NATIONAL PARKS

Gardenwise

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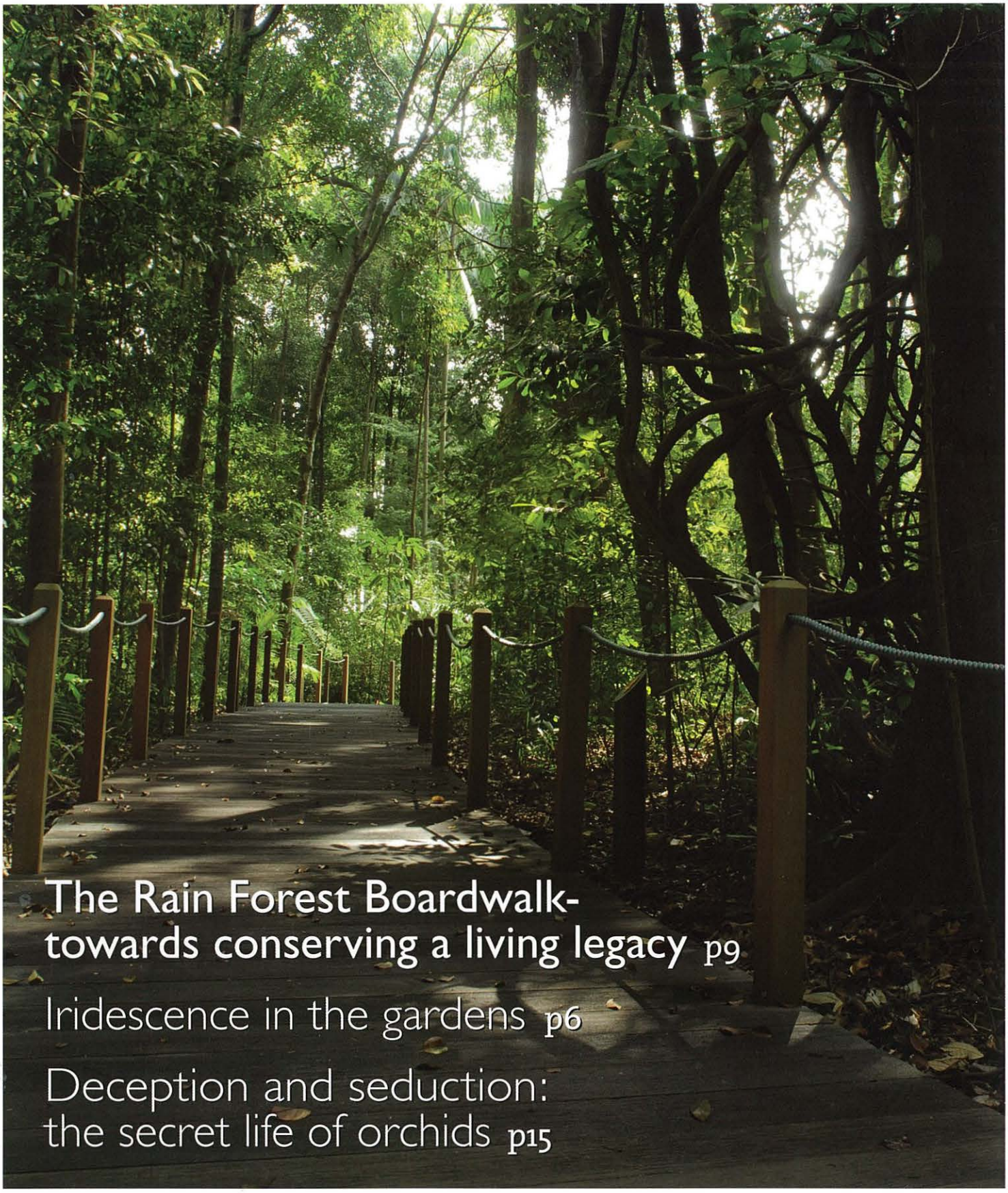
SINGAPORE BOTANIC GARDENS



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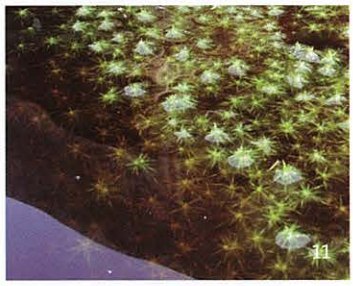

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The Rain Forest Boardwalk
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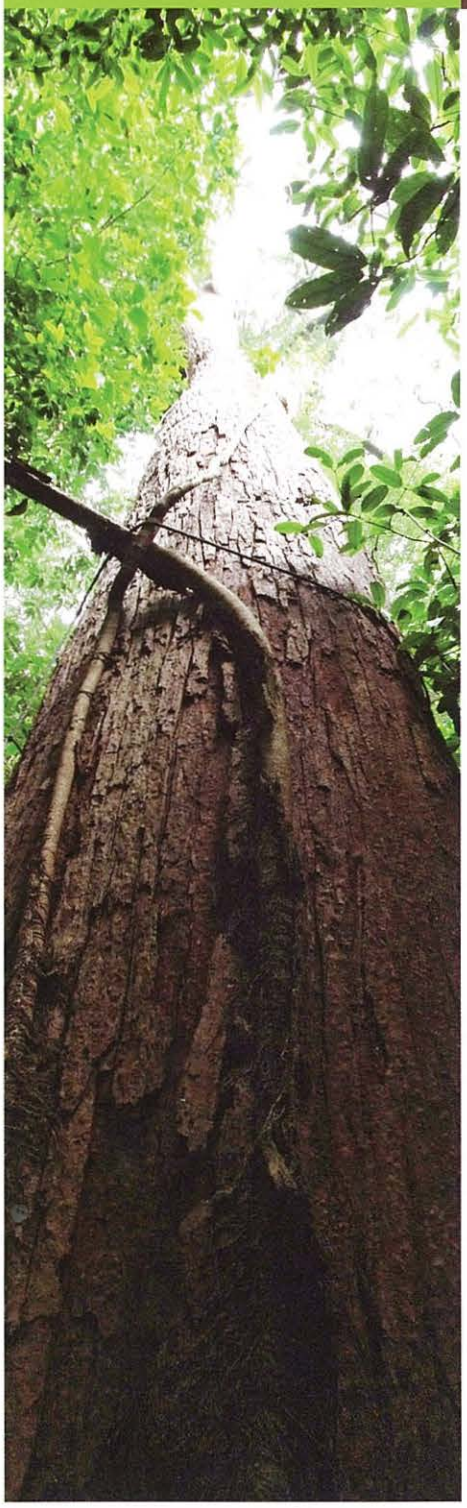
Message from the director



A one-way ring road going clockwise forms the perimeter of the National University of Singapore's Bukit Timah campus, our immediate neighbour. The strip of land to the left of this road that reverted to the Gardens was part of the Economic Garden of the Botanic Gardens from 1879 to 1924 (see Gardenwise 30, pg 26-27). The land currently includes six pre-war bungalows and Raffles Building , a former residential college for students. The latter now houses the operational and training divisions of the National Parks Board (NParks). It is physically linked to the rest of NParks at the Visitor Centre premises rather inconveniently, via a short loop on a public road outside the Gardens. Obviously, better connectivity at this entry precinct with convenient pedestrian and vehicular flow is needed.

This extension to the Gardens offers exciting possibilities for new plant displays and landscapes. It must however be well integrated to the rest of the Gardens. There are plans for several new gardens that will be implemented in phases. The first phase started in April 2008 and includes the redesign of the entry precinct. It will be made more attractive and provide a better sense of entry to the Visitor Centre. An internal connection to Raffles Building will be built, and garden walkways will provide pedestrians with safe, shaded and convenient access to both areas.

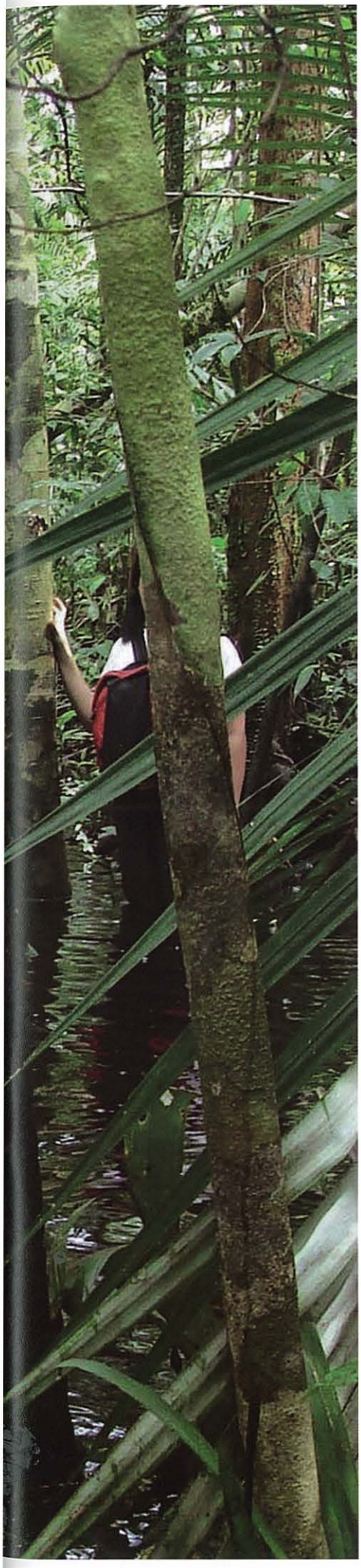
A healing garden in the extension behind Raffles Building is also part of the first phase. As its name implies, the garden will be therapeutic and restful. Principles of universal design in landscapes will be adopted and the garden will be friendly to all. To further create interest and identity, its physical layout will take the form of a human figure where plant displays will be organized around ailments of various parts of the body. The interpretation will be creative, educational and entertaining. The stories that the plants can tell will aid in conveying the message that humans depend on plants. Even cultures and wars and the course of histories have been dictated by plants. The garden will illustrate the importance of conservation and research and the importance of species and diversity. It will be a rich ex-situ conservation collection of tropical plants with attributed healing properties.

This issue sees changes in the production team. Mark Hughes joins as editor while Christina Soh and Mak Sin Chang take over from Hassan Ibrahim as our new production managers. A new feature from our colleagues in education begins here. We hope this will be a regular item for children that will also be a useful guiding tool for parents and teachers.

