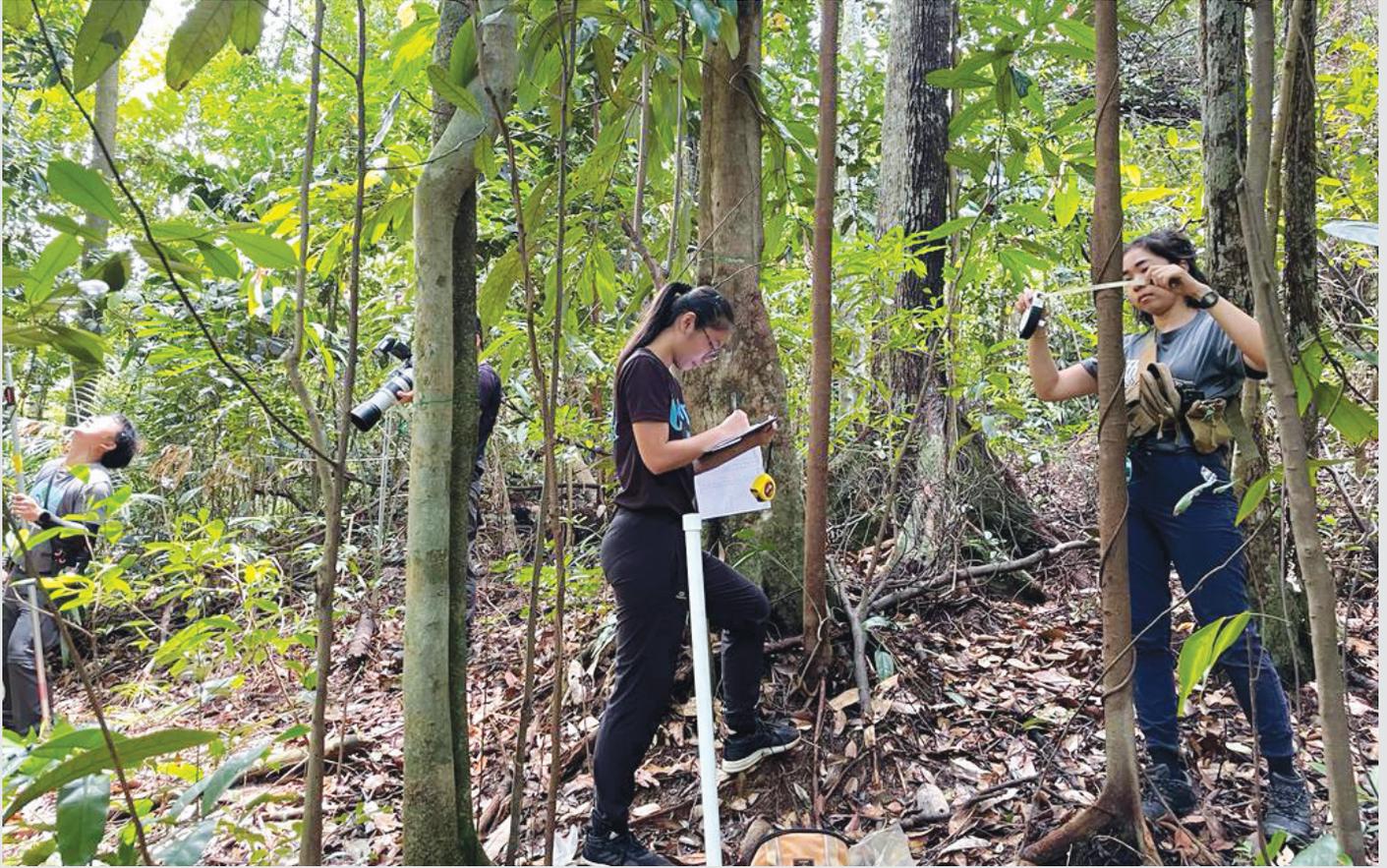
to find this marker. On average, a team could take up to three working days to locate, demarcate and survey a plot. Nevertheless, the team received immense support from staff across multiple NParks divisions with the surveys, as well as volunteers from local universities. With their assistance, the team managed to complete the re-establishment of the 60 plots just before the end of 2022.

Typically, a surveying team consists of five people. They would start the day by assembling the equipment needed for fieldwork before beginning their trek to reach the target plot. Sometimes, they may even take a boat to access plots located deep in the forest, which are easily accessible from the edges of the reservoir. Upon reaching the general area of the plot, the team would then attempt to find the original plot marker before re-establishing the plot. Trees with trunks larger than 5 cm in diameter would be tagged with a metal tag bearing a unique number for long-term tracking of growth and survival. Then, the diameter of the trees will be measured, and an attempt to identify

the tree species will be carried out on the spot. When the identity of the trees cannot be established in the field, a herbarium voucher of the specimen will be made for identification purposes in the Gardens' Herbarium by checking it against the existing preserved collections.

With the new Tropical Forest Ecology Research programme, forest research has come full circle and returned to Singapore Botanic Gardens. Efforts towards long-term, regular monitoring of forest trees and other aspects of the forest ecosystem will provide vital information to augment the benefits of history to understand and manage Singapore's remaining forests in the future. This will help conserve and manage our natural heritage and resources, protecting them for future generations.

Muhammad Khairuldin bin Aziz
Rie Chong
Soh Sun Yi
Chong Kwek Yan
Forest Ecology



A team of researchers measuring, tagging and identifying trees in the permanent study plots in the Central Catchment Nature Reserve.
(Photo credit: Ko Chung-Wing)



