Gardenwise

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Articles

Regular Features

Cover
Ceratina ridleyi, one of the bees that Henry Ridley studied during his time as Director of the Gardens. This species was collected by Ridley in 1903, and is named for him. *(Photo credit: Zestin Soh)*

Opposite page
Dr Jana Leong-Škorničková giving a guided tour of the Gardens during the 8th International Zingiberales Symposium.

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Group Direction

Dear Readers, it is a great pleasure to introduce this issue of *Gardenwise* as the Singapore Botanic Gardens enters its 160th year. The actual official date of the Gardens' founding was 24 December 1859, so our big birthday is still to come later this year, but we will be celebrating it throughout. Here we might reflect on how the Gardens' world has evolved over this long stretch of time, from semi-private pleasure park for Singapore's 19th century elite of the Agri-Horticultural Society to the modern people's garden and high tech scientific institution it is today. What would Lawrence Niven, James Murton, Nathaniel Cantley or, for that matter, the illustrious first director, Nicholas Ridley, have thought of the idea that a tree in the Gardens could be identified by means of its DNA barcode (see pages 6–8)? Equally significant is the international outreach that now typifies the Gardens' work, a good example being last year's 8th International Zingiberales Symposium hosted by us in July, which included a visit to and dinner at the Singapore Garden Festival for the many participants from around the world (pages 9–12). Ridley would have been impressed, I'm sure, especially since it was he who started the Gardens' now long-established expertise in this economically important order of plants. He was not only a good botanist, but rather a polymath, whose interests also included geology and zoology – see the piece about Ridley's bee (pages 22–23). It was also Ridley who started the Gardens' interest in fungi and thus it is especially appropriate that we have two contributions on these fascinating non-plants in this issue (pages 20–21 and pages 28–29).

As well as hosting international meetings, our staff often represent Singapore at gatherings abroad, such as those reported on here at Cape Town (South Africa) and Sendai (Japan), pages 34–39. At home, we have articles on historic specimens that survive in our living collections (pages 13–19), edible local weeds (pages 30–32), another instalment on *Dracaena* (pages 3–5) and our attention is drawn to the extraordinary *Baikiaea insignis* (page 40), a leguminous tree with a generic name made up of six vowels and only two consonants! Returning to Murton and Ridley again, we have the monument celebrating the centenary of the first planting of Brazilian Pará Rubber in Palm Valley in 1877 (see back cover), a plant that was to change the world and is still of vital importance for all who travel by air, since natural rubber latex is essential for the manufacture of aircraft tyres.

Our 160th year is going to be rather special in a number of ways, but I will leave it to the next issue of *Gardenwise* to report on or preview these. Watch this space!

Nigel P. Taylor
Group Director
Singapore Botanic Gardens

Lim Hock Lye, 'Uncle David' (1945–2018)

Known as 'Uncle David' to many, Lim Hock Lye passed away peacefully on 13 December 2018, at the age of 73. He spent his last conscious moments playing with his granddaughters at home, in the company of his wife.

Uncle David spent much of his life working with orchids. He raised the standard of orchidology at the National Orchid Garden, contributing significantly to the breeding and selection of desirable hybrids for orchid naming and growing. Uncle David's most notable achievements include *Aranda* Lee Kuan Yew, a breakthrough for the genus in having large green and yellow flowers, and *Renanthera* ASEAN 2018, a fast-flowering hybrid unlike others of the genus that flower only upon reaching a certain height. He helped the Singapore Botanic Gardens to win eight challenge cups at the Singapore Orchid Show 2016 and bettered this feat in 2018 with 18 challenge cups in total at the Singapore Garden Festival and Singapore Orchid Growers' Association orchid shows. As a Master Hybridiser at the Orchid Society of Southeast Asia, Uncle David has also received the society's Eric Holttum Award twice, first in 1987 for *Phalaenopsis* Amber Delite, and again in 2014 for *Dendrobium* Margaret Thatcher 'Iron Lady'.

Everyone could tell that Uncle David loved his job very much. He was always earliest to arrive at the nursery, usually before 6.30 am. Colleagues would be greeted by his cheerful "Good morning!" and the aroma of toasted bread and freshly brewed coffee. He would spend the day breeding orchids and checking on his hybrids to ensure that they were doing well. Ever the avid photographer, he would take the most exquisite photographs of newly created hybrids and landscapes in the Gardens. He was always keen to share his knowledge and anecdotes about orchids with younger staff, teaching them everything from cultivation to breeding. He introduced many Gardens staff to some of the rarest orchid species in the world and could always expound at length on old orchid hybrids, many of which are no longer to be found in the orchid industry.

Uncle David first started work at a shipping company at 20 years of age. It was then that he met his wife, Ame, at a soya bean stall near the record shop where she worked. At the same time, he started growing orchids on the rooftop of his office, often receiving complaints due to the water from his pots dripping onto the floor below! Mesmerised by the fragrance of *Phalaenopsis bellina*, he decided to devote his career to orchid growing and breeding. David started out by operating a small orchid farm in Jalan Kayu, David Lim Orchids, for a period of ten years. Later, he worked as general manager of the Mandai Orchid Garden before joining the National Orchid Garden in 2008.

On weekends and holidays, Uncle David would cook either Western or Chinese food for the family. His specialty was traditional Peranakan cuisine, including *itek chin* (braised duck), *ayam siok* (tamarind chicken), and coconut candy. He was nicknamed the 'Satay Man', for he could always be seen barbecuing satay handmade by Ame during family parties. The couple even had a short stint selling satay at the Raffles Hotel in the early 1980s! Uncle David was also adept at sewing and he often made teddy bears and blankets for his children and grandchildren.

Those who have known Uncle David will remember him fondly as a calm, cheerful, endearing, knowledgeable and talented gentleman. We will strive to sustain his legacy as one of the region's foremost orchid enthusiasts, growers and breeders.

Sheryl Koh
Mark Choo
National Orchid Garden

Native *Dracaena* in Singapore – Part 1, Cantley's Dracaena

As mentioned by Henry Ridley, the Gardens' first Director, *Dracaena* species are by no means an easy subject to study. This is partly because the leaves vary a lot in size even within a single plant, and the flowers and fruits of most species are very similar. Unfortunately, Dracaenas do not flower very often, and their flowering time is rather unpredictable. In the last issue of *Gardenwise*, we featured several naturalised species in Singapore that flowered *en masse* following a cold spell in January 2018, and the dip in temperature also encouraged various native species to flower across the island. In this and future issues of *Gardenwise*, we will feature some of these *Dracaena* natives as we progress toward a new treatment of the genus that will be published in the upcoming *Flora of Singapore*.

In 1896, Ridley wrote an account on Dracaenas of Peninsular Malaysia, including Singapore. A refined version was published in the *Flora of Peninsular Malaysia* in 1924, but since then, there has been little progress in understanding the diversity of this genus in this region. Today, there are seven species known to be native to Singapore. Already a challenge to study these plants from living material, this task is even harder when dealing with dried herbarium specimens. Unless the specimens are accompanied by detailed notes regarding the habit, size of the plant and other observations which are not apparent from dried samples, differentiating such material into species is difficult. It is therefore not surprising that certain species have been described more than once, even by the same author (!), while others have gone unnoticed.

Dracaena cantleyi, commonly known as Cantley's Dracaena, is perhaps the easiest native *Dracaena* to find and identify. The species was first collected in Singapore by a Danish botanist, Nathaniel Wallich, in 1822. However, the name used by Wallich, *Dracaena*

Botanical illustrations of *Dracaena cantleyi* from our archives. (Left) A painting by an undetermined artist dated 1892 and labelled as *Dracaena aurantiaca*, and (right) a painting of the fruits by D.N. Choudhury dated 1899. *(Courtesy of the Singapore Botanic Gardens Archives)*

Nathaniel Cantley, former Superintendent of the Gardens. *(Courtesy of the Singapore Botanic Gardens Archives)*

A young plant from Seletar with a beautiful new shoot and marmorate leaves.

A flowering plant in its natural habitat in the Nee Soon Freshwater Swamp Forest.

aurantiaca, was not validly published until the 1890s (by the famous British botanist Joseph Hooker). By that time, though, the species had already been given two other names (!), both also based on collections from Singapore. Nathaniel Cantley, Superintendent of the Gardens from 1880 to 1888, collected specimens of this species and brought them with him to the Royal Botanic Gardens, Kew. There the species was formally described by J.G. Baker in 1881. His description was based on a dried leaf from a specimen collected by Cantley, which had no obvious markings on it. A few years later, living material from a flowering specimen was sent to Kew from the Singapore Botanic Gardens. With obvious spotting on the leaves, it was described by J.G. Baker once again (in 1889) as a new species, *Dracaena marmorata*. There is no doubt that the three names refer to the same species, and the rules of botanical naming mean that the oldest of the names, *Dracaena cantleyi*, is the one that needs to be applied. Despite this, the name *Dracaena aurantiaca* still remains commonly used.

Dracaena cantleyi grows as a large shrub or sometimes as a small tree, with few or no branches. Remarkably, the young plants have shiny leaves that are beautifully marmorate (veined or streaked like marble) with lighter circular spots. As the plant grows larger, this feature becomes less prominent. The branched inflorescence is erect and rather large, up to half a metre in length, with a multitude of flowers that are arranged in small tufts of three to five flowers each. The individual flowers are about an inch long, and as in most *Dracaena* species, start to open at dusk. They fully open later in the evening with the tepals flexing backwards, and by dawn the flowers are closed again. In Singapore, the species has two different forms – the tepals of the prettier one are richly tinged with purple on the outside, while those of the plainer one are light green. The ripe fruits are orange and almost the size of a cherry.

Dracaena cantleyi is common in suitable habitats in Johor, and has also been collected from Sumatra and Borneo. In Singapore it is frequently encountered in swampy parts of the primary forests of our nature reserves, and with some luck, may be encountered on the trails around MacRitchie Reservoir. In the Gardens, it is planted around Saraca Stream which is easily accessed from Tanglin Gate.

Cantley's Dracaena has great ornamental potential and indeed, it has been established in the horticulture

Photographs showing the inflorescences and opened flowers of the two forms of *Dracaenea cantleyi* in Singapore, taken in the middle of the night: one form with purple-tinged tepals (top), and the other with green-tinged tepals (bottom).

trade and plants are available in local nurseries. Its potential uses go beyond the beauty of its leaves, however, and apply not only to humans. In 2003, researchers in Borneo noticed orang-utans using the leaves of *Dracaena cantleyi* in an unusual way. They chewed the leaves to make a foamy mixture of the leaf sap and saliva which they then applied to their bodies. A chemical analysis of this mixture revealed that the leaves have anti-inflammatory properties, and indeed the people living near the orang-utans are known to use the leaves to reduce inflammation.

The 'dragon's blood' sap of certain species of *Dracaena* has been used medicinally since ancient times. As with *Dracaena cantleyi*, we have observed foamy substances in the leaves of many species that we have worked with. While their biologically active properties still need to be determined, it is entirely possible that this genus holds untapped medicinal potential.

Matti Niissalo
Molecular Biology Laboratory

Jana Leong-Škorničková
Herbarium

All photos by Jana Leong-Škorničková unless otherwise indicated.

Reference

Morrogh-Bernard HC, Foitová I, Yeen Z, Wilkin P, de Martin R, Rárová L, Doležal K, Nurcahyo W, Olšanský M (2017). Self-medication by orang-utans (*Pongo pygmaeus*) using bioactive properties of *Dracaena cantleyi*. *Scientific Reports* 7, article number: 16653.