This issue also has a slightly different look and feel, and we hope our readers like the design change. Gardenwise continues to attract good review, a testimony to the continuing efforts of the production team and the support of all our colleagues. While changes to design and content are ongoing, we will ensure that it remains relevant in communicating horticulture, botany, conservation and garden related topics to general readers. It is a useful medium for brief records of major changes that take place in the 149-year-old Gardens, and is a means for all in the Gardens and NParks to express and share their interest in horticulture and plants.

Chin See Chung

Malcom Dennies



Meandering through pandan peat swamp forest

It was everywhere! Rising four metres above and one suspects, extending another two to three metres below the dark, tea coloured water, it flanked the waterway that we coursed through on a motorized boat. Occasionally, the passageway could be so narrow that we had to duck to avoid being brushed against the serrated leaf margins. The problem was the ubiquitous pandan, *Pandanus andersonii*. It is the dominant plant species that characterizes the peat swamp forests along the tributaries of River Kemena that lead to the field station where we stayed.

Our journey began when we flew into Bintulu on the 23rd March 2008. By early next morning, we had made our way to the Binyo-Penyilam area, a peat swamp forest that took us two hours to reach on board an '*Ekspress* boat' along River Kemena followed by a 45 minute motorized long-boat ride meandering through the pandan along the river's tributaries (Sungai Penyilam). The purpose of the trip was to survey the Flora of the Binyo-Penyilam peat swamp forest through an MOU with Grand Perfect Sdn. Bhd. our partner for this occasion who provided the logistics for the trip. Also with us on this trip were people from the Sarawak Herbarium.

We were the first guests to grace the spanking new field station, which was delightfully nestled amongst the wilderness, away from the maddening crowd. The well-deliberated facilities include 3 bedrooms, an attic, kitchen, dinning area and even commercial septic tanks. An unexpected luxury in the middle of nowhere!

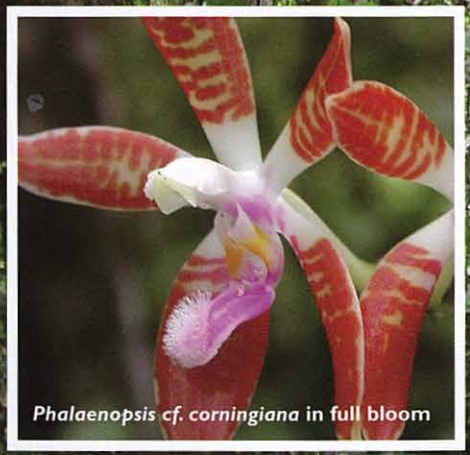
Knowing that peat swamp water is mildly acidic, thus unlikely to have leeches, we had gleefully chucked out our leech socks during packing. Once our bags were set down in the field station, we were all raring to go and explore, as this was going to be a very different experience from the limestone areas we had previously traversed in Sarawak.

The morning air was crisp and the ground wet with dew when we set off each morning. Lunch was mostly eaten on the boat after a morning's collection, mainly botanizing from the boat, stopping when one spotted plants of interest. Once though, we alighted the boat to trek landward, wading at times through chest high black-tea coloured water and 'feeling' our footing on non-visible bundled up tree trunks, which at low water level, would serve as a walkway but on this occasion, had submerged way below the water level

An occasional loud splash followed by an expletive would indicate that someone had lost his balance and fell into the dark water.

Trichoglottis cf. zollingeriana, an uncommon orchid of the peat swamp

Bulbophyllum sp. sect. *Cirrhopetalum*



Phalaenopsis cf. corningiana in full bloom

Myrmecodia sp., an ant plant epiphytic on a tree

A tree climber reaching out for an epiphytic ginger

The flora is rich in epiphytes, especially orchids, some of which were even epiphytic on the Pandanus andersonii.

due to recent high rainfall. An occasional loud splash followed by an expletive would indicate that someone had lost his balance and fell into the dark water. Mercifully, we were too focused on the flora to ever wonder what lurked beneath. We would get back to the station at about 3pm to photograph and press the plants till about 6pm, then took our bath and got ready for dinner. The amazing Sarawakians were multi-talented; multi-tasking as tree climbers, boat operators cum rowers as well as excellent cooks!

The high water level did have its advantages – we could reach out and collect many plant specimens while on the boat, save a few occasions where tree-climbing was needed. The flora is rich in epiphytes, especially orchids, some of which were even epiphytic on the *Pandanus andersonii*. There was a monopodial orchid, *Papilionanthe hookeriana*, scrambling on the Pandanus as well. There were several species of tall Dipterocarp trees in the peat swamp such as *Vatica mangachapoi, Dryobalanops rappa* and *Shorea seminis;* other tree species include those belonging to the genera *Artocarpus, Gonystylus, Memecylon, Barringtonia, Ficus, Syzygium* and *Dacrydium*. Palm species were found mainly on the landward side which include rattans, *Pinanga* spp., *Cyrtostachys renda* and *Eugeissona utilis*; climbers and epiphytes other than orchids include *Aeschynanthus* spp., *Medinilla* spp., *Myrmecodia sp., Flagellaria indica, Uncaria* sp., *Ampelocissus* sp., *Dischidia* spp., *Hoya* spp., *Huperzia* sp. as well as ferns such as *Adiantum* sp., *Schizaea dichotoma,* and *Nephrolepis* sp.

We were split into two teams, with the Singapore Herbarium team being focused mainly on epiphytes, climbers and shrubs while the team from the Sarawak Herbarium focused on trees. In all, the Singapore Herbarium team collected 87 fertile plant specimens and 27 packets of bryophytes. A set of these specimens will be lodged in the Singapore Herbarium with a set of duplicates deposited in the Sarawak Herbarium, as well as in other Herbaria when there are further sets available. The Sarawak Herbarium team will also send us a set of their collection duplicates, so both institutions will have a reference set of specimens to help us fully understand the plant biodiversity of this rich forest.

We'd very much like to thank our hosts from Grand Perfect; Azizan for rushing the construction of the field station for us and for his kecap chilli appetizer which we all enjoyed, and Joanes for coordinating the fantastic trip. We also wish to thank our colleagues from the Sarawak Herbarium; Shalih for his culinary expertise and Malcom for processing the specimens.

Paul Leong
Serena Lee
Herbarium

Photos by Paul Leong unless otherwise stated.

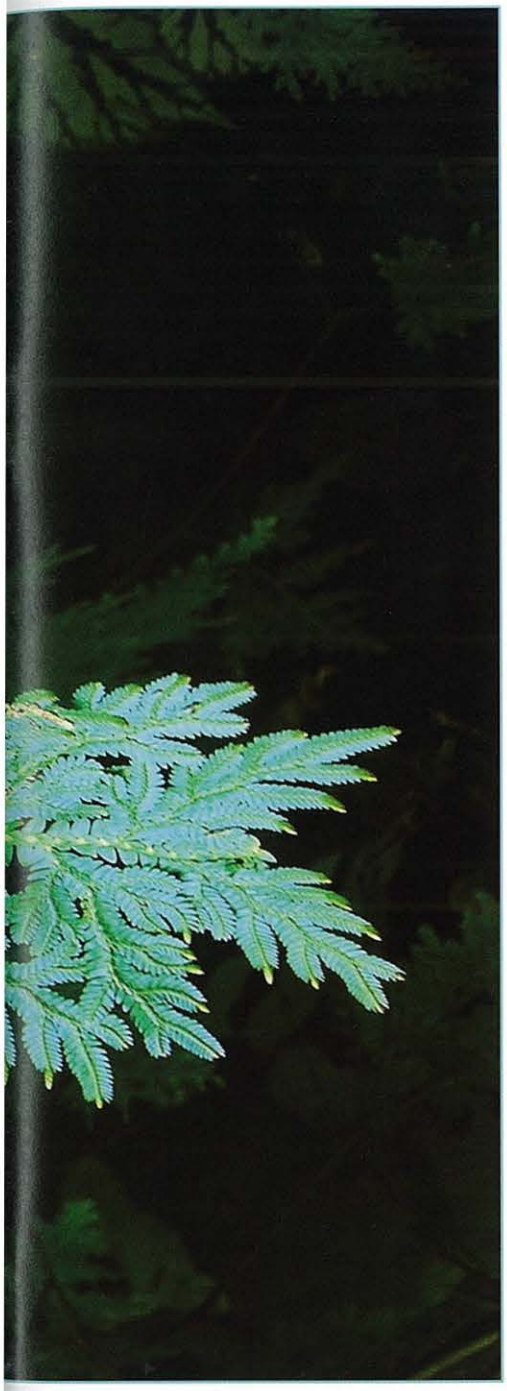
Iridescence in the Gardens

Growing under the bridge in the Evolution Garden are probably two of the most understated and easily overlooked botanical gems of the Gardens. These plants stand out because their leaves are a dazzling metallic blue that shimmer in the shade. Interestingly, the blue sheen disappears and the leaf appears a regular green when viewed at a different angle. Grown en masse, they create an uplifting mood with their play of colour in the dappled sun. Meet *Selaginella willdenowii* and *Selaginella uncinata*, two of the handful of extraordinary plants that have a special and unique ability – iridescence.

Shedding light on the matter...

Since 1896, scientists have been intrigued by this iridescent phenomenon and most of the early studies were conducted on the very same *Selaginella willdenowii*. Initially it was thought that the iridescence was caused by granules of reflective pigments embedded in the plant's cuticle. However, this theory was conclusively proved wrong in the 1970s and 80s as no such pigments could be extracted using organic solvents and no pigment granules could be observed using light microscopy.

The other prevailing school of thought in the 1970s was that iridescence was caused by an optical, rather than chemical effect. It was noted that leaves of *Selaginella willdenowii* lost their iridescence when allowed to wilt, or were wetted with alcohol, suggesting that turgidity of cells had something to do with the mystery. In the mid 1970s, David Lee, one of the world's leading authorities on how leaves interact with light, explained this behaviour of colours using the same optical phenomenon that creates the oily sheen on soap bubbles, or the metallic sheen on dragonfly wings – thin-film interference. Put simply, this phenomenon works on the basis



that light interacting with a very thin film reflects both off the top and the bottom of the thin layer. When the reflected light waves are in sync, that particular wavelength of light is intensified in a process called constructive interference. Conversely, light can also be cancelled out if the reflecting wavelengths are out of sync with each other in the opposite process called destructive interference. Lee suspected that iridescence in *Selaginella willdenowii* was caused by a thin layer in the epidermis reflecting and intensifying the blue wavelengths of light more than any other colour.