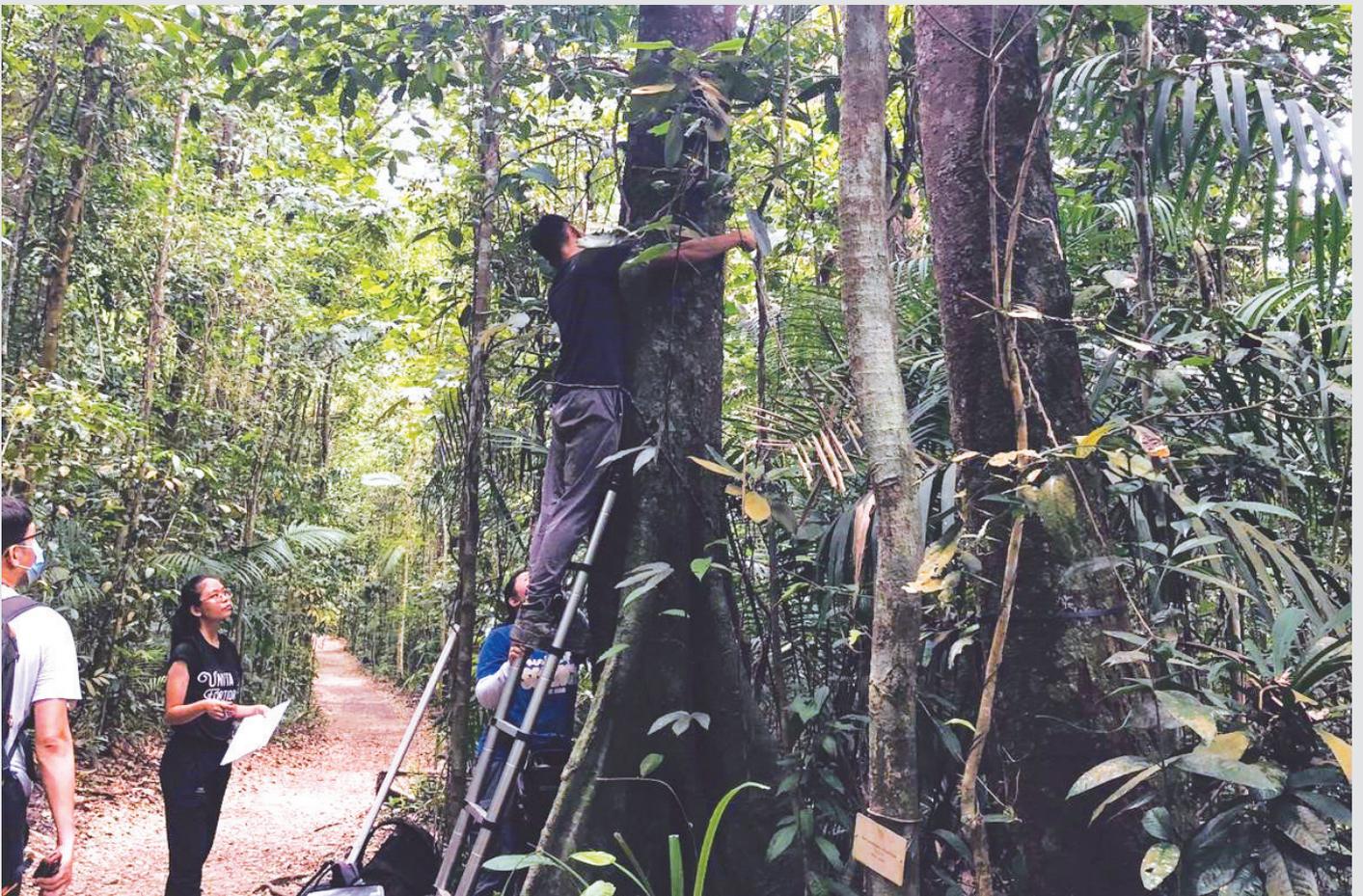
Gardens' forest ecologist, Soh Sun Yi collecting and recording a plant specimen for identification.
(Photo credit: Muhammad Khairuldin)



Project leader and Gardens' forest ecologist, Dr Chong Kwek Yan (Centre), taking photos of leaves in the canopy for identification.
(Photo credit: Teo Jinying)



Researchers making a beeline, through mud and knee-deep water, towards a plot deep in the Nee Soon Swamp Forest. (Photo credit: Jolene Lim)



Researchers installing a dendrometer band around a large Bat Laurel tree (*Prunus polystachya*) at one of the plots along MacRitchie Nature Trail to monitor its growth. (Photo credit: Teo Jinying)

Out of Sight, Out of Mind—The Marasmiaceae mushrooms in Singapore

Hidden away amongst moist leaf litter on the forest floor lies a complex ecosystem that helps recycle trapped nutrients from non-living organic matter back into the soil. This process is known as nutrient cycling, and the organisms involved are known as saprotrophs, which include bacteria and fungi. Among the saprotrophs, saprotrophic fungi are one of the groups of organisms which were often overlooked.

Out of our sight, tiny strands of microscopic mycelial strands spread across the forest floors to help decompose dead organic matter. Only when conditions are right will these fungi produce fruiting bodies to reproduce (sexually), reminding us of their presence.

Singapore, a tropical rainforest nation, hosts an immense diversity of saprotrophic fungi, and in this article,

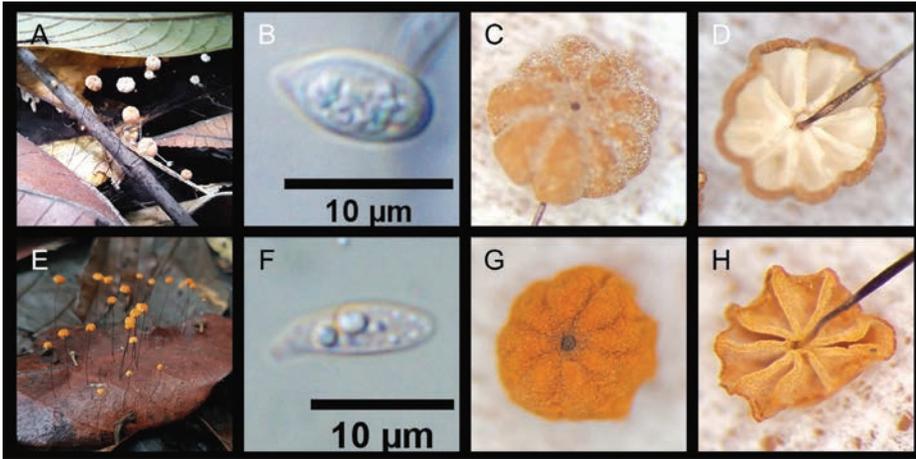
we discuss the often-overlooked Marasmiaceae family. Named after the marasmoid fungi, the family includes fungi with similar-looking fruiting bodies, or mushrooms, that have the ability to resurrect and continue sporulation even after desiccation. Ironically, not all members of the family possess this resurrection ability. The classification of this family is poorly understood and still very much a work in progress. But with the aid of molecular tools, progress has been made in understanding the evolutionary history of this group better. As more fruiting bodies of the family are being made from field surveys, mycologists can study the group more carefully to understand its complicated evolutionary relationships. Our recent survey records at least 14 Marasmiaceae species in Singapore: one *Campanella* sp., one *Tetrapyrgos* sp., three *Crinipellis* sp. and nine *Marasmius* species. Of these, four could be new to science.