DNA barcoding for the identification of a *Pterocarpus* tree

Pterocarpus is a pantropical genus of about 35 to 40 species of trees distributed in tropical areas of Africa, the Neotropics and Southeast Asia. Perhaps the most familiar of these in Singapore is *Pterocarpus indicus*. Commonly known as Angsana, it is native to the region and widely planted here, including in places such as Orchard Road. In the Gardens, our collection of *Pterocarpus* trees includes not only *Pterocarpus indicus*, but also *P. angolensis* from Africa, *P. santalinus* from South India, and *P. rohrii* from the lush rainforests of South America.

One of the most majestic examples from the Gardens' *Pterocarpus* collection is a 30-metre-tall specimen with a dense, dome-shaped crown that was until recently labelled as *P. rohrii*. Located on Lawn E and overlooking Swan Lake, it is perhaps no surprise to know that this large tree is more than 60 years old. It was recorded to have been planted in 1956, from a seed gifted by the Bogor Botanic Gardens in the year 1951.

Recently, as this tree was being considered for Heritage Tree status, the Molecular Biology Lab was tasked with verifying its identity. We collected leaves from the tree, extracted DNA from them, and sequenced the DNA at five different genetic barcode regions. These genetic barcodes are from regions of the DNA which are known to vary between species. Using an existing dataset of DNA sequences of all known *Pterocarpus* species, we compared the genetic barcodes of our tree with those contained in the database. The comparison of genetic material at multiple regions helped to improve the specificity of the results, as we were able to compare the best match at one region with the best match at all of the other regions.

Upon determining that the closest match was to *Pterocarpus indicus*, we sequenced the DNA of 11 other known *P. indicus* trees for genetic comparison. Of these 11 trees, two were from the Botanic Gardens. The other trees had been planted at Toa Payoh Lorong 8, a location determined by Dr Fong Yok King from the Centre for Urban Greenery and Ecology (CUGE) and collaborators at the Temasek Life Sciences Laboratory in an earlier

The Lawn E tree, shown in the centre. *(Photo credit: Choo Le Min)*

An Angsana at Changi with the more typical form seen on this species in Singapore.
(Photo credit: Choo Le Min)

A flowering specimen of the tree on Lawn E that was collected in 2015. At that time the tree was identified as a *P. indicus* but doubts remained over its identity due to its atypical form as it lacked the long, pendulous branches normally associated with *P. indicus*.
(Photo credit: Choo Le Min)

study to have the highest genetic diversity of Angsanas in Singapore. The individual trees that we selected for DNA sampling were known to have originated from a variety of locations such as Indonesia, Myanmar, Singapore and Papua New Guinea. Hence, we could be sure that our sample of trees was representative of the diversity found across the natural range of the species.

Sure enough, at each genetic barcode region, the sequence of our Lawn E tree was found to be more similar to the other *Pterocarpus indicus* sequences than those of the other species in the database. The next most similar sequences belonged to four other Asian *Pterocarpus* species – *P. macrocarpus*, *P. marsupium*, *P. santalinus* and *P. dalbergioides*. However, *P. indicus* is morphologically distinct from those other species, and can be distinguished from them by its leaf and stem characters.

Although our genetic study strongly suggested that the Lawn E specimen is *Pterocarpus indicus*, the tree does not have the pendulous branching habit with long, drooping branches that we typically see on Angsana trees planted

The flower of a *Pterocarpus indicus* tree. *(Photo credit: Edmund Chia)*

Flowers of a cultivated *Pterocarpus rohrii* tree in the Gardens, taken in 2014.
(Photo credit: Koh Sin Lan)

in Singapore. Given this, we wanted to take a further step to rule out the possibility that it could be *P. rohrii*, as its label indicated. For this, we needed to compare fertile material from our Lawn E tree with similar material from *P. rohrii*. Luckily, although our tree was not flowering or fruiting at the time of our study, a search of the herbarium yielded a flowering specimen from the tree that had been collected in 2015. Also held in the herbarium were flowering specimens of *P. rohrii* trees cultivated in the Gardens. Thus, we were able to compare their flowers and rule out the possibility that our tree could be *P. rohrii* and thus confirm that it is indeed *P. indicus*.

Our work was greatly facilitated by our access to fresh material from the living collections at the Gardens and elsewhere in Singapore that could be used for genetic sequencing. In addition, research done by others informed us about the genetic diversity of *Pterocarpus indicus* trees planted in Singapore, and also provided a dataset of the barcode sequences of all species of *Pterocarpus*. Previously collected herbarium specimens were also invaluable in confirming its identity. The use of the Gardens' living collections and herbarium specimens, along with molecular biology techniques, were indeed complementary in helping us to determine the identity of our tree on Lawn E. Who knows what other botanical mysteries these techniques might help to solve next?

Choo Le Min
Herbarium
Molecular Biology Laboratory

The author would like to thank Dr Gillian Khew and Elango Velautham for their helpful discussions and guidance regarding this project; Elango Velautham, Edmund Chia, Jane Lau and Ooi Zong Yu from the Gardens' Horticulture & Operations team, and Seet Hui Ying from NParks' Streetscape division for facilitating the collection of Pterocarpus *leaf samples; Dr Fong Yok King for sharing information on the genetic diversity of Angsana trees in Singapore; and Dr Bente Klitgaard from Kew Gardens for providing the dataset of barcode sequences for all* Pterocarpus *species.*

The 8th International Zingiberales Symposium – continuing a legacy of ginger research in the Gardens

The Ginger order (Zingiberales) consists of eight plant families and about 3,000 species, many of which are economically important as ornamentals and as sources of medicines, spices, fruits and vegetables. The Singapore Botanic Gardens has been involved in ginger research since its beginning and has made significant contributions to understanding the diversity of gingers, mainly in Peninsular Malaysia but also in surrounding countries in Southeast Asia (for more details see *Gardenwise* 28: 4–5). The Gardens' first Director, Henry Ridley, described well over 300 ginger species as new to science. Eric Holttum, the third Director of the Gardens, was another prominent botanist who, apart from orchid breeding and studying ferns, also developed a love of gingers, and wrote the main scientific account of gingers in Peninsular Malaysia. In October 2003, the Gardens officially launched its Ginger Garden, which showcases over 500 species and cultivars of the eight families of the ginger order in an area of about 1 hectare.

In July 2006, the Gardens hosted the 4th International Ginger Symposium. This event is organised every three years and provides a platform for ginger specialists to present their latest findings from various fields of ginger research, exchange ideas and start new collaborations. Following the symposium, the Gardens employed a full-time ginger researcher to continue the legacy of Ridley and Holttum, and to further develop the Gardens as a major centre of ginger research. Since 2006, we have built up a large reference collection in the herbarium, and have more than doubled our living collection of gingers. Various international research projects have also been started, as well as an intensive conservation programme for Singapore's native gingers.

A group photo of the symposium participants. *(Photo credit: Derek Liew)*

Dr Leong Chee Chiew of NParks (left) and Mr Tan Tien Po of SingPost at the 'Singapore Native Gingers' stamp launch. *(Photo credit: Derek Liew)*

Fast forward 12 years and for the second time, the Gardens hosted the International Zingiberales Symposium. For the 8th edition of the symposium, held from 23 to 27 July 2018, we welcomed over 100 delegates from 21 countries. The current Director of the Gardens, Dr Nigel Taylor, greeted the participants and introduced Dr Leong Chee Chiew, Deputy CEO of the National Parks Board (NParks), who gave the opening address. The highlight

of the opening ceremony was an official stamp launch by Mr Tan Tien Po, Senior Vice President of Domestic Mail, Singapore Post (SingPost). SingPost and NParks worked together for over a year to conceptualise and create a set of stamps featuring four Singapore native gingers. Their designs are largely based on beautiful botanical paintings by Waiwai Hove. SingPost went the extra mile and designed a special cachet available only on the launch day and commemorating the symposium.

After the obligatory symposium photo and a tea break, the delegates and invited guests were treated to two very interesting keynote talks. Dr Timothy Barnard, historian from the National University of Singapore, delivered a talk entitled 'Not so mad: H.N. Ridley, science and colonial society'. The talk provided a good overview of the enormous impact Ridley had on the economy and society of Malaya and the Straits Settlements, although he received almost no recognition for it. Dr Barnard explored how Ridley, the leading colonial scientist in the Straits Settlements at the time, became a controversial figure, giving us a rare glimpse into his character. He also elaborated on the role the Gardens played in Singaporean, imperial and botanical history.

Singapore Native Gingers Stamp Set

The Singapore Native Gingers stamp set was launched on the first day of the symposium. SingPost designed a special cachet for the stamps (front cover shown above left), available only on the day of the launch. *(Credits: Scanned images by Bazilah Ibrahim; ginger photographs shown below by Jana Leong-Škorničková)*

Singapore is home to at least 26 species belonging to the Ginger order. As most of the native gingers are rare, NParks, over the past decade, has been actively involved in the conservation of these plants to help ensure that they will be sustained for generations to come. Four native species which are still found in primary forests are featured in the stamp series issued on 24 July 2018 by SingPost. These stamps showcasing Singapore's natural heritage mark the occasion of hosting the 8th International Symposium on Zingiberales by the Singapore Botanic Gardens.

Zingiber singapurense – 1st Local

This small but beautiful plant from the Ginger family (Zingiberaceae) was only described as new to science in 2014 and is found only in Singapore. Although seed-set has never been observed, the species seems to survive in the remaining fragments of primary forests due to its ability to form small plantlets along the old stems. As there are only a few populations left, it is considered to be Critically Endangered and is receiving special attention under NParks' Species Recovery Programme.

Cheilocostus globosus – 70¢

This shrubby species from the Spiral Ginger family (Costaceae), with bright orange flowers appearing at ground level, was Presumed Nationally Extinct in Singapore until it was rediscovered in 2012. The species propagates well from stem cuttings and is easy to grow. Due to its tolerance of a fairly wide range of habitats, conservation efforts have been extremely successful with plants now being established not only in Nature Parks, but also in urban settings along roads in Singapore.

The second speaker, Dr W. John Kress, Distinguished Scientist from the Smithsonian Institution, National Museum of Natural History, delivered a talk entitled 'Coevolution in the Anthropocene: plant-animal interactions in the Zingiberales'. Throughout his eye-opening talk, which was enhanced by beautiful videos, Dr Kress demonstrated the very complex interaction between various animal species and plants of the Ginger order, and pointed out that some of these interactions may not be sustained in the future given the rapid environmental changes happening on our planet today.

Lunch was held after the two keynote presentations, then the symposium proper started. A total of 45 talks and 36 posters were presented in various sessions focusing on molecular phylogeny and taxonomy, morphology, conservation, pollination and reproductive biology, phytochemistry, ethnobotany and horticulture. There was also a special session dedicated to the Banana family (the Musaceae). Indeed, those few days of presentations were both informative and exciting and the information exchanged proved that gingers continue to surprise us on many levels.

Dr John Kress of the Smithsonian Institution, National Museum of Natural History, giving a talk during the symposium. *(Photo credit: Derek Liew)*

Posters were exhibited throughout the symposium in the Green Pavilion and along the corridor leading to the Function Hall at Botany Centre. *(Photo credit: Derek Liew)*

Phrynium hirtum – 90¢

Phrynium hirtum, in the Prayer Plant family (Marantaceae), is native to Southeast Asia but it was only recently discovered that it occurs in the wild in Singapore. As it is currently known from only a single population in one of the primary forest patches, it is classified as Critically Endangered. The young leaves have a dark purple-red tinge on the under-surface, making this plant potentially suitable as an ornamental for shady and moist areas.

Conamomum xanthophlebium – $1.30

Native to Singapore and neighbouring countries, *Conamomum xanthophlebium* from the Ginger family (Zingiberaceae) is a handsome species restricted to primary forests. The leafy shoots may reach 5 m in height, although in Singapore, where it is rare and Critically Endangered, this species only rarely exceeds 3 m. The bright red inflorescences are often overlooked as they appear at ground level, often partly covered in leaf litter. The flowers are reported to be used in Malay curries. The species is hard to establish as an ornamental but can be seen in our forests, for example in the Bukit Timah Nature Reserve.