In 1978, Lee paired up with Charles Hébant and, with the aid of a transmission electron microscope, searched for the thin layers that would be just the right thickness (71-80nm) to reflect blue light in *Selaginella willdenowii* and *S. uncinata*. What they found was that the cell wall of the upper epidermis of these selaginellas contained not one, but two parallel thin layers that would intensify the reflected blue light. Since then, other iridescent fern species have been studied and similar thin layers have also been found in their epidermal cell walls -but these ferns don't have just 2 thin layers as in the selaginellas, but between 18-30 thin layers. Interestingly, the iridescent filmy fern *Trichomanes elegans* did not have any thin layers in its epidermis at all. Its thin layers were found in the chloroplasts itself.

Why out-shine the rest?

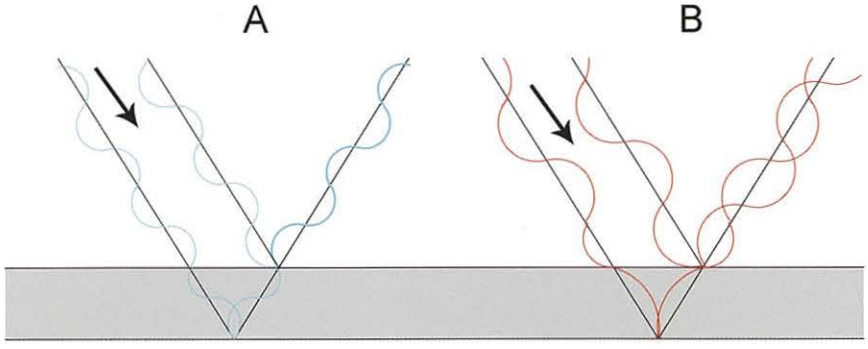
Unfortunately, there is no clear understanding on the exact adaptive significance of iridescence in *Selaginella* and other shiny ferns such as *Danaea nodosa*, *Diaplazium tomentosum*, *Lindsaea lucida*, *Teratophyllum rotundifolium* and *Trichomanes elegans*. But there are a few clues that can shed some light. Although the above mentioned iridescent plants may differ in the exact details of their thin layers, they all tend be found growing in the deep shade conditions of the forest floor, suggesting that iridescence is an adaptation to dark environments. However, low light is only part of the problem for bottom-dwellers. For photosynthesis to take place, most plants require light at the red end of the spectrum. With all the overhead vegetation monopolising most of the available red light, what little light that actually reaches the bottom of the forest is usually very red-deficient. One theory about the benefit of iridescence is that it allows more of the scarce red light to enter the cells, whilst reflecting the unwanted blue light. However, more studies are needed to test this. Other interesting morphological adaptations to low light in iridescent ferns and selaginellas include fewer but larger chloroplasts, and convex shaped upper epidermis cells which focus the available light to their chloroplasts. Clearly, these plants are well adapted to the stressful low-light conditions.

Whether iridescence is a significant adaptation to deep shade conditions or merely a spectacular by-product of some other adaptation we know not of, it is certainly an interesting story that blends the science of physics and biology together. So next time you pass through the Evolution Garden, take a little time to examine this fascinating optical phenomenon and appreciate the complexity of these supposedly more 'primitive' lower plants.

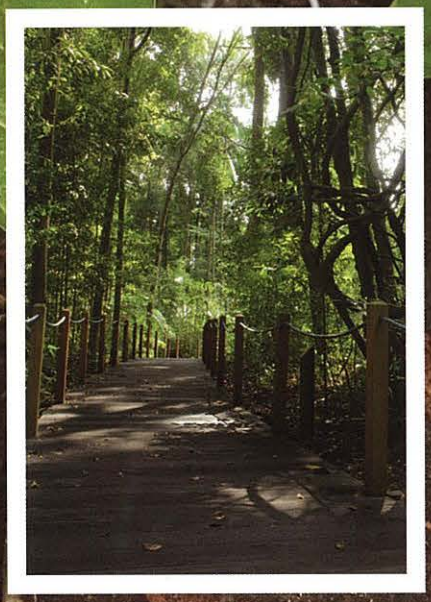
Thereis Choo
Living Collections

Photo by Mark Hughes

This article was based upon the chapter: Iridescent Ferns and their Shady Behavior in the 2004 book A Natural History of Ferns by Robbin C. Moran. It can be found in the Library.



The principle of thin-film interference. Light waves are reflected off the top and the bottom of the thin layer (shaded in grey). In (A) constructive interference occurs as the reflected waves of light are in sync and reinforce each other. Iridescent *Selaginella willdenowii* and *Selaginella uncinata* have a 71-80 nm thin layer that causes constructive interference for blue wavelengths of light, but not for other visible wavelengths of light as in (B). Figure drawn by Vicnesvari Sengily



The Rain Forest Boardwalk – towards conserving a living legacy

Glimpses inside the Gardens' Rain Forest

The Gardens' Rain Forest

In land-scarce Singapore, which has a total land area of only 699km^2 (or 69,900 hectares), the Gardens is indeed fortunate to be able to preserve a patch of rainforest covering an area of 6.2 hectares within its compound. Since its inception in 1859 in its present location, the Gardens has seen many changes and new developments in its landscaping and planting. However, the Rain Forest has continued to stand firm throughout the years and remains as a living legacy in the very heart of the Gardens.

Threats to the Rain Forest

With the progressive development of the Gardens, the Rain Forest gradually became more porous when Liane Road and paths were built through it and it suffered a loss in species diversity. Herbs and shrubs were the worst hit, as many live in deep shade and high humidity. The fauna in the forest has also been affected. Rarely do we see large snakes or the shy monitor lizards in the forest. What seem to thrive are the flighty squirrels, scurrying from tree to tree, and the shrilling cicadas.

This small size of this isolated forest makes the maintenance of a cool moist ground level environment difficult as the patch has a relatively long edges, exposing the forest to external environmental factors.

Regeneration of the trees species is a concern for us, as more than half of them are represented by only one or two individuals. The rampant growth of the introduced climber *Dioscorea sansibarensis* (Dioscoreaceae) and others such as *Smilax setosa* (Smilacaceae), and *Ficus apiocarpa* (Moraceae) may also bring down trees with their weight. Falling trees can also cause problems by leaving gaps that prevent the regeneration of primary forest species requiring shade, high humidity and cooler temperatures for germination. Our rain forest remnant in the Gardens stands as a living experiment demonstrating the long term effects of habitat fragmentation.

The Boardwalk – to conserve and educate

However, despite being an isolated fragment the Gardens' Rain Forest is home to over 300 plant species, representing about 15% of Singapore's flora. About 80% of these species are considered rare or endangered, and thus our small patch of jungle is still extremely valable in terms of conserving biodiversity in Singapore, serving as a seed source and gene pool. We are working towards giving it a long term future through replanting projects, installing lightening conductors and removing aggressive weeds.

Since the completion of the Boardwalk

However, despite being an isolated fragment the Gardens' Rain Forest is home to over 300 plant species, representing about 15% of Singapore's flora.

The Greater Racket Tailed Drongo, one of the rarer native birds of Singapore that can still be found in the Gardens' Rain Forest

in early February 2008, the Gardens' Rain Forest has been made accessible to the public again. To further facilitate awareness on this living legacy and educate the public on issues of forest ecology and conservation, a revised brochure is now available. We hope that visitors to the Gardens will explore our Rain Forest hidden in the heart of the city, and realise we all hold a collective responsibility for its future.

The Rain Forest, just like the rest of the Gardens, enjoys a steady stream of visitors through its paths and provides a valuable learning platform for forest ecology. Guided walks are regularly organized by our Education Outreach unit or carried out by our volunteers. Through such tours, school children and visitors learn about the spiny rattan palms (used in making rattan furniture), the powerful grasp of the strangling fig, *Ficus kerkhovenii* and the majestic and tall jelutong (*Dyera costulata,* Apocynaceae), whose wood is used in the production of the simple pencil. With a steady flow of visitors into the forest on one hand and the need to protect the forest on the other, a win-win solution had to be found. This is where the Boardwalk story begins.

Stretching a total of 492 metres, the Boardwalk is made of glass fibre reinforced concrete, and raised above the ground. The Boardwalk replaced an existing concrete path that was manually removed to aid restoration, in total we expunged 289 m of concrete path, returning the land to the forest.

Come and explore our Rain Forest hidden in the heart of the city. Pick up one of these new leaflets at the Visitor Centre or Green Pavilion to guide you through and help you identify some of its signature plants and trees.

Benjamin Aw
Visitor Services

Photos by Lim Yao Hui unless otherwise stated

New records of *Sphagnum* moss in the lowland tropics

The ecology of this water-loving moss has been well studied in the northern hemisphere where it is abundant. It forms thick and compacted populations along the margins of water bodies in temperate regions, forming peat bogs. Peat bogs are characterised by having deep layers of partially decomposed plant materials and low pH and being low in mineral nutrients. The water accumulated in or draining off such peat bogs becomes tainted by the leached tannins and humic acids, staining it brown like tea.

In the tropics, *Sphagnum* peat bogs are a rarity, but they can form extensive blankets on waterlogged, shaded mountain sites at elevations above 1000 m altitude where night temperatures drop to the mid-10s.

Low elevation or sea level *Sphagnum* bog is rarely seen in the Asian tropics and has been infrequently reported in the literature. Recently, on two separate trips to the lowland peat swamp and heath forests in Sarawak (Malaysia) and West and Central Kalimantan (Indonesian Borneo) respectively, several lowland populations of *Sphagnum* were encountered. All the populations were identified as *Sphagnum cuspidatum*, a widespread species in the north temperate zone that extends to the South East Asian tropics. Interestingly, the collections reported here represent the first records for Kalimantan. Voucher specimens of these new records are kept

Above:
Sphagnum cuspidatum growing in a slow-flowing peaty stream at low altitude in Bargugus, Central Kalimantan.

Below:
Sphagnum cuspidatum was also found at Sungei Kepayan Hulu, West Kalimantan

at the Gardens' Herbarium. Details are given below.