Arguably one of the most common species in Singapore is *Marasmius guyanensis*. It has a tiny cap size of about 5 mm, but the bright orange cap and the habit of forming large numbers of fruiting bodies make it easily noticeable among the leaf litter. If you are lucky, you might see a similar-looking yet-to-be-named species—*Marasmius* sp. ‘Pseudoguy’. The difference between this taxon and *M. guyanensis* is subtle, with the latter fruiting body drying orange entirely while the former with cap drying brownish and gills white. Although they look morphologically similar, both species are found to be genetically different, showing one example of a cryptic species.

On the other side of the size spectrum, *Marasmius pellucidus* is one of the largest *Marasmius* species in Southeast Asia. The species is characterised by its white paper-thin cap and reddish-brown stalk. In addition, this species



Fourteen species of Marasmiaceae documented recently from Singapore. (A) *Crinipellis actinophora*; (B) *C. brunneipurpurea*; (C) *C. malesiana*; (D) *Tetrapyrgos* sp.; (E) *Campanella* sp.; (F) *Marasmius guyanensis*; (G) *M.* sp. ‘Pseudoguy’; (H) *M. tenuissimus*; (I) *M. pellucidus*; (J) *M.* sp. ‘bonnet’; (K) *M. elaeocephalus*; (L) *M. neutrichotus*; (M) *M. palmivorus*; (N) *M.* sp.
(Photo credits: (A, C, D, H-N) Serena Lee; (B, E-G) Yee Yan Ling)



Comparison between *Marasmius guyanensis* (Top row) and *M. sp. 'Pseudoguy'* (Bottom row). (A) & (E) Habit; (B) & (F) Spore shape; (C) & (G) Top view of cap; (D) & (H) Gills. (Photo credits: Yee Yan Ling)



Marasmius pellucidus encountered at Bukit Timah Nature Reserve. (Photo credits: Serena Lee)

loves to grow in dense bunches. The earliest collection of this taxon in the Herbarium of the Singapore Botanic Gardens (SING) can be traced back to 1940, made by the Gardens' first mycologist, Prof. E.J.H. Corner. The species will likely be found during every wet season (so keep your eyes peeled to the forest floor!).

When it comes to variation, *Marasmius* sp. 'Bonnet' is probably the best example of displaying a stunning colour spectrum in the field. The most common variety has a red cap with a stalk that transitions from light brown at the apex to dark orange at the base. Our recent study based on herbarium collections held at SING uncovers two genetically similar species but with phenotypic variation: one phenotype with a pinkish-purple cap and the other being bright orange. This highlights the high phenotypic plasticity that can be seen in fungal species.

Crinipellis is the second-largest genus of the family in terms of species diversity. The presence of matted hairs on the cap and stipe of the fruiting body distinguishes this genus from the rest of the family. While conducting a field survey at the Nee Soon Freshwater Swamp Forest in Central Catchment Nature Reserve, Singapore, *Crinipellis brunneipurpurea*, was encountered among dense undisturbed leaf litter. Also documented was a hairy caterpillar standing on its pseudo legs,



Marasmius sp. 'Bonnet' with its array of colours. (Photo credits: Serena Lee (Left); Paul Leong (Centre); Jana Leong-Škorničková (Right))



Close-up of *Crinipellis actinophora* showing an immature cap. (Photo credit: Yee Yan Ling)

busy feeding on the cap of the specimen. Although such opportunistic feeding is commonly seen, ecological connections behind it need to be better understood in future studies.

Another intriguing species is *Crinipellis actinophora*. Triggered by wet conditions, the fungus becomes rhizomorphic and produces long, wiry fungal cords in the air. Upon contact with any surfaces, these stringy cords will produce white mycelial that secures it onto the contact surface. Perhaps, this could be a method for the fungus to spread itself more effectively in times of optimal resource availability (i.e., water). This growth mechanism is not limited to this species but also to a group of fungi known to cause the horse-hair blight disease of tea and other tropical plants.

The two remaining genera in Singapore are *Campanella* and *Tetrapyrgos*. *Campanella* is rarely seen, let alone collected. In Singapore, it was only collected once, and the sole specimen is characterised by not having a stipe (or stalk) and a gelatinised inner flesh. It is inconclusive that *Campanella* grows only on dead bamboo culms. Other specimens examined in the study that were thought to be *Campanella* initially but grew on dicotyledon leaf litter turned out to be from a different family. As for *Tetrapyrgos*, members of this genus can be distinguished by their bluish frosted stipe and tetrahedral spores.

The outcome of our survey is that we now have a basic understanding of one of the major saprotrophic fungal groups found in Singapore. However, we are not surprised if



Crinipellis brunneipurpurea discovered in Nee Soon freshwater swamp forest with a micro-moth caterpillar feeding on its cap. (Photo credit: Yee Yan Ling)



The sole collection of an unidentified *Campanella* sp. growing on decaying bamboo culms in Singapore. (Photo credit: Yee Yan Ling)



An unidentified *Tetrapyrgos* sp. with its distinctive bluish-grey stipe. (Inset) Spore shape observed under a microscope. (Photo credits: Serena Lee)

more species in this group remain hidden from our eyes for the duration of this study. In 1996, Prof. Corner described at least 42 new *Marasmius* species discovered in Singapore between 1929 and 1943. Thus, do keep your eyes peeled on the forest floors, and perhaps, you might rediscover some of the species he described, or better still, find a new species to help expand the species diversity we know of in Singapore.

Yee Yan Ling
National University of Singapore
(Final Year Project Student)

Serena Lee
Herbarium

A Guide to Macrofungi in Singapore

A Guide to Macrofungi in Singapore



Serena ML Lee & Amy MF Choong

Published in 2023 by the National Parks Board, Singapore, in collaboration with the Department of Biological Sciences, National University of Singapore. 229 pp. Available in the Gardens Shop of the Singapore Botanic Gardens or online at www.botanicgardensshop.sg for \$26.00.