Dr Jana Leong-Škorničková giving a lively tour to symposium participants.
(Photo credit: Pearl Lam)

The 'Zingiberales – beauty in diversity' exhibition highlighted the many ways that plants in the Ginger order are useful to people. *(Photo credit: Grace Lee Khee Shiang)*

Botanical art from the Gardens' Archives was on display at the exhibition.
(Photo credit: Grace Lee Khee Shiang)

The participants were also treated to a visit to the Singapore Garden Festival at Gardens by the Bay, which was where the symposium dinner took place. By noon of the final day, the last talk had been delivered and the results of the best poster competition had been announced, leaving time in the afternoon for a guided tour of the Ginger Garden and other parts of the Singapore Botanic Gardens. Before we knew it, the symposium was over.

In conjunction with the symposium, an exhibition was held at the CDL Green Gallery entitled 'Zingiberales – beauty in diversity'. Aimed mainly at the general public, this exhibition provided a pictorial overview of these fascinating, beautiful and economically important plants. The first part of the exhibition provided a general introduction to the eight families of the Ginger order, showcasing their incredible diversity in terms of size, colours and the habitats in which they occur. The second part explained why botany and plant taxonomy are still important in today's world, and featured various ginger research done in the Gardens as part of international collaborations. Visitors could see the process of plant collecting during field trips to get a better understanding of what it is like to be a botanist. The third part of the exhibition took visitors into the familiar setting of a home. Starting in a 'kitchen', visitors were reminded that gingers are important in our daily lives. Between bananas, curry, ginger flavoured drinks, cosmetics, medicines and ornamental plants, life wouldn't be the same without gingers!

The last part of the exhibition featured botanical paintings from our archives, mainly of plants that have flowered in the Gardens over three different eras. The oldest set originated from two famous brothers, James and Charles de Alwis from Sri Lanka, who were hired by Henry Ridley and created their artworks between 1890 and 1908. A second set featured paintings by Juraimi bin Samsuri, a local artist who worked for the Gardens until 1971. The most recent set was painted by Waiwai Hove from our ginger collections between 2017 and 2018. Thirteen out of 15 of these paintings are featured in the Gardens' calendar for 2019.

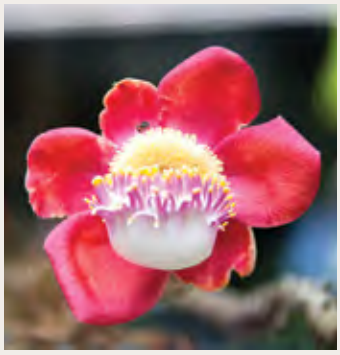
Jana Leong-Škorničková
Herbarium

We would like to acknowledge the generous financial support provided by Mr Tan Jiew Hoe, who enabled almost 40 students and researchers, mainly from the Southeast Asian region, to participate in the symposium.

Historic specimens in the Singapore Botanic Gardens

Since publication of the Botanic Gardens' guide to its historic trees, entitled *Tall Tales*, in 2014, we have identified a significant number of additional historic specimens in the Botanic Gardens including some that are not trees in the conventional sense, but are nevertheless worthy of mention here.

Corner's Cannonball – in the Ginger Garden behind the waterfall



The Cannonball tree (*Couroupita guianensis*) is one of Nature's most extraordinary woody species. At first sight the young tree looks like any other, that is until it starts to develop the curious snake-like flowering stems from its trunk. These bear amongst the weirdest of flowers at their tips. When examined closely you can see that inside the colourful flower is a folded lip-like structure covered in fleshy bristle-like stamens, which a bee has to squeeze inside if it wants to get at the nectar on offer. Most flowers eventually fall to the ground, but a few are successfully pollinated and begin to develop the spherical woody fruits, which really resemble rusty cannonballs when fully grown. The Botanic Gardens has a number of Cannonball trees, but this one is special. In 1934, the Gardens' Assistant Director, E.J.H. Corner, was returning to Singapore from home leave in England. The ship carrying him docked at Colombo (Sri Lanka) and the captain told Corner that they would be in port just eight hours before sailing on to the final destination. Corner decided to use this brief opportunity to visit the famous botanic garden of Peradeniya at Kandy and hired a car to drive there. It is a long journey there and back, which must have occupied most of the eight hours. Upon arrival at the garden Corner could have had little time to explore it, but managed to steal three fruits from the spectacular Cannonball tree that can still be seen at Peradeniya. Our tree, which now has a girth of 3.3 m, was grown from one of these 'stolen' seeds! Others in Tanglin Road are likely from the same source. Later in life Corner would visit the Amazonian forest in Brazil where the Cannonball tree grows, but we do not know if he ever saw it in the wild. However, while in Singapore he is best remembered for training Berok Pig-tailed Macaques to collect botanical specimens from the high forest canopy for his research projects. Here, there is a connection with the Cannonball tree, since we know that monkeys find the rather smelly purplish pulp in which its seeds are imbedded very appetising.

Common Teak – beside Botany Centre

In 1875 the Botanic Gardens began to focus on trialling plants with economic potential, including timber trees. From 1879 many such species were planted in the Economic Garden in what is now called the Bukit Timah Core. However, for educational purposes some were also located in the public parts of the Gardens, such as our Common Teak (*Tectona grandis*), which was raised from seed in 1884. Teak does not grow particularly well in Singapore's constantly humid climate, since it prefers a seasonal regime, such as in its native haunts in northern Thailand and Myanmar, where there is a long dry period each year. In those areas the tree will shed most of its leaves before growing a new set when the rains begin again. Our tree has taken 135 years to reach its present size (the trunk has a girth of 2.3 m), but has at least defied the comments in Henry Burkill's 1927 *Illustrated Guide* to the Gardens, which stated '... it is small and, as teak scarcely stands the climate, is not likely to become a large tree.' It is now the largest specimen in Singapore.

West Indian Locust – on Corner House Lawn

Rather like the Cannonball trees, this species (*Hymenaea courbaril*) is seldom planted today. This fine specimen with a girth of 3.2 m is not the first to be grown in the Botanic Gardens, but is the largest current example. A famous huge specimen once grew on Lawn H, but was destroyed by repeated lightning strikes before the days when we installed copper cables to protect our trees from these electrical discharges. The wood of this species, native to the Caribbean and tropical South America, is very dense and has many uses, being reasonably resistant to insect attack. The tree belongs to the important Legume family (Fabaceae subfamily Caesalpinioideae), which is well represented in nearly all tropical vegetation types and includes many valuable timber species. Indeed, it is likely that the West Indian Locust, or Jatobá as it is known in Brazil, was originally introduced to the Gardens for trialling as a timber tree.

Mandela's Giant Cola – at Orchid Plaza beside the path to the Rain Forest

In March 1997, South African President, Nelson Mandela, was received at the Singapore Botanic Gardens for a VIP Orchid Naming in his honour. On the same occasion this West African *Cola* tree was dedicated to him. This great tree is a fitting tribute to a great man – it now has a girth of 2.8 m. The Giant Cola (*Cola gigantea*) is nowadays seen as a street tree in Singapore, such as along Alexandra Road, but its relative, *Cola nitida*, should be better known as it was the source of the original flavouring used in, and the name given to, popular cola drinks, such as Coca-cola and Pepsi-cola.

Copaiba Balsam – on Lawn H near Main Gate Road

Copaifera is a genus of more than 20 species of woody legumes (family Fabaceae) from tropical America and Africa. Our species is famous for the oil found in its trunk, which has many medicinal uses as well as being similar to diesel. The timber of the tree is also often utilised for a variety of purposes in the Caribbean region. Our *Copaifera officinalis* specimen was received from Kew Gardens (England) in 1926 and planted in its present position the following year. It now has a girth of 2.7 m. In nature the tree is normally deciduous during the dry season, but in Singapore it retains most of its leaves throughout the year. Its seeds are dispersed by birds that are attracted by the fleshy aril which surrounds part of the seed.

Jelutong – south of Maranta Avenue, beside the small forest path that links the Bandstand area with the Ginger Garden

The Jelutong (*Dyera costulata*) is a native of Singapore's flora, our specimen being one of a number of fine examples in the Gardens' Rain Forest and not planted. It stands not very far away from a onetime giant of the species, which was recorded from the west side of Bandstand Hill more than a century ago, but was most likely lost to a lightning strike before the Gardens installed lightning protection systems on its tallest trees. Ours may well be a descendant of that great tree and has already attained a girth of 5 m. Like other members of the Periwinkle family, Apocynaceae, the Jelutong has its entire trunk, branches and leaves filled with whitish latex, formerly used to make chewing gum, while the wood has been used for graphite pencils. A notable feature of the Jelutong, apart from its often immense size, is that the trunk is cylindrical down to the ground and quite devoid of the buttresses displayed by so many rainforest trees. The crown of the tree often emerges from the forest canopy, which it dominates. *Dyera* is named after Sir William Thistleton-Dyer, 1843–1928, former Director of the Royal Botanic Gardens, Kew (England) and son-in-law of Kew's second Director, Sir Joseph Hooker.

Keluak or Kepayang – beside the Pauh Damar on Lawn H opposite the Sun Garden

This tree species is famous for its contribution to Malay cuisine. Though fairly poisonous – when damaged its tissues emit hydrocyanic acid (cyanide!) – the seeds can be eaten if treated in certain ways, such as boiling followed by a long fermentation, and are famous in Nonya restaurants as *buah keluak*, when served with chicken. The tree that bears them is most unusual for its large sunflower-like leaves and ours is the only mature example in Singapore, with a girth of 2.7 m. That it is rarely planted is not surprising, since the seeds are packed into massive fruits weighing as much as 2.5 kg! *Pangium edule*, as it is known botanically, is native to the lowland forests of Southeast Asia and has various traditional uses in spite of being poisonous; for example, various parts of the tree can be pounded and thrown into streams to stupefy fish. While the Latin epithet *edule* means 'edible', only the soft yellow flesh that surrounds the seeds in the fruit in the raw state is less poisonous, but even so we don't recommend that you try it.

Pauh Damar – beside the Buah Keluak Heritage Tree opposite the Sun Garden

Often mistaken for the common Indian Mango, the Pauh Damar (*Mangifera pentandra*), seen here on the right, is its rare relative, found in Singapore only in the Botanic Gardens – a second tree can be seen near the Plant House. The species is regarded as Critically Endangered. It is distinguished from the true mango by its leaves, which usually lack a wavy margin, and its flowers with three to five fertile stamens, rather than only one (hence the botanical epithet *pentandra*, meaning 'with five stamens'). Our specimen has an attractive habit, the branches sweeping down to the ground and clothed in very shiny, evergreen leaves (the trunk has a girth of 2.1 m). The fruits are said to be edible and fragrant, with green skin when ripe, enclosing pale orange, sweet, watery flesh with few fibres. See the previous issue of *Gardenwise*, 51: 12–13, for more details on this species.