West Kalimantan

Location: Anjungan, Sungei Kepayan Hulu, peatswamp forest; 00°19.208'N 109°09.665'E, 45 m elevation, Aug 2007, Tan H.H. 07-25 (SING).

This was in degraded peat swamp was accessible via a plank track (usually built for illegal logging) at km 60 Pontianak, along the old coastal road. The surrounding vegetation consists of secondary scrub and regenerating peat swamp forest. The plank track was slightly raised as the ground beneath is unstable and the area is prone to flooding during monsoons. The track had little overhead cover and is very exposed to direct sunlight. A population of *Sphagnum* was observed while walking on the plank track.

The *Sphagnum* was found growing in tannin tainted water puddles next to the track (Figures). The pH of the water was 3.8 (August 2007). Further along the track, a blackish water stream was encountered, but no *Sphagnum* was present. Two species of aquatic macrophyte were spotted, viz. *Barclaya motleyi* (Nymphaeceae) and *Cryptocoryne* sp. (Araceae).

Central Kalimantan

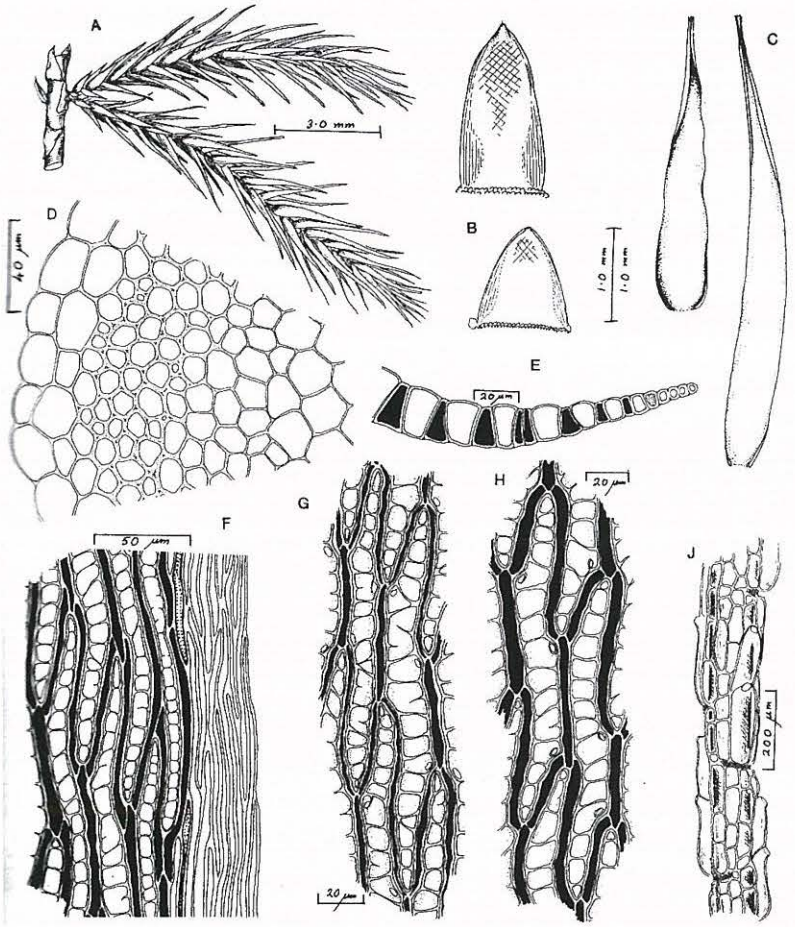
Location: Mangkutup-Kapuas/Kahayan basin, Bargugus, heath forest; 01°56.291'S 114°04.371'E, 22 m elevation, Sep 2007, coll. Tan H.H. 07-33 (SING).

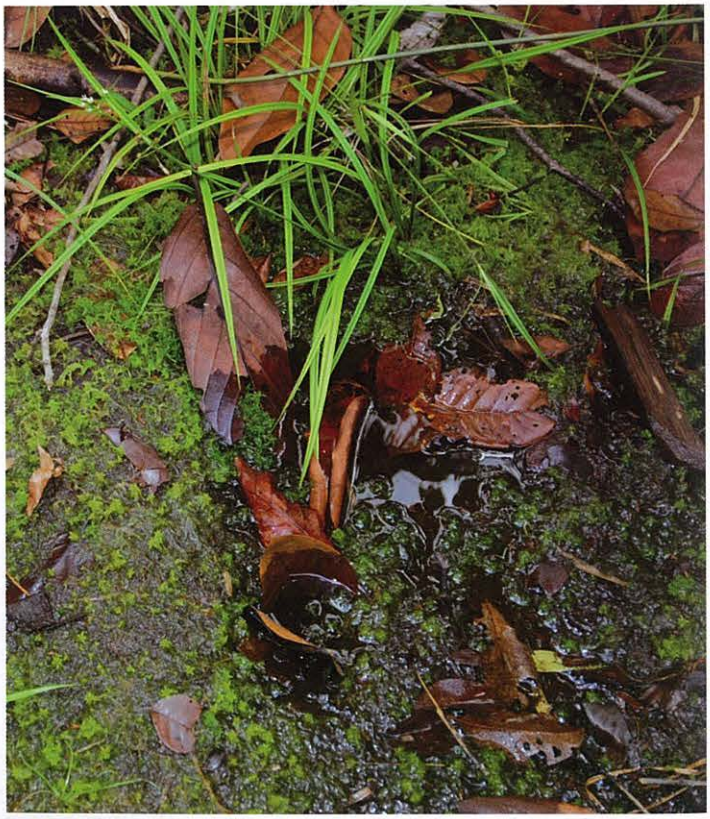
The site was a slow flowing blackish water stream located next to a road, surrounded by secondary vegetation. The stream bed consisted of white fine sand and peat deposits. This stream was fully exposed. The *Sphagnum* moss forming a carpet, was growing along the stream bank next to a road bridge, half submerged and half out of water. The water was highly acidic at pH 3.0. No aquatic macrophytes were sighted.

Tan Heok Hui, Tan Swee Hee
Raffles Museum of Biodiversity Research

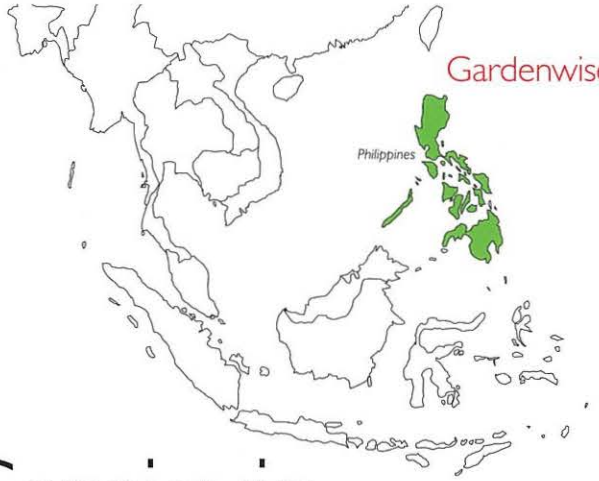
Benito C. Tan
Herbarium and Library

The anatomy of *Sphagnum cuspidatum* and the species in-situ in Sungei Kepayan Hulu





Photos by Tan Heok Hui & Tan Swee Hee



Exploring plant biodiversity on the Philippine island of Camiguin

The Philippine archipelago consists of over 7000 islands. The locality of Camiguin is highlighted in red

The jagged peaks of the volcano, Mt. Hibok-hibok

Research staff from the Gardens' herbarium and the Liceo de Cagayan University in Mindanao have commenced a collaborative project to undertake a botanical survey of Mt. Hibok-hibok on the Philippine island of Camiguin. This venture is supported by a recently signed Memorandum of Understanding between our two institutions, which confirms our intention to work together on the common goal of understanding and conserving the plants of the Philippines.

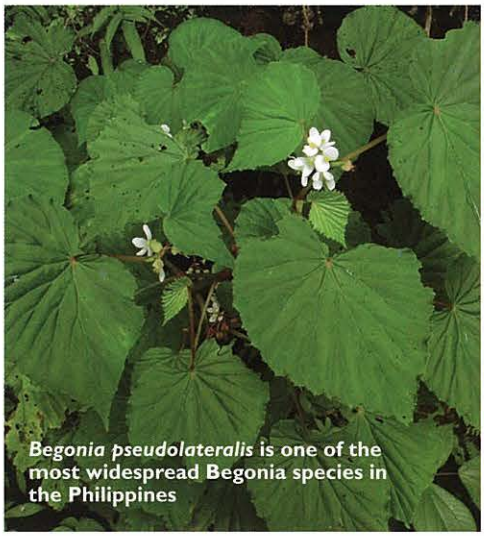
Camiguin is a pear-shaped island province, found to the north of mainland Mindanao in the Bohol Sea. The island boasts several volcanic peaks, with Mt. Hibok-hibok rising to 1250 m in altitude. It is one of the most active peaks on the island, as evidenced by numerous steam vents and a hot spring. Despite the relatively young age of the island (ca. 1 million years) there are a number of plants and animals that are endemic to Camiguin, which highlights the importance of conserving its biodiversity. There is no single place to go for information on the plants of Camiguin, so it is at present extremely difficult to identify and monitor the status of the indigenous flora of the island. Such information will also be of benefit to local government who wish to encourage eco-tourism on Camiguin. We hope that the collaborative efforts between the Gardens and Liceo de Cagayan University will provide the information necessary for the conservation of the islands plants.

During February 2008, the team explored the rain forests of Camiguin including a full ascent of Mt. Hibok-hibok. The volcano was last active in the late 1940's – early 1950's, with a series of eruptions culminating in a large event in 1951 in which hundreds of people lost their lives. This eruption still has its mark on the vegetation of the

During February 2008, the team explored the rain forests of Camiguin including a full ascent of Mt. Hibok-hibok.