Mushrooms that we commonly encounter in parks and nature reserves in Singapore or included in our favourite takeaway meals are known as macrofungi. Technically speaking, they are fruiting bodies of fungi for the sole purpose of reproduction. Not all fungi are macro in size, as some are microscopic and invisible to the naked eye, such as yeasts. The study of fungi is known as *mycology*, and the word is derived from the Ancient Greek *mukēs* = fungus, and the suffix *-logia* = study. Mycology, albeit a megascience, has long been neglected and overshadowed by more glamorous scientific quests, primarily focusing on animals and flowering plants. For a long time, fungal taxonomy has been a total mess. The Molecular Revolution in the 1980s provided reliable tools and techniques to classify and examine

relationships between fungi genera and families. At present, only 6–8% of the world's fungi have been identified so far. However, interest in fungi is on a meteoric rise as people become aware of their importance in our ecosystem and how entangled we are with the fungal kingdom.

This pictorial guidebook is a labour of love by two dedicated Singaporean mycologists, Serena Lee of the Singapore Botanic Gardens and Amy Choong of the National University of Singapore. The latter has been lecturing Fungal Biology at the prestigious university for six years, while the former has spent seven years painstakingly collecting and documenting fungi in the field and the herbarium. A total of 165 taxa from Singapore are presented in this generously illustrated book, some of

which are new records from the island. This small handy book packs easily into a bag, and it is not just for seasoned mycologists interested in identifying local macrofungi. But, it is also highly recommended for naturalists and fungi lovers as glossaries (text and pictorial explanations of technical words and terms used) are also provided. As macrofungi diversity in Singapore is still poorly documented, do not be alarmed if you encounter a mushroom not illustrated in this lovely book! I suggest you take a photo of the mushroom and send it to Serena and Amy for identification!

Low Yee Wen
Herbarium

A Floral Explosion—Needles on Show!

Strolling along the Fragrant Garden, visitors are frequently welcomed by sweet scents of flowers strongly permeating the air in the early mornings or the evenings. Standing out among the greenery near the edge of this thematic garden was a particularly eye-catching flowering tree. It has striking white flower clusters set against its dark green foliage and would stop visitors in their tracks. This stunning medium-sized tree is known by its scientific name, *Posoqueria latifolia*, a member of the Coffee family, Rubiaceae. It is most commonly known as the Needle Flower Tree based on its flower shape. Otherwise, it is also known as Monkey Apple, Brazilian Oak or Tree Jasmine.

This attractive tree has a native range from Mexico to Tropical America, where it thrives primarily in the wet tropical biome. The genus *Posoqueria* was established in 1775 by a French pharmacist, botanist and explorer, Jean Baptiste Christophore Fusée Aublet (1720–1778). He was also known to be one of the first botanists to study ethnobotany in the Neotropics. Aublet named the genus after its local name, *Aymara-Posopheri*, used by the Galibi tribe in French Guiana. *Aymara* is a large freshwater fish species that eats the fruits of this plant in the wild.

The species has been recorded to reach 10 m high in its natural habitat. In contrast, it is typically 5–7 m tall in cultivation and tends to develop a slim, straight trunk supporting a densely branched, pyramidal-shaped crown. The large oval-shaped dark green leaves can reach 20 cm long and leathery. They are arranged in pairs along the branch with distinct stipules visible between each pair of leaves—a typical characteristic of plants in the Rubiaceae.

The showy snow-white flowers are borne in drooping clusters at the ends of branchlets. They have extremely long but thin corolla tubes measuring up to 18 cm long and flared at the mouth bearing five recurving corolla lobes. The mouth of the corolla tube is densely



Pyramidal crown of the Needle Flower Tree with scattered clusters of fragrant tubular flowers dotting it. This tree can be seen in the Fragrant Garden.



The conspicuous 'firework-like' cluster of the long tubular fragrant flowers of the *Posoqueria latifolia*.



Close-up of *Posoqueria latifolia* flowers. The flower on the right displays the united ellipsoid structure of the anthers before the Pollen Catapult Mechanism (PCM), and the flower on the left shows the after-effect of PCM.



The presence of a stipule on the branch between a pair of leaves is characteristic of the Coffee family, Rubiaceae.

covered with short and soft erect hairs. These tubular flowers have a distinctive sweet fragrance similar to Gardenias and are most intense in the evening and night. The flowers are believed to be pollinated by hawkmoth, which has an extremely long proboscis to access the nectar at the base of the long floral tube. The fruits are berry-like to 5 cm wide and maturing orangish-yellow. The fruits have jelly-like pulp that are said to be sweet, aromatic and edible but lacking flavour.

Unique to some *Posoqueria* species and its closest relative, the flowers of *Posoqueria latifolia* exhibit a peculiar yet remarkable pollination system known as the Pollen Catapult Mechanism (PCM). The five anthers are united into an ellipsoidal structure at the bud stage and remain united even after the corolla lobes have fully expanded at maturity. When a pollinator touches the ellipsoidal structure, the two lateral stamen pairs fold backwards, and the solitary frontal stamen moves forward violently and causes a rapid explosion, dusting the unsuspecting pollinator with pollen.

This tree's yellowish or grey wood is fine-grained, dense and attractive. It was once popularly used to style into walking sticks and umbrella handles in the 1900s to be sold in the British market. In some parts of Tropical America, it is used in turnery and for tool handles. When you next explore the Fragrant Garden, keep a look out for the Needle Flower Tree. You will not miss its showy, sweetly scented tubular white flowers.

Nura Abdul Karim
Library, Training & External Relations

All photos by Nura Abdul Karim.

The 8th Southeast Asia Botanic Gardens Network Conference & Meeting

The University of Philippines Los Baños (UPLB), through the Makiling Botanic Gardens, Makiling Center for Mountain Ecosystems (MCME) and its College of Forestry and Natural Resources in Laguna, Philippines, hosted the 8th Southeast Asia Botanic Gardens (SEABG) Network Conference and Meeting from 27–29 June 2023. This event was also supported and co-organised by the Botanic Gardens Conservation International (BGCI). The event was also held in conjunction with the 60th founding anniversary celebrations of the UPLB Makiling Botanic Gardens. Over 60 delegates from the Philippines and other Southeast Asian nations, namely Indonesia, Malaysia, Singapore, Thailand and Vietnam, including Taiwan, attended the conference. This event had two components: (i) the conference, and (ii) the meeting of the SEABG Network Steering Committee members and selected invitees from various regional botanic gardens, arboreta and forest departments.