Ketapang – in the Ethnobotany Garden

This large *Terminalia catappa*, that towers nearly 20 m tall, overlooks the north side of the Ethnobotany Garden. Its mature crown has a wide-spreading vase shape. Fittingly this tree has many uses for human livelihood, since almost every part can be used for food, plant fibre or timber. It is native to sandy coastal habitats and is popularly used as a beach stabiliser, its vast roots compacting sands and poor soils and its heavy leaf fall serving as mulch to enrich the soil beneath. It is commonly referred to in Malay as Ketapang (hence the epithet *catappa*), or as the Indian Almond and Singapore Almond, owing to its kernel having a taste very similar to almonds. Often growing to heights of up to 35 m, this deciduous tree sheds its leaves twice a year. Old leaves turn a bright red before senescing, an unusual feature in the tropics, but reminiscent of autumn in cold temperate regions. Its edible fruits are especially attractive to bats, which are its main means of seed dispersal, although in Singapore it also attracts the introduced Australian White Cockatoo. It has been recorded that the fruits can also be dispersed by monkeys and in seawater. Its bark, roots and green fruits can be used for tanning leather and provide a black pigment for dyeing cottons and rattan. Its timber was used in the past for constructing houses, boats and carts, and was at times used in furniture making. Its oil and leaves are also used to treat ailments. In Singapore, the leaves of this tree are popular among aquarium owners who place leaves in their tanks for the antibacterial effect of the natural release of tannic and humic acids as they decay.

Kempas – two examples, one between Corner House Gate and Corner Walk (girth 4.1 m), and the other on Lawn K (girth 2.9 m)

The Kempas (*Koompassia malaccensis*) is one of the most characteristic trees of Southeast Asia's lowland forests and is found wild in the Botanic Gardens' Rain Forest. Although once common it is nowadays regarded as Endangered in Singapore. Attaining more than 50 m in height, it has a strongly buttressed trunk whose timber is very hard and heavy, being sought after for construction purposes and at one time used for railway sleepers. We are uncertain as to whether our specimens were planted as timber trees or are self-sown native examples. The single-seeded winged fruits are produced towards the end of the year and float down to the ground on the breeze. Kempas Road in Singapore is named after this species.

Meranti Melantai – in the Rain Forest at the end of the former Liane Road

This giant Meranti (*Shorea macroptera*) was once common in the great forests that formerly clothed Peninsular Malaysia and Singapore. The name of the family Dipterocarpaceae refers to one of its genera that bears two-winged seeds, but those of our Meranti are three-winged. We are very fortunate to be able to admire this majestic specimen with a girth of 4.1 m, thanks to the foresight of the Gardens' earliest managers who decided to preserve our rainforest tract. The age of our tree can only be guessed at, but it was very likely already a giant when Raffles landed in Singapore in 1819. Gaze up into the crown of this great tree and wonder about all the events it has been sentinel to over its long life in the forest! Can we hear the roar of tigers that once passed it by?

Meraga – in the Rain Forest near the Palm Court entrance

The Meraga (*Pertusadina eurhyncha*) is a member of the Coffee family (Rubiaceae) which breaks the general rule that there are few big trees in the family. Indeed the Meraga is much bigger than the Yellow Cheesewood mentioned below, with a girth of 3.5 m and capable of emerging through the rainforest canopy. Our specimen survived the violent storms that hit the Rain Forest in the first half of 2016, while trees around it were felled. The trunk is very distinctive for its curious, almost woven appearance. This is a rare species and can otherwise be seen easily only by the main summit path in the Bukit Timah Nature Reserve.

Yellow Flame – at the edge of Jacob Ballas Children's Garden near Kheam Hock Road

The Yellow Flame (*Peltophorum pterocarpum*) is amongst Singapore's most familiar street trees, but few if any are as big as the Botanic Gardens' specimen at the edge of Jacob Ballas Children's Garden, with a girth of 4.5 m! The species is reckoned as a native of the island, though very rare in the wild state. Its abundant yellow flowers followed by coppery seed pods are a common sight, though nonetheless beautiful.

Yellow Cheesewood or Bangkal – at the north edge of the Foliage Garden

The Yellow Cheesewood (*Nauclea orientalis*) belongs to the Coffee family, one of the most important and diverse plant families in the tropics worldwide. The family is not especially noted for major tree species, but rather for the many understorey shrubs and herbs. Our Yellow Cheesewood is an exception, which makes a good sized ornamental tree with large leaves and compact heads of scented flowers (its trunk has a girth of 2 m). The timber can be used in wood-carving and the bark has been used in the treatment of stomach-aches and animal bites. The species is found wild in Indochina and Malesia, though not in Singapore.

Big African Baobab – just inside the Melati Gate

African Baobabs (*Adansonia digitata*) behave in a somewhat uncertain way in Singapore's climate, because they are used to a long dry season in their natural habitat, which they don't get here. Our tree is one amongst many specimens dotted around the Botanic Gardens and was moved to its present position when the Bukit Timah Core was developed in the 1990s. Despite being moved, it has done well and can now boast a girth of 5 m. It flowers too and sometimes produces the large lozenge-shaped furry fruits that are the food of African Elephants. This suggests that our local Asian bats are attracted to its smelly nocturnal flowers and successfully pollinate them.

African Oil Palms – in the Healing Garden and near the Fragrant Garden

In 1920, a small plantation of African Oil Palms (*Elaeis guineensis*) was established in the Economic Garden as a source of seeds for what would later become a major plantation industry in the Southeast Asian region. Six of these now historic palms survive within the Healing Garden and below the Fragrant Garden, one of those in the latter area having reached nearly 10 m in height. The plantation was probably established as a result of our former Director, Henry Ridley, having promoted the plant in his Agricultural Bulletin back in 1907, which created a demand for seeds. Prior to this the palm had been grown in the Gardens from 1875 as an ornamental subject. These very old Oil Palms look strange compared to those seen in modern plantations, because in great age the palms shed the bases of leaves that died much earlier in the palm's life and develop relatively smooth trunks, very unlike the younger specimens that grace our Nassim Gate Visitor Centre entrance, whose scaly trunks are full of epiphytes.

Doum Palm – in the National Orchid Garden

Hyphaene dichotoma (*H. indica*), as seen in the National Orchid Garden, is a most unusual palm, which unlike most of its family is a true tree, since it has a trunk below its repeatedly forking (dichotomous) branches. Our specimen must be nearly 100 years old as it is mentioned as a young plant in I.H. Burkill's 1927 *Illustrated Guide* to the Gardens as being on the Sun Rockery, which is where the Orchid Garden is today. The Doum Palm genus ranges from West Africa to parts of the Middle East, Madagascar and western India and is used for many purposes. The ancient Egyptians are said to have used fruits of one of its species as the first recorded flavouring for beer, long before hops became the norm. It is inside the National Orchid Garden because when designed, the garden took over the western part of Palm Valley, so there are many fine palms amongst the orchid displays, giving the garden height and character.

Nibung Palm clump – near the Heritage Museum

If you walk from our Holttum Hall Heritage Museum towards the pergola of hanging aerial roots or the Swiss Granite Ball fountain, you will pass a huge clump of Nibung Palm (*Oncosperma tigillarium*). This clump most likely dates from 1878 when Superintendent James Murton established a palm collection in this area of the Gardens. Over more than a century of growth, this clump has gradually become hollow in its centre as older trunks have died away. The hollow centre can now accommodate up to 15 adults or rather more school children and is fun to go inside and look up at the continually waving fronds of this palm, which seem to move even when there is no perceptible breeze. The trunks of this palm are fiercely spiny to prevent creatures climbing them to steal the unripe fruits. The species is native to the back-of-mangrove vegetation at the coast and in sandy areas inland. The resistance of the trunks to decay have suited them for use as seaside fishing *kelongs* driven into the seabed.

Ridley's Giant Bamboo – near Palm Court

In the late 19th century the Gardens' Director, Henry Ridley, was exploring the botany of the region and came across this village bamboo in Peninsular Malaysia. It was planted adjacent to Palm Court, beside what is now the route up from the Shaw Foundation Symphony Stage towards Nassim Gate. Later, a subsequent Director, Eric Holttum, decided it was a distinct species and described it in Ridley's honour as *Gigantochloa ridleyi*. Village bamboos are plants selected for their utility and Ridley's is particularly useful as it apparently rarely if ever flowers, meaning that the plant never dies after flowering, being a constant resource for the village folk. It is also one of the species exhibited in the Botanists' Boardwalk in the Learning Forest, but the original clump referred to above is magnificent and more than a century old.

Nigel P. Taylor
Group Director
Singapore Botanic Gardens

Cordyceps – the 'real deal'?

'Man-cultivated Cordyceps, everyone! Grab them before they are gone!' she said.

Plants and fungi have been used by practitioners of Traditional Chinese Medicine (TCM) to treat a variety of ailments since ancient times. Particularly, *Ophiocordyceps sinensis* (formerly known as *Cordyceps sinensis*) has long been highly prized for its healing properties. Commonly sold as Cordyceps in markets, it is used for a variety of ailments, ranging from the common cold to impotency and lung cancer. No wonder it is dubbed as a wonder drug!

Packets of man-cultivated Cordyceps at a market in the Cameron Highlands.

Ophiocordyceps sinensis is known as 'winter worm summer grass' or 冬虫夏草 in Chinese, because of the way it is formed. Despite its common name, it is not a grass or even a plant at all, but rather a fungus that grows on a caterpillar. The fungus attacks the caterpillars of Ghost Moths from the Hepialidae family, especially those from the genus *Thitarodes*, and produces the valuable medicinal herb that is used in TCM. The caterpillar is infected by the fungal spores in late summer, when it is vulnerable as it undergoes moulting. Through autumn, the fungal mycelia besiege the body of the infected caterpillar, which then moves vertically beneath the surface of the soil and eventually dies. During the winter, the fruiting body of the fungus grows out of the dead caterpillar's head, forms a bud and freezes. Hence, the 'winter worm' part of its name. Through the following spring and summer, the fruiting body continues to grow and emerges above the soil surface, explaining the 'summer grass' part of the name. The cycle then repeats with the spores stored in the fruiting body infecting other caterpillars.

The plant rhizomes of *Stachys sieboldii* advertised as Cordyceps in the market.

This fungus is prized not only for its healing properties, but because the species is limited to growing in only one place in the world — the Tibetan Plateau region at an elevation of 3,000 to 4,500 metres, where it is painstakingly harvested by hand. Its reported curative powers, combined with increasing scarcity and high market demand, have driven the prices up starkly over the years. As such, global TCM consumers are faced with many counterfeits on the market with similar morphological features as the genuine Cordyceps.

In fact, Cordyceps substitutes are sold locally in Singapore. At one market stall, for instance, we witnessed packets of 'man-cultivated Cordyceps' snatched clean by consumers believing that they were the real deal. To further

(Left) The tuberous rhizomes of *Stachys sieboldii* imported from China, and (right) locally grown man-cultivated Cordyceps from the Cameron Highlands.

Cooked rhizomes of the man-cultivated Cordyceps in a home-made chicken herbal soup recommended by the seller.

entice buyers, the experienced seller even threw in a few recipes with 'Cordyceps' listed as the main ingredient. Although the man-cultivated Cordyceps bore some resemblance to the real deal seen in the common traditional medicine halls in the neighbourhoods of Singapore, there was something odd-looking about them. In fact, they looked like the rhizomes of a plant. We found out from the seller that she had obtained her goods from the Cameron Highlands in Malaysia and decided to investigate further.

It turns out that the man-cultivated Cordyceps are the tuberous rhizomes of the Chinese Artichoke, *Stachys sieboldii*, belonging to the Mint family (Lamiaceae). Curious about the source of the false Cordyceps, we decided to make a trip to the Cameron Highlands to find out if the misconception of the Chinese Artichoke had originated there. In the highlands, we explored the local markets, hoping to find the Chinese Artichoke labelled or advertised as Cordyceps. We finally came to a row of stalls selling dried goods and there they were. Compared to the exorbitant prices found in the market for the real Cordyceps, these substitutes were being sold for a mere fraction of the cost. We purchased a few packets to bring back to Singapore and cooked them together in an herbal chicken soup, as suggested. They did not add any strong flavour to the soup but, unlike real Cordyceps, were crunchy, almost like an artichoke or cooked lotus rhizome. Needless to say, after a few bowls, we did not feel the extraordinarily good juju that the authentic Cordyceps is said to confer.