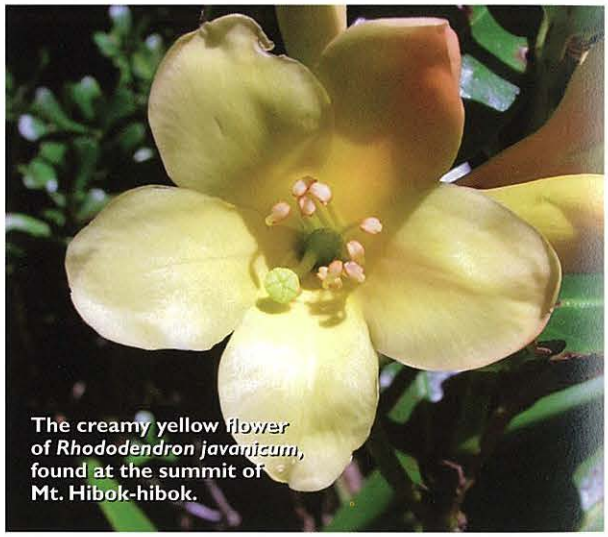
Dr. Jana Škornicková examining the epiphytes on a tree near Binawangan waterfall

Dr. Mark Hughes looking at *Begonia acuminatissima*, previously known as *B. camiguinensis*



Begonia pseudolateralis is one of the most widespread Begonia species in the Philippines

This red-flowered *Rhododendron* (*R. quadrasianum*) was first described from the Philippines in 1886.



The creamy yellow flower of *Rhododendron javanicum*, found at the summit of Mt. Hibok-hibok.

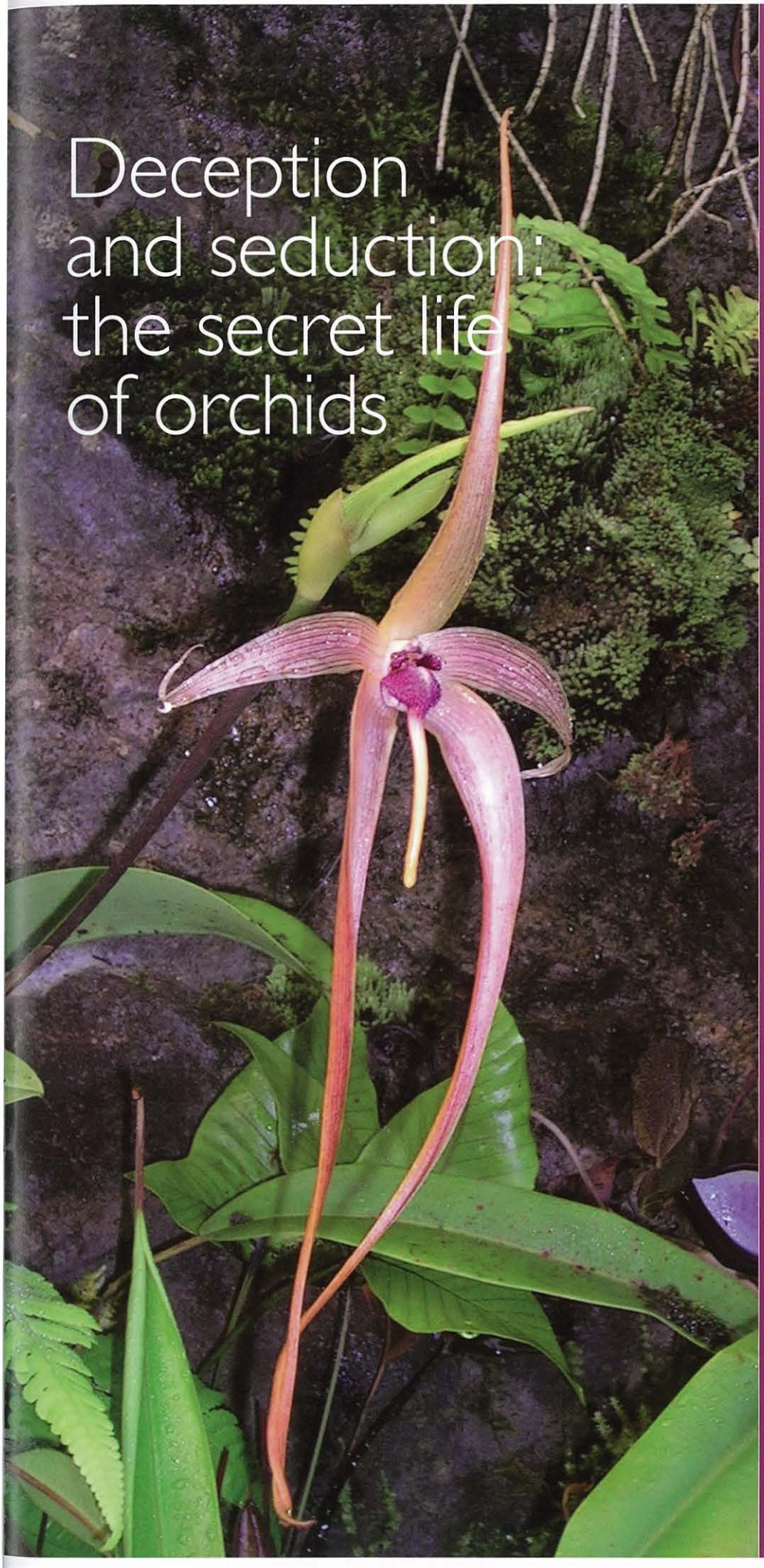
mountain, which on the northern slopes is characterised by low-canopy forest largely made up of pioneer trees and shrubs. The understory at lower elevations contains many specimens of *Medinilla multiflora*, with its striking blue and purple infructescences. Large stands of *Alipina aquatica* were also present, displaying clusters of red berries. At higher elevations we found several *Aeschynanthus* species, including *A. philippinensis*. The summit vegetation was open heathland, and amongst the shrubs there were two species of *Rhododendron*, one of which we have identified as R. *quadrasianum* and another tentatively as *R. javanicum* ssp. *schadenbergii*. Exploring other mountains on the island revealed some interesting herbaceous plants, such as the orchid *Spathoglottis plicata*, the balsam *Impatiens burkei* and two *Begonia* species, *B. acuminatissima* and *B. pseudolateralis*.

Many moss species were also found in the wet forests, with an initial estimate of 100 species representing approximately 50 genera. The Liceo de Cagayan University is starting a research herbarium, so pressed specimens were collected of many of the flowering plants, ferns and mosses we encountered. The specimens were collected in newspaper and dried over electric stoves at Liceo University on mainland Mindanao, using a dryer specially made for the expedition. It consisted of only concrete blocks and chicken wire, but proved to be excellent for preparing herbarium material. These specimens, represented in both the Gardens' herbarium and at Liceo de Cagayan University, will provide a permanent record of the plants of Camiguin and a reference point for their identification, monitoring and conservation.

Mark Hughes
Benito C. Tan
Jana Škorničková
Herbarium

Photos by Jana Škorničková, Mark Hughes and Jony Berjes

Deception and seduction: the secret life of orchids



The orchid family (Orchidaceae) is the largest family of flowering plants in the world with approximately 25,000 species. It is also extremely diverse and not yet completely known, with new species being discovered and described every week. The diversity of species extends to their pollination mechanisms. Most orchids are cross-pollinated, requiring specific pollinators (such as ants, bees, beetles, wasps, moths, butterflies, flies, and birds) to transfer the pollen from one plant to another. Some are visited and pollinated by more promiscuous pollinators such as the carpenter bee, *Xylocopa*. They have many extremely complex and ingenious pollination mechanisms to ensure effective and efficient pollination.

How do orchids attract their pollinators? It is interesting that to attract pollinators orchids use features that may be described in human terms, including hunger, anger, sex, survival instinct and deception.

Species that are pollinated by bees and birds usually offer nectar as reward. Orchids pollinated by hummingbirds and sunbirds have flowers that are usually red or orange in colour and most produce large quantities of nectar. Birds do not have a strong response to scent, and hence most of these species produce odorless flowers. The birds pick up the pollen when they try to get the nectar reward, and when they visit another flower, the pollen is deposited into the stigma.

Orchids pollinated by hummingbirds and sunbirds have flowers that are usually red or orange in colour and most produce large quantities of nectar.

Left:
Bulbophyllum echinolabium, **which emits a strong, unpleasant odour, is believed to be pollinated by flies.**

Orchids pollinated by butterflies have large and showy flowers, with their colours ranging from bluish purple and green to red and orange. Some are scented, and usually nectar is offered as a reward. Nectar guides and nectaries are present, the latter being hidden in narrow tubes or spurs at the back of the flower which can only be reached by the long tongue (proboscis) of the butterflies.

Most moths are nocturnal, and as a consequence most orchid flowers which are pollinated by moths are white and reflect the moonlight. They tend to open in the evening, with large with tubular floral parts, emit strong sweet scent at night or early morning and often offer nectar as reward. One interesting example is *Angraecum sesquipedale*. It is a native to Madagascar and produces a strong scent. The flower has a nectar tube of 25-30 cm (10-12 in.) in length with only the distal end filled with nectar. When studying the species, Charles Darwin postulated that there must be an as yet undiscovered moth with a proboscis capable of extending to 11 in. (28 cm) that visits this flower, otherwise the orchid could never be pollinated. The postulated pollinator was discovered in 1903, some 41 years after Darwin's death. The predicted pollinator was a hawk moth now named *Xanthopan morganii praedicta* (praedicta meaning predicted). It has an appropriately long proboscis which fits perfectly into the nectary of *Angraecum sesquipedale*. After feeding, the moth pulls its proboscis out and as it passes the tip of the column, the pollinarium sticks to the proboscis. When it visits the next flower the pollinarium is caught in the stigma due to the narrow gap between stigma and nectary entrance.

Many flies visit dead animals or dung to look for food. Flowers of some orchid species such as members of the genus *Bulbophyllum*, emit a strong, unpleasant odour. Attracted by the smell, the flies visit the usually brown or orange flowers and pollinate them.

Bees can see wavelengths from 300 nm (UV) to 650 nm (orange). Since bees can see UV light, the reflection patterns of bee pollinated flowers as seen by bees may look very different to that seen by a human. Orchids pollinated by bees are usually colourful and scented, and often have ultraviolet nectar guides on their lip. Sometimes, nectar is offered as reward.

Pollination mechanisms are often very complicated, such as in several genera of neotropical orchids which are pollinated by orchid bees (euglossine bees). These bees are characterized by their long tongues, and the males collect fragrances from objects as such flowers, dead wood, etc. They store the fragrances in their hind legs, and it is believed that the female bees judge the quality of the male bees by the fragrances they collected prior to mating.