The conference theme was *Conservation of Threatened Species in Southeast Asia's Botanic Gardens*, and it drew a total of 17 oral and eight poster presentations. Most of the presentations covered conservation projects of specific plant groups such as endemic orchids, bryophytes, camellias, magnolias, etc, and the management and conservation initiatives on endangered and exceptional species. The Singapore Botanic Gardens (SBG) was represented by Dr Nura Abdul Karim and Mr Koh Teng Seah. Mr Koh presented the talk *When the Old Meet the New: SBG Micropropagation Lab and Seedbank*, while Dr Nura announced the upcoming 8th Global Botanic Gardens Congress (GBGC) that will be held in Singapore and hosted by SBG and BGCI from 5–10 August 2024. In addition, Dr Nura also presented a poster on the proposed Phenology Network project on behalf of Dr Ho Boon Chuan and his team in the Gardens. This project aims to track the long-term phenophase changes of selected tree species in-

country and across the region to analyse how a species differs in its phenology when growing in different areas and environments. The poster presentation drew tremendous interest from the UPLB as it has just begun collecting phenology data within its designated Phenology Ecotourism (PhEco) Trail in the Makiling Botanic Gardens. Both SBG and UPLB are in discussion to collaborate on this network project.

The meeting of the core Steering Committee was chaired by the SEABG Network Coordinator, Dr Greetha Arumugum, and it covered updates on the various regional botanical institutions' conservation projects that were in collaboration with BGCI. It also highlights the ongoing developments or upcoming plans for new botanic gardens in various countries in the region. The Steering Committee also discussed the need to formulate National Botanic Garden Networks within larger member countries to promote collaborations. In addition, it was also proposed that



Participants of the 8th Southeast Asia Botanic Gardens Network Conference & Meeting. (Photo credit: University of Philippines Los Baños)



Participants listening to an oral presentation at the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) Umali Auditorium, University of Philippines Los Baños Campus.

non-members, such as Timor-Leste and Papua New Guinea, should be invited to future meetings as they are nations with rich biodiversity that have yet to be fully explored and documented with consideration that they may require future assistance from the network. The SEABG Network Coordinator will work towards identifying representatives from these countries with help from current SEABG Network members that have established contacts with them, such as Indonesia. During the

meeting, Taiwan's Cecilia Koo Botanic Conservation Center (KBCC) also took the opportunity to announce that in conjunction with the 23rd World Orchid Conference 2024 in Tainan, it will organise a workshop on orchid conservation and aims to sponsor relevant staff in the SEABG Botanic Gardens Network to participate.

On the last day of the conference, participants were treated to a day trip to the Mudspring Trail, the Makiling

Botanic Gardens and Experiment Station located at the Mt Makiling Forest Reserves. The mud spring is one of the mud pots formed on Mt Makiling, a dormant volcano. A mud pot is an acidic hot spring with limited water and usually forms a pool of bubbling watery mud that grows in size over time as the acid and microorganisms decompose the surrounding rocks into clay and mud. The Mt Makiling mudspring records a temperature of 80°C, sulfurous (50mg/l) and highly acidic (2pH), releasing thick hot vapours with a distinct rotten egg smell.

Overall, the event went smoothly as planned and was well received by all participants. It allowed them to meet in person after three years, forge new contacts, discuss potential new collaborations, and be kept abreast of organisational changes in regional botanical institutions. The next SEABG Network meeting is expected to be hosted by the Sabah Parks, Malaysia, in 2025.

Nura Abdul Karim
Library, Training & External Relations

All photos by Nura Abdul Karim unless otherwise stated.



Participants being briefed about the plant collection held at the Mt Makiling Experiment Station.



Thick billowing of hot sulphur-smelling vapours from the Mt Makiling mudspring.

HPL Canopy Link officially opens in the Tyersall-Gallop Core



Aerial view of HPL Canopy Link. (Photo credit: Tan Wan Xin)

The opening of the HPL (Hotel Properties Limited) Canopy Link in November 2022 marks the completion of the Tyersall-Gallop Core of the Gardens, which has opened progressively in stages since 2017. The 200-metre-long barrier-free pedestrian bridge provides seamless access between the central part of the Gardens and the Gallop Extension.

The bridge begins at the Learning Forest and serves as a vantage point for the bamboo collection at the Tyersall Bambusetum. At the highest portion of the bridge, visitors can get up close with the Giant Bamboo (*Dendrocalamus giganteus*), the world's tallest bamboo. At maturity, the Giant Bamboo can attain heights of up to 30 m tall - an impressive feat for grass! In favourable growing conditions, the Giant Bamboo is known to grow up to 40 cm a day, making it one of the fastest-growing bamboo species. From the bridge, visitors will get to admire the tall and majestic Common Pulai tree (*Alstonia angustiloba*), a heritage tree growing along the Burkill Driveway.

The planting concept around the HPL Canopy Link is to showcase plants from Continental Southeast Asia, encompassing Myanmar, Thailand, Laos, Cambodia and Vietnam, a subtropical region heavily influenced

by distinct wet and dry seasons lasting several months. As such, most plants in this region have adapted to grow in hot climates up to 40°C and seasonal drought.

As the bridge meanders through the landscape, visitors will get to explore two main habitats synonymous with the Continental Southeast Asia region: mixed deciduous forests and dry dipterocarp forests. Some of the major plant families featured in the HPL Canopy Link include the Custard Apple family (Annonaceae), the Palm family (Arecaceae) and the Magnolia family (Magnoliaceae).



The Common Pulai tree, *Alstonia angustiloba* (Blue arrow), and (Orange arrow) a clump of newly established Giant Bamboo (*Dendrocalamus giganteus*).

Of the two habitats, mixed deciduous forests occur in areas with higher rainfall. As the name suggests, the forest consists of a mixture of evergreen and deciduous plants. Weather conditions are generally less extreme and high in plant diversity. To replicate this habitat in a section of the HPL Canopy Link, a multi-layered mixed planting of shrubs, trees and various bamboo species was established. In Continental Southeast Asia, dry dipterocarp forest exists in regions with low rainfall and are dominated by members of the Dipterocarp family (Dipterocarpaceae). As water availability affects plant growth, the forest canopy of dry dipterocarp forests is categorised as low and open. Hence, plants in this forest type have evolved and adapted to cope with extreme weather conditions and forest fires by having thick and rough bark. Some examples of trees from the dry dipterocarp forests planted at the HPL Canopy Link are *Makhae Tae* (*Sindora siamensis*, a member of the Pea family (Fabaceae)) and *Raing Phnom* (*Pentacme siamensis*, formerly known as *Shorea siamensis*), a member of the Dipterocarp family).