Real or fake *Ophiocordyceps sinensis*? Here are some of the ways that it can be differentiated from the Chinese Artichoke, but be aware that there are many other counterfeits out there as well.

	Cordyceps (*Ophiocordyceps sinensis*) – the 'real deal'	Chinese Artichoke (*Stachys sieboldii*) – the 'man-cultivated Cordyceps'
Appearance	Sclerotium takes the form of the caterpillar host, with four pairs of prominent feet-like protrusions along its 'abdomen'. Segments have fine longitudinal wrinkles.	Tuberous rhizome without paired protrusions. Internodes (segments) are smooth and sometimes have visible buds at the nodes.
Tenacity	Elastic or chewy	Crispy or crunchy
Colour	Light brown	Pale to slightly yellow
Odour	Mushroom-like	Almost odourless
Taste	Slightly sweet	Sweet and nutty

Regina Yeo S.W.
Volunteer at the Herbarium

Ho Boon Chuan
Herbarium

All photos by the authors

Ridley's encounters with bees

Deep within the research collections of London's Natural History Museum, among shelves of bees from across the globe, a single specimen in near-perfect condition caught my eye. A visiting researcher on Southeast Asian bees, I carefully removed the specimen's label to examine details of its provenance. To my pleasant surprise, the bee was collected over a century ago in Singapore by none other than the first Director of the Gardens, Henry Ridley!

Ridley is most renowned for his scientific contributions toward botany in the Malay Peninsula, but being an ardent naturalist he also took a keen interest in animals, especially those closely linked with plants. It is perhaps no surprise then that along with specimens of plants, he collected bees, given their importance as pollinators in the tropics.

The Insular Digger Bee, *Amegilla insularis*, a magnificent forest denizen, was first described by F. Smith in 1857. Ridley later collected a specimen of this bee in 1900 that was described by Meade-Waldo in 1914 as *Amegilla fulvohirta*, a name that is now synonymised under *A. insularis*.

Several bees that Ridley collected during his time in the Gardens were described as new species to science then, and many were even named after him. Although modern taxonomists later synonymised most of them under earlier recorded names, his collections of bees nevertheless provide a rare window into the past and a baseline for current bee research in Singapore. Provided here are photographs of some of the beautiful species that Ridley collected locally.

The Striped Nomia, *Nomia strigata*, is a beautiful solitary bee that is common around flowers in the Gardens. Ridley collected a specimen of this bee from Singapore that was described as *Nomia iridescens* var. *ridleyi* by Cockerell in 1910.

Ridley's Ceratina, *Ceratina ridleyi*, is a twig-nesting solitary bee that occurs only in mature forests. It is the only local bee species that retains Ridley's name. Ridley collected specimens of this bee in Singapore in 1903 and 1907, and his 1903 specimen is designated as a co-type.

Two other bees that Ridley collected from Singapore are the Black-sided Ceratina, *Ceratina nigrolateralis* (left), and the Orange-winged Leafcutter, *Megachile atrata* (right). The former may sometimes be seen around the flowers of the Red Leea (*Leea rubra*) in the Gardens, while the latter occurs mostly near coastal areas.

Zestin Soh
Horticulture and Operations

The author would like to thank Assistant Professor John Ascher from the National University of Singapore for helpful discussions on this topic.

All photos by Zestin Soh

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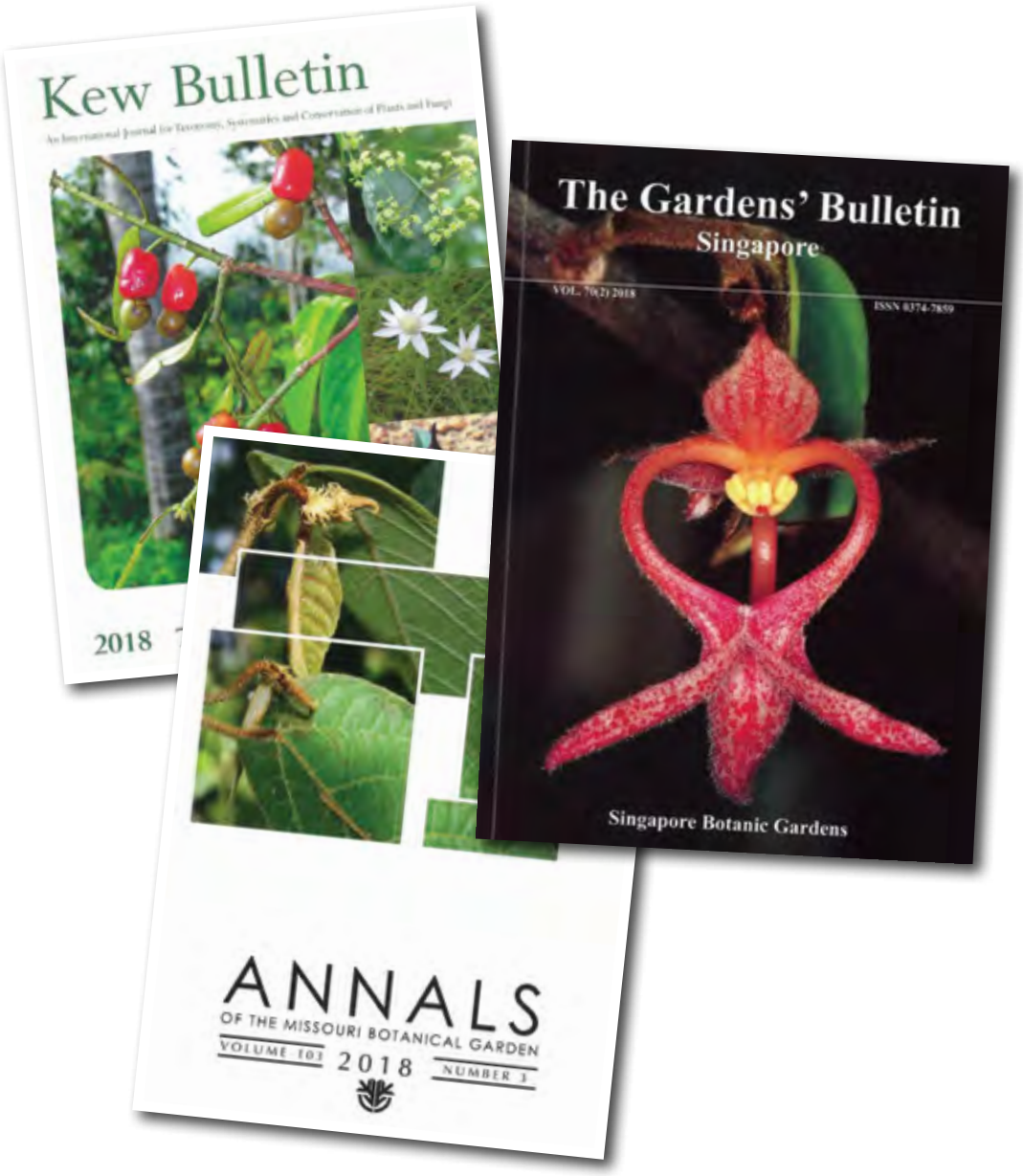
Peer review



Communication of the results of scientific research to the wider world marks the culmination of any piece of work in all branches of science. The research question and the results found can be presented orally at conferences and meetings but ultimately it will also need to be published in a book or a journal. In the 18th and 19th centuries, botanical research was frequently presented in books, often after decades of research. Through the 19th century and particularly in the 20th century, the era of publishing in books gave way to primarily publishing original research in journals. The number of botanical journals consequently rose enormously over time, each with its own institutional, geographical or taxonomic focus. Many of these journals were established by botanic gardens and botanical societies as a forum for their own scientists to convey their work to the world. This includes Singapore Botanic Gardens' own journal which is known today as *Gardens' Bulletin Singapore*.

Most of the great botanic gardens of the world established journals early in their developments, very many of which continue to this day. These include titles such as *Kew Bulletin* from the Royal Botanic Gardens Kew, the *Edinburgh Journal of Botany* from the Royal Botanic Garden Edinburgh, *Candollea* from the Conservatory and Botanical Garden of the City of Geneva, *Willdenowia* from the Berlin Botanic Garden, *Brittonia* from the New York Botanical Garden, and *Annals of the Missouri Botanical Garden* from its namesake and many more. Often these journals changed name over time, sometimes because of a perception that the older title lacked some gravitas (for example, *Notes from the Royal Botanic Garden Edinburgh* became *Edinburgh Journal of Botany*). It was not only the botanic gardens and museums that founded journals but also many learned societies such as London's Linnean Society, which has had many titles including the current *Botanical Journal of the Linnean Society*. Many titles from these societies focused on particular plant groups such as the journal *Gesneriads*, with articles on the Gesneriaceae, and *Haseltonia*, for cacti and succulents.

With their very different histories these titles mostly started out as ways for staff of botanic gardens and museums or members of learned societies to publish their research in as simple a manner as possible. The gatekeeper to ensure the work being published was of sufficient quality was only the editor, assisted perhaps by one or two members of an editorial board. This is a practice that has been almost wholly abandoned by scientific journals in favour of a process known as peer review.

Peer review is, as its name suggests, a process whereby a researcher has his or her work assessed by peers in the same field of research before it is published. The basis for this is that no journal editor has enough breadth of knowledge to ensure that the research being presented in the paper is novel, that the techniques employed are appropriate to address the questions raised in the research, and that the conclusions reached in the paper are supported by the data presented. People who work in similar fields are much better able to ensure that all of these items are addressed and point out to the editor of the journal and the author of the paper if there are any holes in the logic and arguments and ultimately recommend to the

editor whether the work should be published at all or only after major or minor revision. It is a very rare paper indeed that is submitted to a journal, sent out for peer review by the editor, and ultimately returned to the author with no further work required. The job of the editor is to assess the reviews, with two reviews usually being requested, and act upon the recommendations presented. If the reviewers are largely in agreement with each other, the job of the editor is relatively straightforward. If the reviewers come to different conclusions, the editor has to weigh up the arguments and come to a final decision. Sometimes seeking fresh reviews from different people is the best way forward.

Most botanical journals adopt a policy of single-blind review whereby the reviewers can opt to be anonymous and the author does not know who reviewed their paper. Most journals have this as the default position with the reviewers being able to waive anonymity if they desire. The reason for this anonymity is that it is believed that the reviewer can be more candid if the author does not know who they are.

For plant taxonomy the job of the peer reviewer can be difficult. Very few people will know the plants being discussed anywhere near as well as the person who wrote the paper. The reviewer, on rare occasions, may have as deep a knowledge and can spot that the species concepts are incorrect, that a supposed new species is actually the same as one already known, or that the description is flawed in some way. More often the reviewer will not know the plants in such depth but has a more general knowledge of the plants concerned and will be able to comment on whether the author has accessed and assessed the appropriate literature, that the descriptions broadly work for the plants concerned, and check that there are no internal lapses in logic and adherence to the rules of botanical nomenclature. For the description of new species, the reviewer can ensure that a new species is compared to the species that are most similar and that the characters assessed as being of particular importance have not already been dismissed as such for the putative new species' relatives. Far from being an inconvenience to the author, peer review also ensures that researchers minimise mistakes that they themselves would not want to see in print but had overlooked until their peers pointed them out.

Any researcher that wants to see their own work published in a journal understands that the process of peer review is a quid pro quo – that if they expect their own work to be reviewed and published then they too must accept requests from journals to review papers by other authors. Getting the balance correct is difficult as to review a paper well can be a time-consuming business. Many an editor will admit that finding suitable reviewers for all papers submitted to a journal can also be time-consuming and frustrating.