One interesting example of euglossine bee pollination is found in the genus *Coryanthes*, also known as the "bucket orchids". This genus is distributed from Mexico to Bolivia and Brazil. A gland of the flower produces a liquid which drips into the bucket and fills it. The bee is attracted by the smell of the liquid and lands on the rim of the bucket and eventually falls into it. To save itself from drowning, the bee has to get out through an opening situated just below the tip of the column. On its way out, the bee picks up the pollinarium from the column. Attracted by a second flower, the bee repeats the process.

Another example is the pollination of species of *Catasetum* by the euglossine bee, *Eulaema cingulata*. There are some 160 species of the genus which occur from Mexico to tropical America, with the majority in Brazil. The plants produce clustered, thick, cigar-shaped pseudobulbs. One unusual characteristic of *Catasetum* species is that they produce unisexual, fleshy flowers on different plants. The male flowers are more colourful and showy whereas the female flowers are usually yellowish-green. The flowers produce a scent which attracts the male bees. Near the tip of the column is a pair of antennae,

Pg16, left to right:

A flower of *Ophrys apifera* from England; the process of self pollination is clearly seen.

This colourful *Masdevallia* species is pollinated by hummingbirds.

Cycnoches pentadactylon is pollinated by euglossine bees.

Left:
Bees can see UV light, the reflection patterns of bee pollinated flowers seen by bees may look very different from what is seen by human. *Catasetum pileatum* flowers under visible (A) and ultraviolet (B) light.

which are under tension. As the bee lands on the lip of the flower to search for the scent compounds it touches the antennae, causing the pollinarium to fly out and stick to the bee's back. As it subsequently visits a female flower, the bee deposits the pollinarium onto the stigma.

In *Cycnoches,* after the bee lands on the flower it starts to scratch seeking scent compounds while trying to hold onto the lip which is hard and slippery. As the bee slips and falls, its body touches the tip of the column where the pollinarium is located. As a result, it picks up the pollinarium on its rear end. This process is repeated on a visit to a female flower. The stigma is notched and as the bee falls the pollinia are caught in the notch. They remain in the stigma because the weight of the bee plus the force generated by its falling is enough to break the adhesive bond between the viscidium and the bee's rear end.

Oncidium in their natural habitat in tropical America mimic flowers of the non-orchid plant, *Malphigia*. Oils are produced on the surface of *Malphigia* flowers by specialized glands known as elaiophores. The oils are collected from the flowers by female anthophorid bees for feeding their larvae. Many species of *Oncidium* do not offer an oil reward, but are thought to mimic *Malphigia* flowers that share the same habitat. Certain parts of the flower, such as the calli on the lip, resemble the elaiophores. When the bees visit the *Oncidium* trying to collect the non-existent oil, they pollinate the flowers.

Wax or resin is collected and used by female bees for nest construction. Flowers of some *Maxillaria* and *Cymbidium* species produce structures that look like resin or wax on the surface of flowers. The bees are attracted to the flowers and when they try to collect the "rewards", the flowers are pollinated.

Finally, members of the terrestrial genus *Ophrys* employ sexual deception as their pollination mechanism. The genus is also known as "bee orchids" because their flowers resemble the furry bodies of bees. They can be found in central to South Europe, North Africa, Asia Minor, mostly around the Mediterranean. The Greek name for the genus, "*Ophrys*" means "eyebrow", it refers to the furry edges of the lips of some species. The flowers produce a scent (pheromone) which resembles the one produced by the female insect, and this attracts male bees from a long distance. As they get closer to the plant they pick up on the visual cue of the resemblance of the flower lip to the body of a female bee. When the male tries to copulate with the flowers (pseudocopulation), the pollinarium sticks to its head or abdomen and is ready to pollinate the next flower the bee visits. So what do the pollinators get? The male bees hatch about two weeks before the females. Therefore female bees are initially scarce, and as a result the males find it difficult to find a mate. The strategy of the bee seems to be: "Hey, I will go for anything that looks like a female because I can't afford not to."

There are always exceptions in nature. In order to colonise a new location where there are no pollinators, some orchid species produce seeds by self-pollination. For example, after the end of the last ice age in Europe ca. 10,000 years ago (during which the United Kingdom was largely covered in ice), *Ophrys apifera* recolonised the UK from Europe but its pollinator did not come with it. In common with many orchids at the far north of their geographical distribution - where pollinators become scarce - it has only survived by self pollination. According to Dr Henry Oakeley, he has not observed this Ophrys doing anything except self pollinate, the pollinia always fall out of the pollen sac and curve round into the stigma. In continental Europe, the species is pollinated by bees.

Yam Tim Wing
Orchid Breeding and Micropropagation

Photos by Yam Tim Wing unless otherwise stated

Screening of 'An Inconvenient Truth'

On 20 April, we hosted the public screening of the film An Inconvenient Truth in collaboration with Home Box Office (HBO). The overwhelming demand resulted in the two planned screenings becoming three. In all, about 500 visitors caught the film.

Presented by former USA Vice-President Al Gore, this documentary highlights the important role we play as custodians of the Earth. Its aim is to demonstrate that climate change is caused by human activity and will have potentially catastrophic effects on our environment. As well as providing an accessible insight to the science behind climate change, the film also gives us a greater understanding of the economics and politics involved. The film ends with a reminder that although the problem of climate change is caused by our lifestyle, the solution also lies with us.

This film is an example of the outreach the Gardens is dedicated to on environmental and conservation issues.

Benjamin Aw
Visitor Services

The award-winning documentary by Al Gore was screened three times at the Gardens on the 20th April

The Shaw Foundation Symphony Stage played host to 'Love & Destiny', a dance musical organized by the Chinese Cultural Festival committee on Saturday 22 March. The Guest of Honour Dr Lee Boon Yang, Minister for Information, Communications and the Arts graced the event with 800 audience in attendance despite the wet weather. The performance was the grand finale to the week long Chinese Cultural Festival 2008.

A dance musical

Written in 1958 by Chinese composers He Zhanbao and Chen Gang who graduated from the Shanghai Conservatory of Music, this symbolic piece is brought to life again through the interpretation of Liang Zhu Violin Concerto or Butterfly LoversTM Violin Concerto. The dance displays the romance and emotion between the pair as they fight against feudalism for their love before transforming into butterflies to be together forever.

Produced, choreographed and conducted by Fan Dong Kai, Creative Director of People's Association, this dance musical is accompanied by other delightful groups such as Black Forest, Kym Rhythmic, Juz-B and Chua Yi Fang.

Benjamin Aw
Visitor Services

Photos by Benjamin Aw


Liang Shanbo's sorrow as they are torn apart


Female lead playing the role of Zhu Yingtai

The invited participants at the IUCN/IAB meeting with staff of the Gardens.

First Asian Bryophyte Red List meeting held at SBG

The Gardens hosted an international conference cum workshop from 28 February to 2 March in 2008 to produce the first Red List of endangered Asian bryophytes. This international meeting was organized by the Gardens' Herbarium at the request of IUCN (International Union for Conservation of Nature and Natural Resources) and the IAB (International Association of Bryologists).

The meeting with the main theme, "Towards the First Red List of Endangered Bryophytes in East, South and Southeast Asia", was attended by 18 invited bryologists from ten countries in Europe and Asia, namely Sweden, Finland, Norway, Czech Republic, Russia, Japan, China, Malaysia, Singapore and the Philippines. The participants are either the authorities of a group of bryophytes worldwide including Asia, or renowned taxonomists of Asian bryoflora.

The goal of the conference was to assess and list species of endangered bryophytes from East, South and South East Asia by way of group discussion and by using the newly developed tool of rapid assessment called The RapidList Programme recently published by IUCN.

The conference opened on Feb 29 with a half day seminar on selected topics dealing with the problems encountered in the red-listing of endangered bryophytes in Europe and Japan, the uses of global databases and the newly developed rapid assessment method in estimating the endangered status of bryophytes. This was immediately followed by two days of discussion to formulate the first bryophyte Red List..

The participants also found time for a tour of the National Orchid Garden and Cool House in the Gardens. Both were praised for their beautiful landscape, scientific focus and rich display of plant diversity, including many species of mosses. Later, a visit to a supplier of ornamental aquarium bryophytes also highlighted the commercial value of this group of plants.

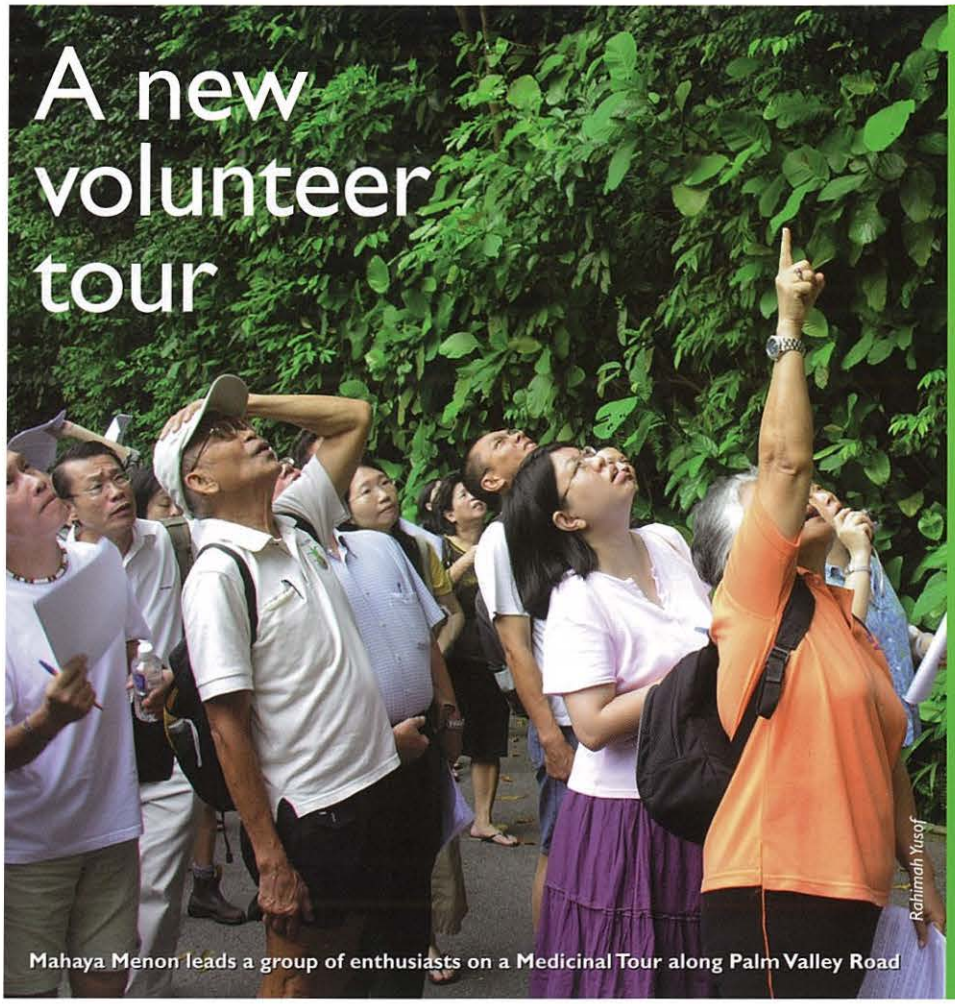
In the end, two separate Red Lists of endangered Asian bryophytes, the hepatics (liverworts and hornworts) and mosses, were produced, each including some 150 taxa. The two lists will be circulated to other members of the IAB for feedback and additional comments before submitting it to IUCN for official recognition.