Towards the Gallop Extension, the planting scheme at HPL Canopy Link gradually expands to include plants from the Malay Peninsula, transitioning and merging into the existing planting concept there. Lowland hill forests are formed on valleys and hill slopes, and it is characteristic of the habitat to have a dense and tall canopy. As sunlight filters through multiple canopy layers, shade-loving understorey plants flourish and occupy different niches within the habitat.

The HPL Canopy Link is built not entirely just for humans but also for our native resident wildlife as it serves as an important ecological corridor between the main parts of the Gardens and Gallop extension. The bridge enables the safe movement of animals between the two natural areas. Civets and other small mammals were observed using the bridge during



Cycas siamensis (Centre) is an ancient gymnosperm that grows naturally along cliffs and outcrops in Continental Southeast Asia. In HPL Canopy Link, cycads are planted on a steep slope to mimic their natural habitat.



Members of the Custard Apple family (Annonaceae) (Left), the Palm family (Arecaceae) (Centre), and the Magnolia family (Magnoliaceae) (Right). *Mitrephora keithii* (Top left), *Goniothalamus tapis* (Bottom left), *Pinanga kanchanaburiensis* (Top centre), *Corypha lecomtei* (Bottom centre), *Magnolia* 'Sukontha' (Top right), *Magnolia* sp. (Bottom right).



Characteristic bark on young saplings of *Makhae Tae* (*Sindora siamensis*) (Left) and *Raing Phnom* (*Pentacme siamensis*) (Right).

construction and after completion. In time to come, as the planted trees grow taller and their canopies reach beyond the bridge's height, natural canopy bridges will improve connectivity for arboreal animals between the two sites of the Gardens.

Jolene Lim
Living Collections

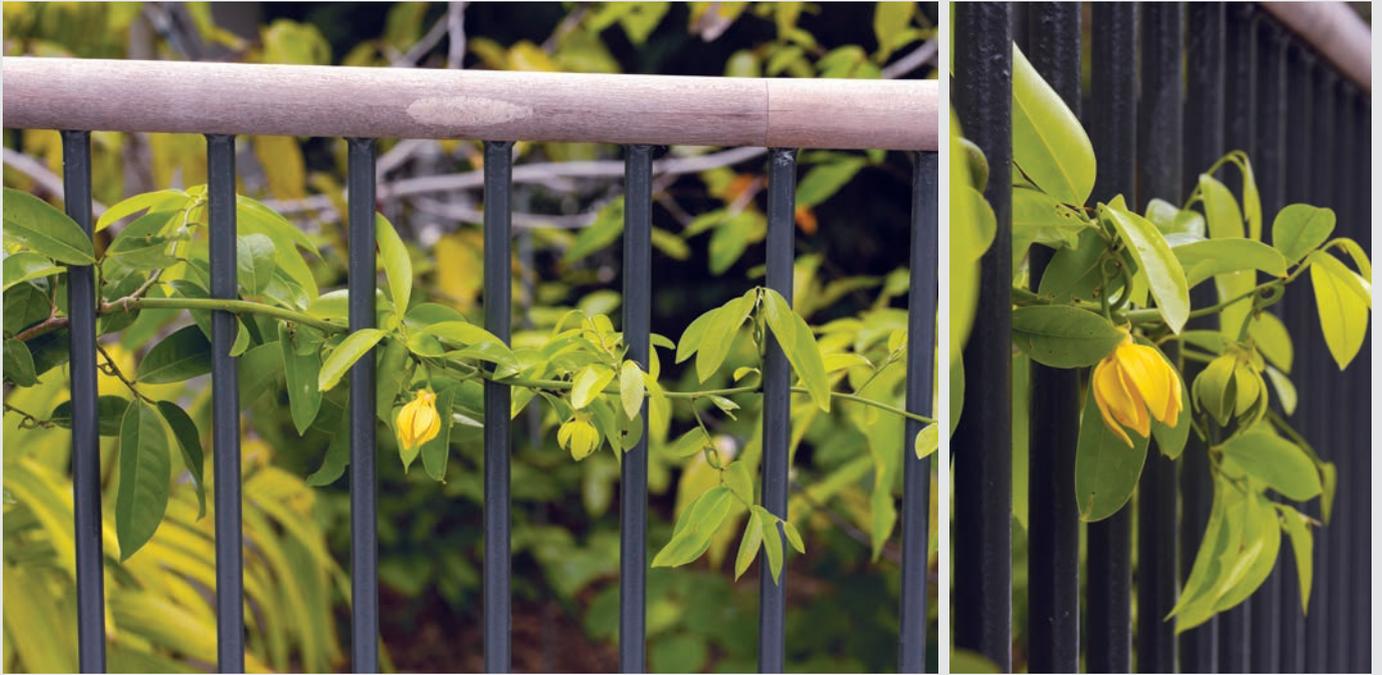
Zaki Jamil
*Horticulture and Community Gardening
Division,
National Parks Board*

All photos by Jolene Lim unless otherwise stated.



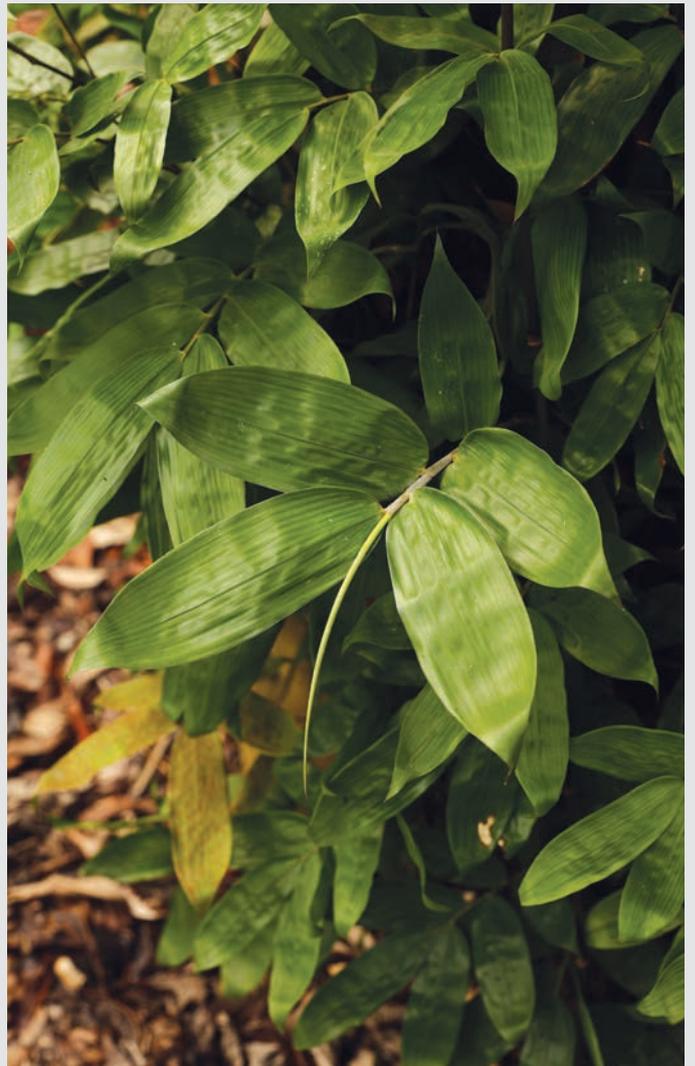
A rich diversity of palm species is planted along HPL Canopy Link.