The process of peer review does have its critics. A good reviewer must necessarily be impartial and assess the work only on the content of what is written in the paper rather than on the reputation or background of the author. It has been argued that there is no such thing as a truly impartial reviewer and that we all have our prejudices whether we recognise and acknowledge them or not. Some journals attempt to counteract this with a process called double-blind peer review whereby not only does the author not know who reviewed their paper, but the reviewer does not know the name of the author of the paper. In the relatively small field of taxonomic botany, however, a reviewer who does not fairly quickly work out who the author of the paper is despite not having been given the name is perhaps not as knowledgeable in the subject matter as the editor believed! Critics of both single-blind and double-blind review have advocated open review whereby the author is known to the reviewers and the reviewers are known to the author. Advocates of this approach argue that reviewers must necessarily be more impartial and fair to the work if they cannot hide behind a screen of anonymity.

It has also been argued that the peer review process consolidates mainstream thinking and blocks innovative ideas. Some journals have, therefore, experimented with different ways of peer reviewing such as post publication review whereby a paper is published, usually only online, and is then subject to criticism from anybody who wishes to do so. This may then result in a new version of the paper being published in which the community's criticisms are addressed. In taxonomic botany, this process could lead to chaos as species are reported and then withdrawn, or the technical aspects of the description of a new species are not yet met to validly publish the species – mistakes that would easily be caught by reviewers and editors before publication.

The *Gardens' Bulletin Singapore* uses a process of single-blind peer review, including for all papers submitted by staff of the Botanic Gardens. If the editor submits a paper to *Gardens' Bulletin* the review and editorial process is taken out of his hands and passed to a member of the editorial board. He too is then subject to peer review of his work. Although it is acknowledged that peer review is not a perfect system, it currently suits *Gardens' Bulletin* well and there are no plans to change it in the foreseeable future. Through this, we hope that we can maintain an excellent standard of scientific publication for our authors and readers.

David Middleton
Herbarium

Publications by Gardens' staff in 2018

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Sponge Bob's cousin found in Singapore

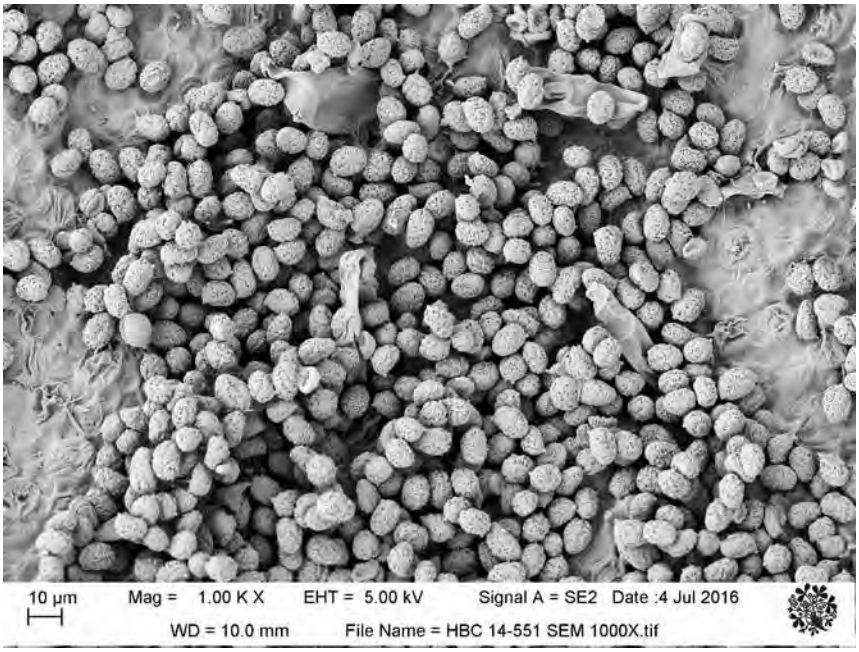
Spongispora temasekensis **near (left) Swan Lake and (right) the Nassim Gate Visitor Centre. At both locations they were growing beneath a** ***Hopea odorata*** **tree.**

In 2011, a fungus from Borneo was named *Spongiforma squarepantsii* in honour of the cartoon character SpongeBob SquarePants. Commonly known as boletes, members of this family (Boletaceae) are fleshy fungi that have pores rather than gills. This characteristic makes them readily identifiable on the shelves of supermarkets. At any rate, this article is not about the SpongeBob fungus nor its commercially available relatives, but its cousin – a brand new species and genus recently described from our Gardens!

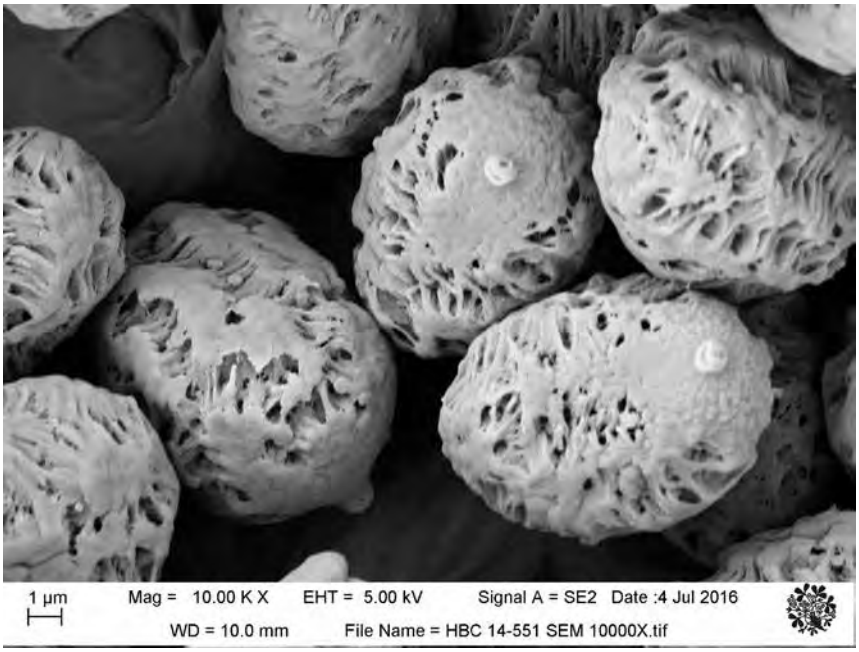
The new genus differs from all other genera of Boletaceae by a combination of characters which includes a whitish to pale yellow poroid surface that turns brownish upon bruising, a coarsely reticulated stipe, a certain surface

The clearly visible poroid surface under the cap of a fruiting body.

The blue basal mycelium of *Spongispora temasekensis.* *(Photo credit: Bryn Dentinger)*



An SEM image of the spores at 1000× magnification.



An SEM image of the spores at 10000× magnification.

structure on the cap of the mushroom, and blue basal mycelia. What truly makes it stand out are the spores, with ornamentation unknown to any other bolete. A look under the scanning electron microscope (SEM) reveals that they are sponge-like with irregular clefts, cracks and warts.

Named *Spongispora temasekensis* in recognition of its place of discovery (Singapore was historically known as 'Temasek'), the fruiting bodies can be found beneath *Hopea odorata* trees in the Gardens from March to November, subject to the rains of course. So the next time you come for a visit, do keep an eye out for them. They are an amazing reminder that there are still new organisms waiting to be discovered right beneath our noses.

My colleague Jana Leong-Škorničková tells me that there is a similar mushroom in her native Czech Republic that is called 'grandmother's boletus'. Soft and squishy, it becomes a bit slimy when stir-fried. *Spongispora temasekensis* is very similar to the one she describes, although truly not worth eating, unfortunately.

Serena Lee
Herbarium

All photos by Serena Lee, unless otherwise indicated.

Edible weeds in Singapore

A weed is defined as a plant that is undesirable in a particular situation. In our City in a Garden where greenery is immaculately maintained, weeds can be difficult to find. However, if we look close enough, they can be seen growing in our midst, and some of these are edible. Many of them also play an important ecological role, providing food and shelter for fauna that inhabit our urban green spaces. Here are five edible weeds that can be found around Singapore.

Ivy Gourd

The flower (inset), and fruits and foliage of the Ivy Gourd.

The Ivy Gourd can be seen growing on shrubs and fences in local wastelands and neglected home gardens. A member of the Melon family, Curcubitaceae, its botanical name is *Coccinia grandis*. This plant is a perennial, dioecious vine or climber, with male and female flowers produced on separate plants. Its flowers are white and have five petals, appearing like stars against a green background of foliage. They are usually produced singly and close during the later part of the day. The female flowers have a distinctive but small cylindrical ovary that can be found behind the whorl of petals.

This vine produces edible fruits that can be eaten when immature. Used in soups and curries, they are elliptical in shape, and green with white stripes when young. They are sometimes available at vegetable stalls in Little India. The young shoots and leaves are also edible and sold in bundles in the Thai supermarket in Golden Mile Complex. They can be prepared by frying, blanching or boiling.

The seeds of the Ivy Gourd are not readily available, but plants can be propagated from stem cuttings. If fruits are desired, it is important to have both male and female plants growing in the same garden. Stem cuttings should be harvested from mature plants with flowers in order to properly identify whether they are male or female.

As a climber, this gourd requires a trellis to grow on. It thrives in a sunny or semi-shaded location with well-drained soil. Over time, the Ivy Gourd will produce a swollen stem known as a caudex; if trimmed back and planted in a decorative pot, it can make an attractive bonsai plant.

Pygmy Groundcherry

The fruits of the Pygmy Groundcherry (*Physalis minima*) look similar to the familiar Cape Gooseberries that are used to adorn cakes, but are much smaller. A member of the Nightshade family, Solanaceae, it is related to common vegetables such as tomatoes, potatoes and brinjals. When ripe, the fruits of the Pygmy Groundcherry are juicy and sweet.

The Pygmy Groundcherry grows as a small, many-branched shrub that behaves like an annual. Young plants grow quickly to flower and fruit before dying. The fruits are curious-looking berries encased within a balloon-like calyx. When ripe, the berries turn yellowish orange and the surrounding calyx has a paper-like texture.

The balloon-like calyx of the Pygmy Groundcherry (left). When mature, the calyx surrounding the fruit has a papery texture (right).

This plant can be raised from seeds that are harvested from ripe fruits. The Pygmy Groundcherry makes a good container plant and grows best in well-drained, moist and fertile soil. Exposure to direct sunlight for at least four hours every day is required for healthy growth.

Turkey Berry

The Turkey Berry, botanically known as *Solanum torvum*, is another edible weed from the Nightshade family. It is best known for its green, pea-like fruits that are borne in clusters, and when immature, are an important ingredient in Thai green curries.

This plant is a prickly shrub that can reach about 2 m in height. It grows as a perennial in the tropics, but tends to get straggly with age. Plants can be rejuvenated by pruning, and this also helps to maintain a manageable growth habit. The Turkey Berry can be propagated from seed or stem cuttings. It is best cultivated in outdoor gardens, where it can be exposed to full sun and have sufficient space to grow. This plant should be grown in fertile soil that retains moisture.

Tomatoes and brinjals may be grafted onto the rootstock of the Turkey Berry, which is reported to confer vigour, be resistant to some soil-borne pests and diseases, and have some tolerance to waterlogging that often occurs in our wet, lowland tropical climate.

The immature, pea-like fruits (left) and flowers (below left) of the Turkey Berry.

Pigweed

Known botanically by the name of *Portulaca oleracea*, the Pigweed is a less attractive cousin of the Moss Rose (*Portulaca grandiflora*) and Wingpod Purslane (*Portulaca umbraticola*). It can be found growing between crevices in concrete structures and amongst other plants in garden beds. The leaves and young shoots of this plant can be consumed as a vegetable.