The production of these lists marked the meeting as a landmark in the progress and development of Asian Bryology. It also highlights the increasingly important role played by the Gardens in the study and documentation of moss diversity in the Asian region.

The meeting was partly funded by the Botanical Gardens Conservation International (BGCI), The Tan Chin Kee Foundation and Lady Yuen-Peng McNeice.

Benito C. Tan
Herbarium and Library

A new volunteer tour



Mahaya Menon leads a group of enthusiasts on a Medicinal Tour along Palm Valley Road

First offered in October 2007, the Edible and Medicinal Plant tour is gaining ground as one of the must-attend tours conducted regularly by the volunteers of the Gardens. Held every first Saturday of the month at 9am & 10am, each tour lasts for an hour, starting off from the Visitor Centre.

Featuring an array of spice and medicinal plants, the tour entices you to delve deeper into the wonders of plants such as: *Syzygium aromaticum* (clove, cengkeh), which was used traditionally by the Malay and Indonesian community to relieve toothache as well as to act as a breath freshener; *Myristica fragans* (nutmeg, pokok pala), used for the treatment of boils as well as to relieve rheumatism; the culinary herb *Cymbopogon citratus* (lemon grass, serai), the sensitive plant *Mimosa pudica* (touch-me-not, pokok malu-malu) and *Zingiber officinale* (ginger, halia).

Visit www.sbg.org.sg (Calendar of Events) for more information on our regular tours.

Benjamin Aw
Visitor Services

Volunteer tea reception

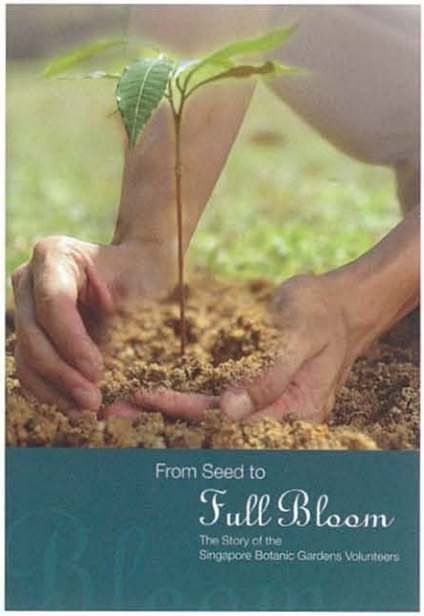
Passion. Spirit. Fellowship. These are traits of the 343 Singapore Botanic Garden's volunteers who conduct weekly tours such as the Rainforest, National Orchid Garden, Evolution and the new Edible & Medicinal plant tours. How do they juggle their work, family and personal time, yet find time for volunteering?

The answer lies in their passion and respect for nature coupled with their desire to educate visitors on how we play a part in conservation. Fueling their spirit is a sense of satisfaction knowing their knowledge inspires their visitors. For example, Kon Kee Meng, a retired Singaporean, joined to learn new stories about plant life to share them with other people. He has been volunteering regularly for 3 different tours held weekly in the Gardens since 2004.

Acknowledging our volunteers efforts through a souvenir book titled 'From Seed to Full Bloom' is a small gesture from us compared to their love for the Gardens. Presented during their annual Volunteer Tea Reception, this short book encapsulates their endeavours since the inception of the volunteer programme. Keith Hiller, our Volunteer Coordinator, recalls starting the training programme in 2001 with only a handful of guides. This group has now grown to 31 trained Rain Forest guides with another 25 in the moulding.

This spirit of volunteerism demands a salute. For those who have been pondering about a calling from Mother Nature, wait no longer. For information on joining us as a volunteer, please contact Visitor Services at 6471 7138. We hope to see you!

Benjamin Aw
Visitor Services



The souvenir book dedicated to SBG's passionate Volunteers

Spices galore!

It is of no doubt that spices play an important role in our lives – be it for culinary use or for their medicinal properties. The cultivation of spices in Singapore has long been intertwined with the development of the country since Raffles founded modern Singapore in 1819. He immediately established a Botanical and Experimental Garden for the cultivation of popular spice crops like cinnamon (*Cinnamomum zeylanicum*, Lauraceae), nutmeg (*Myristica fragrans*, Myristicaceae), gambier (*Uncaria gambier*, Rubiaceae) and Clove (*Syzygium aromaticum*, Myrtaceae). Spices and their trade were a major consideration in the tussle for the control of South East Asia between the colonial powers in those days.

The Gardens had an opportunity to learn more about this trade through an exhibition in the Library. It was brought to the Gardens as part of a travelling exhibition from the National Archives of Singapore. Entitled "Spice Frontier: Changing Boundaries, Evolving Uses", the exhibition spanned over the period 16 April to 15 May 2008.

In conjunction with the poster exhibition, the Library also included from its own collection a display of rare books, herbarium specimens and botanical drawings, all linked to the theme of spices.

To enrich the exhibition, dried spices were also put on display, allowing visitors to the Library to learn about the common and not so common spices used in our region. Many modern, high-rise city dwellers have certainly not seen what processed gambier looks like, let alone be aware of what betel chewing is all about. Certainly many are aware of the use of tamarind (*Tamarindus indicus*, Leguminosae) as a souring agent in many Asian dishes. However, many are surprised to discover alternatives like the asam gelugor, a relative of the mangosteen, or the asam paya (*Eleiodoxa conferta*, Palmae). The latter, from the peat-swamp forests in the region, is however not commonly available in the market.

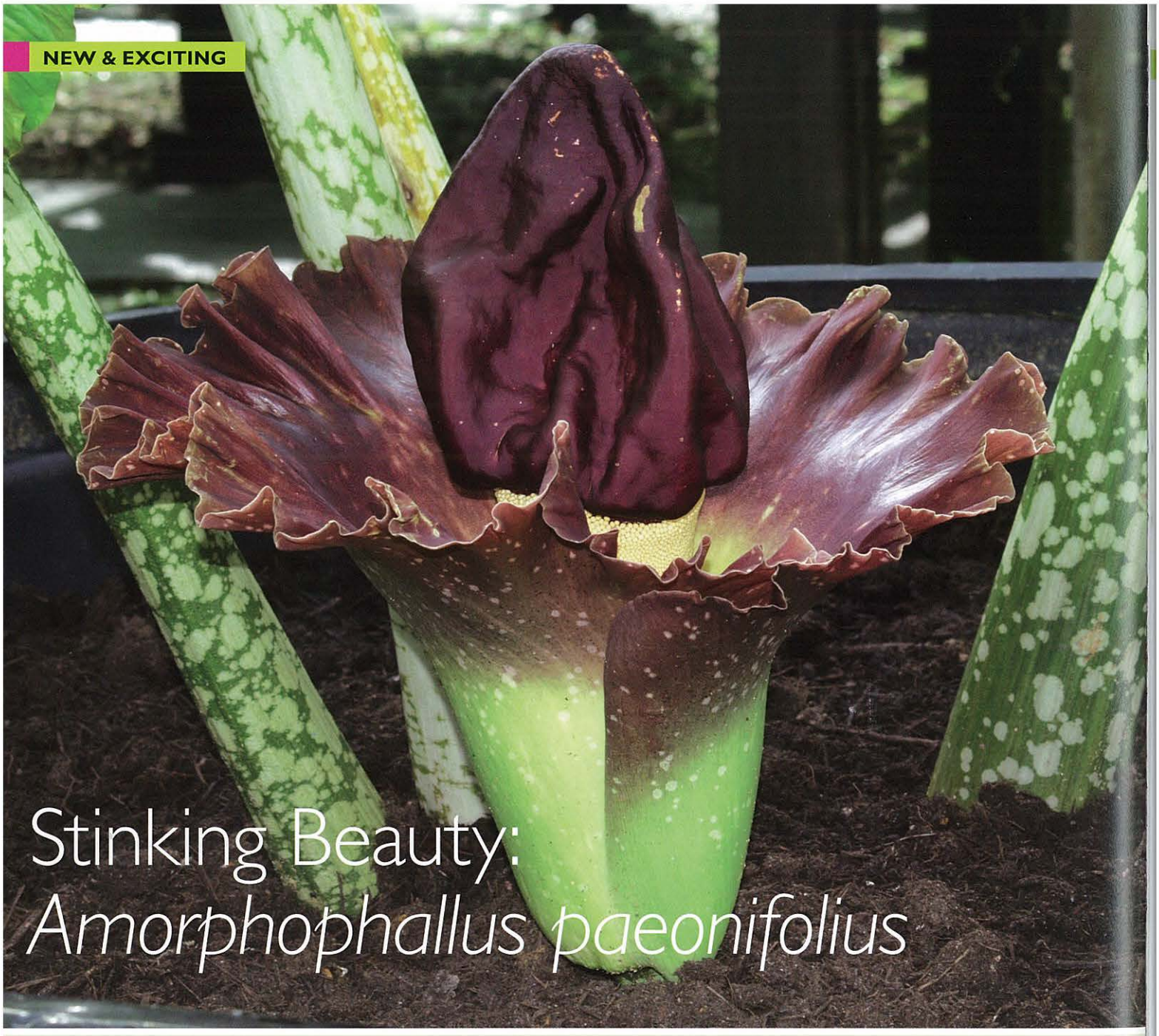
Hassan Ibrahim
Library

Photos taken by Jassy Phua

Top:
A view of the Exhibition

Bottom:
Botanical drawing of the *asam gelugor*

The Gardens would like to thank the National Archives of Singapore for sharing their poster display.