Keep a lookout for some of these plants planted along the HPL Canopy Link:



***Artabotrys siamensis* (Climbing Ylang-Ylang)**

Unlike the shrubby Ylang-Ylang (*Cananga odorata* var. *fruticosa*), the Climbing Ylang-Ylang has specialised inflorescence hooks on the stems to help in climbing. The flowers are fragrant, maturing from green to yellow and are often hidden by the leaves.



Dinochloa scabrida

A climbing bamboo with strong stems that twine and rough hairs on its leaves and culm sheaths to aid in climbing.



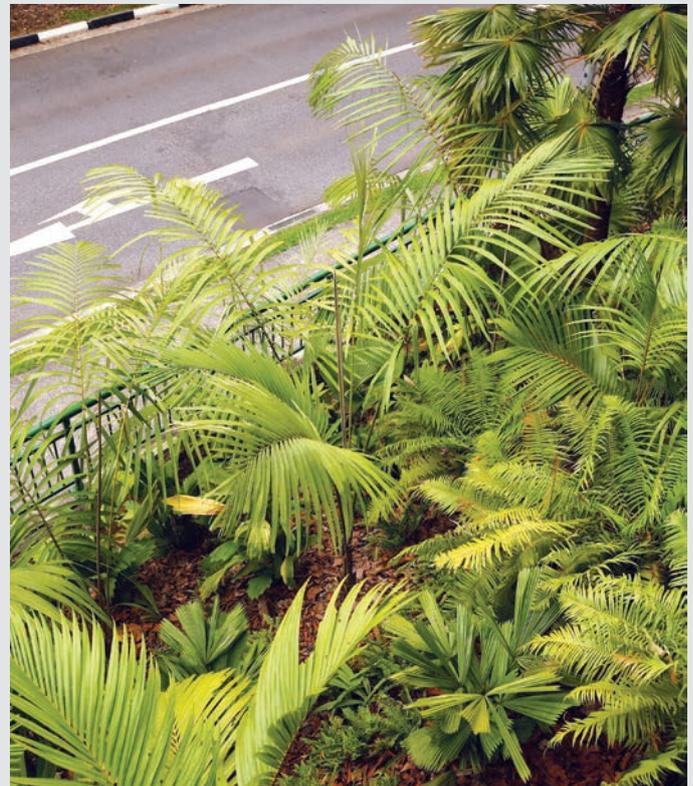
***Platycerium wallichii* (Indian Staghorn)**

This epiphytic staghorn fern is native to South Asia and Continental Southeast Asia. It is an unusual staghorn fern that goes dormant during dry seasons.



***Lanonia centralis* (Vietnam Hat Palm)**

This palm species was mistaken as *Licuala spinosa* for many years until DNA analysis revealed it to be distinct from *Licuala* and as a new species from Central and Southeast Vietnam. Unlike *Licuala*, this genus is dioecious. In its natural habitat, this palm grows on steep slopes in closed forests. The generic name is derived from the Vietnamese *La* = hat, and *Non* = palm. In Vietnam, locals dry the fresh leaves and weave them into the distinctive conical-shaped Vietnamese hats.



***Orania sylvicola* (Ibul)**

This charismatic lowland palm has fronds with glabrous undersides and red-brown hairs covering leaf sheaths and petioles. The Ibul palm has a wide distribution, ranging from Southern Thailand to Peninsular Malaysia, Singapore, and Sumatra. In Singapore, this palm is critically endangered and has a restricted distribution to Bukit Timah Nature Reserve, the Gardens' Rain Forest, Palm Valley and Tyersall Learning Forest.

The Global Tree Assessment Workshop 2023

From 27 February to 3 March 2023, the Singapore Botanic Gardens hosted the Botanic Gardens Conservation International (BGCI) led Global Tree Assessment (GTA) Workshop, which aimed to complete conservation assessments for tree species native to Indonesia and Malaysia. This was the first in-person GTA Workshop for Southeast Asia since 2019.

The workshop was attended by 30 regional tropical plant specialists, of which 20 were experienced assessors. Ten staff members from the Gardens participated in the workshop for the first time. The organisations involved from Malaysia were the Forest Research Institute of Malaysia (FRIM), Sabah Forestry Department, Forestry Department of Sarawak and Forever Sabah, while from Indonesia were the National Research and Innovation Agency (BRIN) and Universitas Samudra.

The workshop aimed to examine over 200 tree species that had never been assessed on the International Union for Conservation of Nature’s Red List. To achieve this goal, the participants worked in small groups and produced assessments and maps from data they had prepared before the workshop. Over the course of the workshop assessments, the participants successfully completed 250 species, slightly beyond the target aimed.



The GTA Workshop 2023 participants, trainers, and facilitators at the Singapore Botanic Gardens. (Photo credit: BGCI)

To break their extremely gruelling assessment exercise, the participants were treated to a tour of the Singapore Botanic Gardens’ Heritage Core and the Tropical Montane Orchidetum and Sembcorp Coolhouse in the National Orchid Garden. Besides fulfilling the important assessment exercise, the workshop was much welcomed on a social level serving as an avenue for in-person interactions with old friends and colleagues and networking with new contacts, which had been

stalled for almost three years due to the pandemic and ensuing travel restrictions.