The flowers and foliage of the Pigweed.

The Pigweed is a low-growing succulent with a prostrate growth habit. Its leaves are shaped like a teardrop and take on a reddish tinge when grown under direct sunlight. When not in flower, the plant can be easily confused with the Wingpod Purslane due to its similar-looking leaves. Its flowers are small, yellow and inconspicuous (scarcely 3 mm in diameter), and very fleeting – opening for only an hour and a half in the morning. The fruits are capsules that can be found at the axils of the leaves.

Due to its small size, the Pigweed makes a good plant for container growing. Seeds for raising new plants can be harvested from mature fruits. Alternatively, new plants can be raised from stem cuttings. Plants should be grown in well-drained soil and given direct sunlight to grow well. Under wet and shady conditions, plants will etiolate and easily succumb to diseases such as stem rot.

Stinking Passionflower

The foliage and immature green fruits of the Stinking Passionflower, and (left) a ripe fruit opened to show the seeds inside.

The attractive flower of the Stinking Passionflower.

The Stinking Passionflower (*Passiflora foetida*) is well-known to butterfly enthusiasts in Singapore. The leaves of this plant, which grows as a vine, are food for the larvae of the Leopard Lacewing (*Cethosia cyane*) and Tawny Coster (*Acraea terpsicore*) butterflies. As such, this plant is often grown in local gardens to attract butterflies.

The species' epithet, *foetida*, refers to the foul smell released by the leaves when crushed. When mature, this vine is rather free-flowering and produces attractive white flowers that are marked with a ring of purple streaks. They open in the morning and close by about noon. The fruits of this plant are also quite attractive as they are surrounded by finely dissected, feather-like bracts, and sometimes have small clear drops of secretions that glisten in sunlight. Note that both the leaves and immature green fruits are toxic. Only the ripe fruits, which are yellow, are edible.

The Stinking Passionflower is a climber and requires a trellis to grow on. It needs to have at least four hours of direct sunlight each day, and the soil should be fertile and well-drained. Plants can be propagated from seeds taken from ripe fruits or from stem cuttings. Although plants can be grown in large containers, it is better to plant them in the ground so that they can grow larger and hence become more prolific, and also better able to withstand dry conditions.

Wilson Wong
Horticulture and Operations

All photos by Dr Wilson Wong

Before harvesting any plant material, the budding city forager should always seek permission. It is not advisable to pluck plants from the roadside as there may be contaminants produced by the vehicles that travel along the road. Garden chemicals may have been applied in some sites. To err on the safe side, one can harvest seeds and cuttings to propagate new plants to grow in one's garden.

Any plant being grown for consumption should be thoroughly researched before eating. Certain parts of the plant may be toxic during certain stages, or may be unsafe to eat at any time. Special preparation steps may be required to ensure food harvested from the plant is safe for consumption.

A day out at the library

These days, Singapore's public libraries are more than just places to borrow books – they are modern spaces that provide a conducive environment for learning. The National Library Board (NLB) recently invited staff from NParks to participate in an event aimed at encouraging youths to explore themes related to Science, Technology, Engineering, Arts and Mathematics (S.T.E.A.M.). Called the Tween S.T.E.A.M. Lab, this event was held on 17 and 18 November 2018 at the Woodlands Regional Library.

Staff from across NParks came together to set up a booth for the event. More than 500 participants and parents made their way to our booth to learn more about Singapore's native biodiversity.

Learning about enchanting Button Snails called the 'jewels of Chek Jawa' with Leroy Alphonso from NParks' Pulau Ubin team. *(Photo credit: Cyrena Lin)*

A participant getting up close and personal with the various specimens on display. *(Photo credit: Muhammad Taufiq Jumal)*

Introducing native plants that are suitable for home gardening. *(Photo credit: Cyrena Lin)*

The Gardens' Education team led the effort for NParks, and brought along a wide collection of flora and fauna specimens found in native habitats such as rainforests, mangroves and intertidal zones to share with the public. Through a series of show-and-tell activities, interactive games and hands-on crafts, the captivated audience discovered how they can play a part in conserving Singapore's natural heritage.

Cyrena Lin
Muhammad Taufiq Jumal
Tan Hui Min
Education Branch

NLB is a long-term partner of the Gardens. During the school holidays, Junior Reading Ambassadors from NLB perform regular dramatised storytelling sessions for the Gardens' visitors at the Jacob Ballas Children's Garden. These well-received sessions aim to instil a lifelong passion for reading in youths, and the Children's Garden serves as a perfect environment to bring that to life.

For more information about educational programmes offered at the Gardens, go to: www.nparks.gov.sg/sbg/education

Bringing the Global Strategy for Plant Conservation Targets beyond 2020

Participants at the GPPC 2018 in Cape Town, South Africa.

The magnificent Kirstenbosch National Botanical Garden in Cape Town, South Africa was the venue for a conference aimed at supporting the worldwide implementation of the Global Strategy for Plant Conservation (GSPC). It was organised by the Global Partnership for Plant Conservation (GPPC), in association with the Secretariat of the Convention on Biological Diversity and Botanic Gardens Conservation International (BGCI). This important conference, known as the GPPC 2018, was hosted by the South African National Biodiversity Institute (SANBI) from 28 August to 1 September 2018, and was held straight after a meeting of the BGCI International Advisory Council, of which the Gardens is one of 30 members.

A poster session during the GPPC 2018 conference.

An earlier conference held in October 2010 in Nagoya, Japan, had adopted a Global Strategy for Plant Conservation for the period 2011 to 2020, with 16 targets for plant conservation to be achieved by 2020.

The GPPC 2018 brought together plant conservationists, scientists, policy makers and practitioners from over 30 countries to evaluate how far the 2020 targets have progressed worldwide, and to develop ideas for a global plant conservation strategy for the post-2020 period.

The renowned Kirstenbosch National Botanical Garden with the magnificent Table Mountain as its backdrop.

The lush landscape of the Harold Porter National Botanical Garden.

The main objectives of the GPPC 2018 conference included:

- Showcasing examples and sharing experiences on GSPC implementation during workshop sessions
- Providing guidance and support for national and regional GSPC implementation as it enters a new phase
- Helping to build leadership amongst the participating organisations for monitoring and delivery of the GSPC targets
- Developing priorities for the GSPC in the period beyond 2020 and the ways in which it will contribute to the 2050 Vision for Biodiversity and the 2030 Agenda on Sustainable Development

At the closing summation of the conference, it was concluded that although not all targets would be

The Karoo Desert National Botanical Garden with its collection of arid and semi-arid plants of South Africa.

The West Coast National Park with a colourful carpet of spring wildflowers.

achieved by 2020, it is important to celebrate the successes that have happened, and to continue pursuing plant conservation objectives by building on the strength and collaborative spirit of the plant conservation and botanical garden networks that have been established.

It was noted that the GSPC had also been influential for organisations beyond the botanic garden community.

The results of the conference and the strategic workshops were reported to the Convention on Biological Diversity at its 14th meeting of the Conference of Parties in Egypt in November 2018. The report serves as a contribution from the GPPC and the plant conservation community towards future plans to achieve the 2050 Vision for Biodiversity and the 2030 Agenda on Sustainable Development.

Besides attending workshops and presentations, delegates of the GPPC 2018 had the opportunity to tour the much acclaimed Kirstenbosch National Botanical Garden that was founded in 1913. Not many gardens can match the majestic setting of Kirstenbosch, where the eastern slope of Cape Town's Table Mountain serves as a grand backdrop to the garden's lush landscape. Kirstenbosch enjoys a Mediterranean climate, with a long, hot and dry summer and a short, cool and rainy winter, supporting a unique display of plants that closely resemble the flora of Western Australia. Kirstenbosch strongly emphasises the cultivation of indigenous plants, and the highlights of the garden's spectacular living collections are its stunning proteas and ancient cycads. It is one of 10 National Botanic Gardens that cover the different biomes of South Africa, and is managed by SANBI.

Delegates of the conference also had the opportunity to visit two other SANBI administered gardens and one nature park under the South African National Parks' management. The Harold Porter National Botanical Garden is situated in the centre of the coastal fynbos ecosystem and is renowned for its waterfalls and deep gorges with relict forests, flats and marshes. The Karoo Desert National Botanical Garden displays a wide variety of arid and semi-arid plants native to South Africa, and is located at the foot of the Hex River Mountains. The West Coast National Park lies 120 km north of Cape Town in the Western Cape province of South Africa. It is approximately 36,260 hectares in size and borders the Atlantic Ocean to the west. The park is particularly famous for its bird life, wild fauna and the spring wildflowers which occur from August to September.

Nura Abdul Karim
Library, Training and External Relations

All photos by Nura Abdul Karim

The 7th International Legume Conference in Sendai, Japan

With the theme of 'Legume Systematics for the Next Generation', the 7th International Legume Conference was held in Sendai, Japan, from 29 August to 2 September 2018. Supported by the Tropical Biosphere Research Center at the University of the Ryukyus, Tohoku University, and the Sendai Tourism, Convention and International Association, this was the first time the conference has been held in Asia. It was attended by 132 participants from 27 different countries. Two of us represented the Singapore Botanic Gardens, and to our surprise, we found ourselves to be the only participants from a Southeast Asian institution.

The conference programme consisted of 11 symposia, one workshop and three 'flash talk' sessions which covered a variety of topics central to legumes. A total of 85 oral presentations and 33 posters provided insights on legume-related topics such as morphology, diversity, systematics, genomics, adaptation, evolution, conservation and bacterial symbiosis.

A few of the mornings began with a 20-minute flash talk session, followed by a 40-minute plenary lecture delivered by outstanding legume scientists such as Dr Brigitte Marazzi, Professor Tetsukazu Yahara, Dr Erik Koenen and Dr Ken Naito. The rest of the regular conference days were taken up by symposium talks lasting until 7 in the evening. There were no parallel symposia, so we were spared the agony of choosing between talks and were able to attend all of them.

A break from the presentations came on the third day of the five-day conference. One of us (Boon Chuan) attended a workshop on the integration and analyses of massive

Choo Le Min giving a talk on the phylogenetics and biogeography of the *Daniellia* clade in Africa and Madagascar during the conference. *(Photo credit: Ho Boon Chuan)*

Ho Boon Chuan giving a talk on the legumes being researched as part of the Flora of Singapore project. He also presented a poster on this topic during the conference. *(Photo credit: Choo Le Min)*

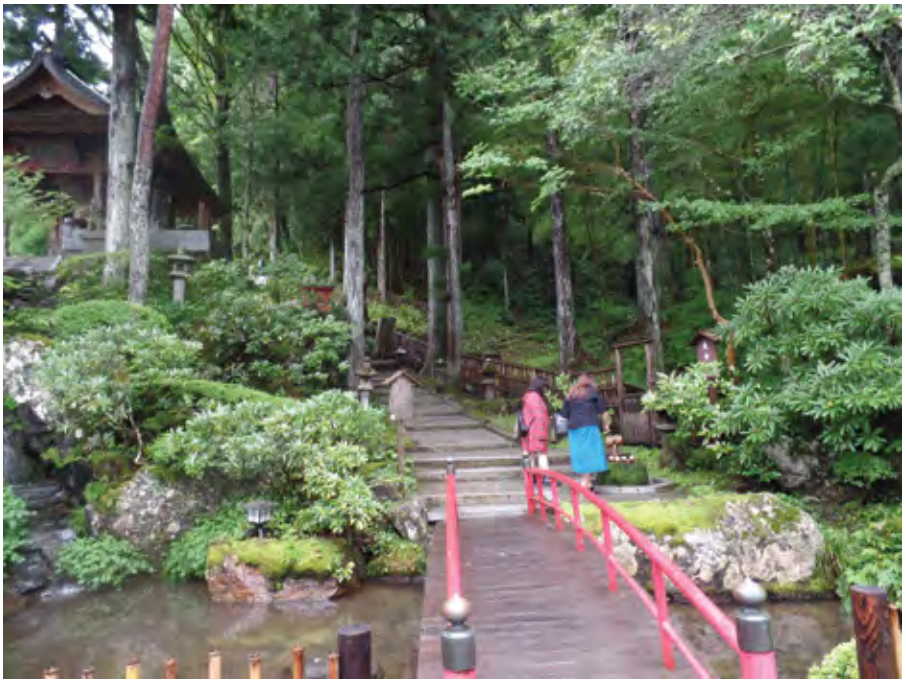
Dr Koji Yonekura conducting a guided tour of the Tohoku University Botanical Gardens. *(Photo credit: Choo Le Min)*

data sets used to look at biodiversity patterns at regional and global scales, while the other (Le Min) joined a guided tour of the Tohoku University Botanical Gardens, including the Tsuda Memorial Herbarium, on the Aoba Mountain of Sendai. Situated within a beautiful natural forest dominated by Momi Fir trees (*Abies firma*), this 49-hectare pristine primeval forest has been preserved for about 400 years, since the Edo era. The guided tour was followed by a half-day excursion to attractions in the vicinity such as temples and a whiskey distillery. The day ended with a visit to a traditional *ryokan*, where we enjoyed a hot spring bath and a Japanese-style conference dinner.