The workshop was a great success, with participants actively involved and working hard towards achieving the target of assessing over 200 tree species occurring in Malaysia and Indonesia, as well as Singapore.

Nura Abdul Karim
Library, Training & External Relations



The participants were engrossed in their group assessment activities. Some serious discussions could be heard throughout the workshop within each group and between groups. (Photo credit: Nura Abdul Karim)



A group comprising assessors from Indonesia, Malaysia and Singapore sharing tree taxa information and learning from each other to complete the assessment work. (Photo credit: Nura Abdul Karim)

List of VIP orchid hybrids named by the Gardens from January to June 2023

| Date | Dignitary/ Organisations/ Others | Name of orchid hybrid |
|-----------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| 17 January 2023 | His Excellency Shavkat Mirziyoyev, President of the Republic of Uzbekistan | <i>Dendrobium</i> Shavkat Mirziyoyev |
| 30 January 2023 | His Excellency Dato' Seri Anwar bin Ibrahim, Prime Minister of Malaysia, and Dato' Seri Dr Wan Azizah binti Wan Ismail | <i>Dendrobium</i> Anwar Azizah |
| 9 February 2023 | His Excellency Pham Minh Chinh, Prime Minister of the Socialist Republic of Vietnam, and Mdm Le Thi Bich Tran | <i>Papilionanda</i> Pham Le Tran Chinh |
| 10 March 2023 | His Excellency Klaus Iohannis, President of Romania, and Mrs Carmen Iohannis | <i>Dendrobium</i> Carmen Iohannis |
| 2 June 2023 | The Honourable Anthony Albanese MP, Prime Minister of Australia | <i>Dendrobium</i> Anthony Albanese |



His Excellency Shavkat Mirziyoyev, President of the Republic of Uzbekistan (Right), accompanied by Prof. Tan Puay Yok (Left), Director of the Singapore Botanic Gardens, with the orchid *Dendrobium* Shavkat Mirziyoyev named in his honour on 17 Jan 2023 at the Istana. (Photo credits: (Left) Ministry of Foreign Affairs, Singapore; (Right) National Parks Board)



His Excellency Dato' Seri Anwar Bin Ibrahim, Prime Minister of Malaysia, and spouse Dato' Seri Dr Wan Azizah Binti Wan Ismail, with the orchid *Dendrobium* Anwar Azizah named in their honour on 30 January 2023 at the Istana. (Photo credits: (Left) Ministry of Foreign Affairs, Singapore; (Right) National Parks Board)



His Excellency Pham Minh Chinh (Fourth from right), Prime Minister of the Socialist Republic of Vietnam, and spouse Mdm Le Thi Bich Tran (Second from right), with the orchid *Papilionanda* Pham Le Tran Chinh named in their honour on 9 February 2023 on the occasion of their visit to the National Orchid Garden. Mr Pham and Mdm Le were accompanied by Dr Tan See Leng (Fourth from left), Minister for Manpower and Second Minister for Trade and Industry, Singapore, and Prof. Tan Puay Yok (Right), Director of the Singapore Botanic Gardens.
(Photo credits: National Parks Board)



His Excellency Klaus Iohannis (Second from right), President of Romania, and First Lady Mrs Carmen Iohannis (Second from left), with the orchid *Dendrobium* Carmen Iohannis named in their honour on 10 March 2023 during their visit to the National Orchid Garden. Mr and Mrs Iohannis were accompanied by Dr Mohamad Maliki Bin Osman (Left), Minister in the Prime Minister's Office, Second Minister for Education and Second Minister for Foreign Affairs, Singapore, and Dr Yap Him Hoo (Right), Deputy CEO of National Parks Board, Singapore.
(Photo credits: National Parks Board)



The Honourable Anthony Albanese MP, Prime Minister of Australia, accompanied by Ms Hwang Yu-Ning, CEO of National Parks Board, Singapore, with the orchid *Dendrobium* Anthony Albanese named in his honour on 2 June 2023 at the Istana.
(Photo credits: (Left) Ministry of Foreign Affairs, Singapore; (Right) National Parks Board)

Impressions from Northwestern India: Nature Printed Fodder Grasses



Preserved in the Gardens' Archives is an exceptionally rare copy of the *Illustrations of the Indigenous Fodder Grasses of the Plains of North-Western India* by John Firminger Duthie. Duthie was an English botanist and Director of the Botanical Department of Northern India who founded the Saharanpur (Uttar Pradesh) Herbarium in 1876. The Saharanpur Herbarium merged with the Forest School Herbarium in Uttarakhand to form the Dehra Dun Herbarium in 1908.

The book, published in two parts between 1886 and 1887, includes 80 illustrations of fodder grasses native to northwestern India. Apart from scientific names, widely adopted vernacular names of the grasses were also provided for every illustration. Pressed by an ever-increasing demand for reliable plant identification, Duthie hoped the book would contribute "towards a better knowledge of... the more important fodder grasses" of Northern India.

Given the monochrome nature of its content, the book looks ordinary at first sight. Upon closer inspection, the sentence "Printed from Nature by Thos. D. Bona, Thomason College Press, Roorkee", in fine print, was included at the bottom of each plate. This implies that all the plates in the book were produced by a process known as nature printing, which is a practice of obtaining direct or indirect impressions of natural objects through various printing techniques.

According to Roderick Cave's *Impressions of Nature: A History of Nature Printing* (2010), the technique used for Duthie's book is known as lithographic transfer printing. Although this technique was widely used in Europe, Thomas D. Bona, Superintendent of the Thomason College Press in India, independently developed this process in Roorkee City, India. Firstly, a plate was made by applying ink onto the surface of a selected grass specimen and later rubbed on specially prepared paper. The print on paper was then transferred onto a lithographic stone which, in turn, was used for mass printing.

Conventionally, illustrations in early botanical books were hand drawn by skilled artists. Nature printing enabled the accurate reproduction of a plant's image without needing an artist. The botanical accuracy of the plates, which Duthie vouched for, made it possible for agricultural officers and farmers to identify Indian fodder grasses easily. In addition, the plates were also meant to be a companion to Duthie's monograph, *The Fodder Grasses of Northern India*, published in 1888.

Illustrations of the Indigenous Fodder Grasses of the Plains of North-Western India will be featured in the upcoming exhibition, *Capturing Nature*, at the Botanical Art Gallery from 29 September 2023 onwards.

Martina Yeo
Michele Rodda
Herbarium & Botanical Art Gallery