The Rock Garden at the Tohoku University Botanical Gardens. *(Photo credit: Choo Le Min)*

Visiting the Tsuda Memorial Herbarium. *(Photo credit: Choo Le Min)*

The conference provided an excellent opportunity to meet and interact with scientists focusing on various aspects of legume research from across the world, and also to establish new contacts for future collaborations. We were excited to meet authors of important and excellent works on legumes whom we have long admired. Most noteworthy is the 82-year-old Professor Hiroyoshi Ohashi from



A visit to a temple while on a half-day excursion during the conference. *(Photo credit: Choo Le Min)*

Wearing a *yukata* for the Japanese-style conference dinner. *(Photo credit: Tadashi Kajita)*

Tohoku University, who published his classic work, *The Asian Desmodium and its allied genera*, in 1973. This work is still cited today in publications dealing with *Desmodium* and its close relatives.

The conference concluded with a symposium entitled 'Celebrating 40 years of legume systematics: the productive career of Gwilym P. Lewis'. Gwilym is an expert in legume taxonomy and morphology at Kew Gardens, and has worked extensively on legumes in the neotropics. He is also the main co-editor of the 577-page reference book *Legumes of the World* (2005), a monumental work that informs our understanding of the systematics and evolution of the third-largest flowering plant family in the world. Gwilym himself delivered the final plenary talk of the conference. He spoke about his 40-year career, from starting out as gardener at Kew Gardens to becoming a leader in legume research. During his talk, he also gave us interesting tips on how to thrive in botanical research. This ended the conference on an overwhelmingly positive note and reaffirmed our choice of pursuing a career in legume research.

The organisers in Japan are to be commended for their excellent organisation of the conference and their kind hospitality. We look forward to attending the next legume conference, which will be held in Brazil in 2022.

Ho Boon Chuan
Choo Le Min
Herbarium

The participants of the 7th International Legume Conference. *(Photo credit: Tadashi Kajita)*

A tropical African plant in Singapore

Hailing from tropical Africa, *Baikiaea insignis* is a handsome, medium-sized evergreen tree belonging to the Bean or Legume family (Fabaceae). Commonly known as Nkoba or Knobakoba, it is slow-growing and found naturally at elevations of up to 1,800 m in rainforests and swampy forests. The Gardens has a lovely Nkoba specimen on Lawn F, between Swan Lake and the Learning Forest. Our tree has been growing on this site for almost 40 years. It has a low, wide-spreading crown, a straight trunk that is slightly fluted at the base, and is over 20 m in height. It blooms annually, and in the early mornings and evenings while in bloom, visitors are rewarded with a highly perfumed scent that emanates from the flowers. There is no doubt that this fragrance has caused many passers-by to stop in their tracks.

The Gardens' Nkoba tree on Lawn F, with vivid pink flushes of young leaves.

The genus *Baikiaea* includes a handful of species that are restricted to mainland Africa, and is named for the Scottish physician, naturalist and explorer, Dr William Balfour Baikie (1825–1864), who travelled to Nigeria to help open up the country to British trade. The specific epithet, *insignis*, means 'conspicuous' or 'outstanding', likely in reference to its large striking flowers that measure around 25 cm in diameter.

The leaves of Nkoba are arranged spirally on a short petiole, and are compound with a single leaflet at the apex. The mature leaves are glossy and dark green, while the young leaves are a lovely pinkish colour. The inflorescences are racemes that bear a few flowers each, gradually opening in succession. The flowers have five large, delicate petals with slightly ruffled margins; one petal is pale lemon-yellow, while the rest are cream-white. They are strongly perfumed and rather floppy looking. They open in the evening and wither by the afternoon of the following day. The fruit is a flat woody pod covered in soft brown hairs. When mature, the fruit splits open explosively to throw its dark reddish seeds several metres away from the parent tree.

The vibrant pink young leaves of the Nkoba tree.

A *Baikiaea insignis* flower with its delicate white corolla and prominent lemon-yellow standard petal.

In tropical Africa, the Nkoba is harvested for its wood, which is used to make flooring, furniture, wooden joints and shelving. The wood is moderately hard, heavy and strong but is considered non-durable and is susceptible to beetle and termite attacks. The wood is also collected for fuel and to make charcoal. The roasted seeds are eaten during times of famine, when limited food sources are available.

Do check out this handsome African tree the next time you take a stroll along Swan Lake. If you make it there when the tree is in flower, you will not be disappointed by the fragrance of its lovely white flowers.

Nura Abdul Karim
Library, Training and External Relations

All photos by Nura Abdul Karim

July–December 2018

Papilionanda **Moon Jae-in and Kim Jung-sook was named after His Excellency Moon Jae-in, President of the Republic of Korea, and Mdm Kim Jung-sook during their visit to the Singapore Botanic Gardens on 12 July 2018. They are shown here with the Prime Minister of Singapore, Mr Lee Hsien Loong, and Mdm Ho Ching.**

Dendrobium **Sebastian Kurz was named for His Excellency Sebastian Kurz, Federal Chancellor of the Republic of Austria, in the National Orchid Garden on 29 August 2018.**

Dr Andrew Henderson, Institute of Systematic Botany, United States of America

Dr Aphiya Hathayatham and **Mrs Ganigar Chen** from the National Science Museum, Thailand, and delegation

H.E. Mr Bakytzhan Sagintayev, Prime Minister of Kazakhstan

Mr Bob Harwood, Northern Territory Herbarium, Australia

Dr Brigitta Duyfjes, Naturalis Biodiversity Center, Leiden, The Netherlands

Mr Carlos Moedas, EU Commissioner for Research, Science & Innovation, and **H.E. Mrs Barbara Plinkert**, EU Ambassador to Singapore

Dr Caroline Pannell, University of Oxford, United Kingdom

Ms Chantal Colleu-Dumond and **Mr Jean-Michel Dumond**, Chaumont Gardens, Loire Valley, France

Ms Chatchaba Promma, East China Normal University, China

Dr Daniel Geiger, Santa Barbara Museum of Natural History, United States of America

Dr Daniele Cicuzza, Universiti Brunei Darussalam

Delegation from the World Heritage Site Management Committee

Dr Didik Widyatmoko from the Bogor Botanic Gardens, legislative officials from the city of Bogor, Indonesia, and delegation

Ms Elizabeth Joyce, James Cook University, Australia

Dr Elliot Gardner, The Morton Arboretum, United States of America

Mr Ethan Cheah, Forest Research Institute Malaysia

Mr Fu Long Fei, Guangxi Institute of Botany, China

Dr Hans-Joachim Esser, Botanische Staatssammlung München, Germany

Dr Ian Turner, Royal Botanic Gardens, Kew, United Kingdom

Mr Jack Dangermond, Founder and President of ESRI, and **Mrs Laura Dangermond**, United States of America

Mr Jefte Arshed, De La Salle University, Philippines

Mr Jim Gardiner, Vice President of the Royal Horticulture Society, United Kingdom

Mr Jose Blandon, Mayor of Panama City, and **Mrs Blandon**, and **H.E. Mrs Mary Seet-Cheng**, Ambassador of Singapore to Panama

Mrs Karen Pence, Second Lady of the United States of America

Mrs Keren Terner-Eyal, Ministry of Transport, Israel

Dr Kim Young-Dong, Hallym University, South Korea

H.E. Mr Lee Hsien Loong, Prime Minister of Singapore, and **Mdm Ho Ching**

Mr Marek Gróbaczyk, Minister of Maritime Economy and Inland Navigation of Poland, and delegation

Mr Michael George, former Board Member of the Kew Foundation, United Kingdom

H.E. Mr Moon Jae-in, President of South Korea, and **Mdm Kim Jung-sook**

Mdm Nor Ezzawanis A.T., Forest Research Institute Malaysia

Dr Peter van Welzen, Naturalis Biodiversity Center, Leiden, The Netherlands

Ms Prue Pettett, Brisbane Botanic Gardens, Australia

Mdm Rafidah A.R., Forest Research Institute Malaysia

H.E. Mr Sebastian Kurz, Federal Chancellor of the Republic of Austria

Mr Scott Saddler and **Mr Owen Bolitho**, National Arboretum Canberra, Australia

Mr Shin Koo Kang, Korea Forest Service, Sejong City, Korea

Dr Souvanpheng Boupphanouvong, Minister to the Prime Minister's Office of Laos

Dr Thani Al Zeyoudi, Minister of Climate Change and Environment, United Arab Emirates, and delegation

Ms Ummul Nazrah E.R., Forest Research Institute Malaysia

Dr Wang Ruijiang, South China Botanical Garden, China

Dr Willem de Wilde, Naturalis Biodiversity Center, Leiden, The Netherlands

Dr Ye Wen, South China Botanical Garden, China

Dr Yong Kien Thai, University of Malaya, Malaysia

Dr Yumei Wei, Guangxi Institute of Botany, China

The Pará Rubber centenary monument

A photograph of the monument in 1990. It remains in its original location near Symphony Lake, although much of the surrounding landscape has changed since this image was taken.

In 1877, the Gardens received 22 Pará Rubber tree (*Hevea brasiliensis*) seedlings from Brazil by way of Kew Gardens. Thirteen of these were planted by James Murton, Superintendent of the Gardens at the time, in a location of Palm Valley that was originally planned for the Economic Garden. Eleven of the trees survived, and these were later transplanted by Murton into the final location of the Economic Garden – in today's Bukit Timah Core.

There, they grew to produce offspring that were just beginning to set seed when Henry Ridley arrived in 1888 as the Gardens' Director. Seeing Rubber's potential as a commercial crop, Ridley experimented with different ways to tap the latex, developed techniques to preserve the latex for export, and sent out seeds and seedlings for planting throughout the region. His work spurred the rubber boom in Southeast Asia and brought prosperity to the region.

The significance of the introduction of Rubber was marked by the placement of a modest monument in Palm Valley. Intended to commemorate the 100th anniversary of those first trees planted at the Gardens, it is made of concrete and resembles the trunk of a Rubber tree. The monument is marked with a score line along its side for tapping latex and is inscribed with the following: "This is the original site where eleven seedlings of Pará Rubber, *Hevea brasiliensis*, were first successfully planted in 1877. These rubber trees gave rise to the birth and growth of the plantation rubber industry, first in Peninsular Malaysia and subsequently throughout the world."

Christina Soh
Library