Stinking Beauty: *Amorphophallus paeonifolius*

During late May, a specimen of *Amorphophallus paeonifolius* came into flower at the Gardens, and was placed on display in the Green Pavilion. Also known as the Elephant Foot Yam, the other common names for this plant give some idea of the of the foul-smelling nature of its inflorescence: Corpse Flower, Devils Tongue and Voodoo Lily. Our specimen arrived as a small corm received from Xishuangbanna Tropical Botanic Garden in 1998. After growing slowly at first, the now-sizeable corm eventually flowered whilst sitting in a container 4 feet square and 2 feet deep, after being fed on liberal quantities of fertilizer and chicken dung.

The inflorescence reached about 40 cm in height. It consisted of a spadix with a dark blackish violet distorted apex and a fleshy purplish skirt called the spathe. The male and female flowers are located on the spadix; male at the top and the female below. Our specimen lived up to its common names by producing a rotten fish smell which attracted carrion flies, the pollinators of this species. The rather macabre display only lasted a few days, after which the flower wilted and lost its smell. This is the second time this particular corm has flowered, and it will now rest to rebuild its strength before luring more flies to the Gardens in a few years time.

If you have space at home (and tolerant neighbours!) you can try growing this plant yourself, as the large and starchy edible corms can often be found in the vegetable shops of Little India.

Mark Hughes
Herbarium

Aung Thame
Living Collections

Photo by Aung Thame

Sweet, sour, and remarkably useful!

Tamarindus, commonly known as tamarind (English), asam jawa (Malay), luo wang zi or suan-jiao (Mandarin Pinyin), and ambli (Hindi and Bengali), is a monotypic genus in the Fabaceae (legume family). It is thought to have originated in tropical Africa and Madagascar and was introduced to Asia in ancient times. Tamarind is so widely cultivated and naturalized on the Indian subcontinent that it is often incorrectly reported as native to India. The binomial attributed to this plant by Linnaeus in 1753, *Tamarindus indica,* reinforces this misconception. The generic name is a Latinized form of the Arabic name "tamar-u'l-Hind", meaning "Indian date". The epithet literally means "of India" but has also been applied to plants originating from the East Indies.

Tamarind is a slow growing, semi-deciduous to evergreen tree 15-30 m in height with a broad domed crown. The leaves are pinnately compound with 10-18 pairs of subsessile, oblong leaflets up to 2.5 cm long. The small (1 cm) flowers, borne in pendant racemes, consist of 4 pale yellow to pink sepals and 3 unequal yellow petals with pinkish to reddish-brown veins and crisped margins (2 additional petals are reduced to inconspicuous bristles). The fruit are reddish- to grayish-brown, curved, oblong, indehiscent pods (usually 5-12 cm in length) with a thin, brittle pericarp (outer covering) and a sticky, brown pulp surrounding 1-8 hard, shiny black seeds.

This is one of the most widely cultivated and valued tree species in the tropics. In addition to being an exceptional, drought tolerant ornamental and shade tree, the young leaves, flowers, and fruit are edible. Rich in vitamins B and C, as well as iron and calcium, the fruit pulp is consumed fresh and used as an ingredient in beverages, preserves, curries, chutney, ice cream, candies, chewing gum, and condiments such as Worcestershire, Angostura Bitters, and barbecue sauce. The pulp tastes both acidic/sour and slightly sweet, though some cultivars have been selected for sweeter flavor. The fruit is a ubiquitous ingredient in the cuisine of many tropical nations in both the Old World and the New World. The seeds may be consumed after being boiled or roasted. They are also ground into flour, used as beads, and yield pectin used in processing foods and textiles. An oil extracted from the seeds may be used for cooking, lamp fuel, and varnish. The foliage is used as forage, food for silkworms, and a source of red dye. The flowers yield a yellow dye. The hard, heavy heartwood is regarded as an excellent fuel and charcoal, and it is also used in furniture, turnery, and implements. The bark is used for tanning and its extracts are used in fixing dyes and making ink. The bark, leaves, flowers, fruit, and seeds are used in traditional medicine to treat many ailments including asthma, boils, conjunctivitis, constipation, coughs, diabetes, dysentery, fever, hemorrhoids, inflammation, jaundice, rashes, rheumatism, scurvy, sores, and wounds. Pharmacologic laboratory analyses have isolated a number of antioxidant nutrients (flavonoids and other phenolic compounds) from tamarind pulp. In vitro studies have confirmed its antimicrobial properties, and in animal studies it has proven effective in lowering blood sugar and serum cholesterol levels. The polysaccharide in tamarind seed has a unique structure that makes it particularly useful in various pharmaceutical applications.

At the Gardens, tamarind trees can be seen in the Economic Garden; a dozen trees encircle the Spice Garden at the south side of Eco Lake. Tamarind fruit are readily available in local markets, and its distinctive flavor can be enjoyed at any number of local eateries.

Marc Frank
Living Collections

Photos by Mark Frank

The leaves, inflorescence, flowers and fruits of *Tamarindus indica*

The snake tree: *Stereospermum fimbriatum*

Recently, a handsome tall tree carpeted a portion of Lawn B with its delicate frilly pale blossoms. The tree is *Stereospermum fimbriatum* (Family: Bignoniaceae), locally known in Malay as chachah or in English as the snake tree. The hot dry days and cooler nights had triggered this old tree to bloom profusely and shed its flowers continuously for a few days; the resulting natural carpet of blooms was breathtaking. Records showed that this tree originated from the old Singapore Municipal Nursery and was planted in the Gardens in November 1937.

The generic name, *Stereospermum*, describes the hard winged seeds and comes from the Greek words, 'stereos' meaning hard or solid and 'sperma' meaning seed. The specific name *fimbriatum* refers to the fringed petals.

The tree is native to Indochina and the Malay Peninsula. The flowers appear on bare branches after leaf drop. The showy pale pink corollas are trumpet-like, about 5 – 7 cm wide with 5 fringed lobes, and are borne on loose terminal or lateral clusters. They open late in the evening and last till the following morning when the delicate tissue-like corollas spin down gracefully like snow-flakes to cover the ground. The subsequent fruits are long narrow pods, 37-75 x 1.25 cm, twisted and hanging in loose coils looking very much like snakes, hence the common name.

The snake tree was used as an ornamental wayside tree in Singapore in the 1960s, but over the years it has lost favour and can hardly be found along the roads today. However, it was a useful plant in traditional Malay medicine. The leaves were used to treat ear-ache, itchiness and scabies and a decoction of the roots was given as a protective medicine after childbirth.

Keep an eye out for the snake tree and hopefully you can catch her again in all her splendour next time she sheds her delicate flowers to the ground.

Nura Abdul Karim
Living Collections

Photos by Koh Sin Lan unless otherwise stated.

Top:
Mother nature's floral carpet of pink snake tree blooms.

Middle:
Dangling in the air, the snake-like pods of the *Stereospermum fimbriatum*.

Bottom:
Close-up of the delicate frilly *Stereospermum fimbriatum* flowers. (Photo: Nura A. Karim)

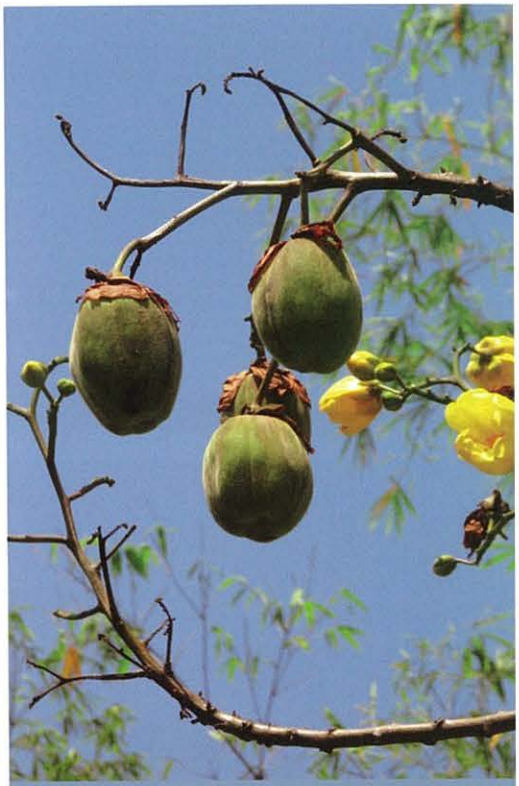
The buttercup tree: *Cochlospermum religiosum*

Over in the Economic Garden by the bamboo collection, there is a group of small trees with striking rich yellow flowers hanging on their bare branches. This is *Cochlospermum religiosum* (family: Cochlospermaceae), commonly known as the buttercup tree or yellow silk cotton tree. The buttercup tree is a native of India and Myanmar. The genus, *Cochlospermum*, is derived from the Greek '*kochlos*' meaning snail shell and '*sperma*' meaning seed, referring to the appearance of the seeds. The species epithet, *religiosum*, refers to the religious association of the tree in its native country, India. Its brilliant showy yellow buttercup-like flowers and the floss around its seeds, reminiscent of the Kapok *(Ceiba pentandra)* seeds, allude to its English common names.

Although rather shapeless and untidy, this small tree has great ornamental value because of its showy flowers that bloom throughout the year. The tree sheds its leaves before the flowers appear in terminal bunches of 10-15, which only open one or two at a time. Each flower is bisexual, about 9 cm wide, with 5 free sepals and petals, many free yellow stamens and a slightly curved style. The fruit of the buttercup tree is large, up to 10 cm long, pear-shaped, smooth and velvety. When ripe, the fruit capsule turns from light green to brown and splits open to show coiled brown seeds that resemble tiny snails covered in long silky hairs.

The buttercup tree yields a gum called katira that is insoluble in water but swells in it, and mixed with gum-arabic gives a water-borne adhesive paste. The katira gum has been used in book-binding and has some value in cigar, cosmetic and ice-cream manufacture as well as in the textile and pharmaceutical industries. The floss surrounding the seeds can be a substitute for kapok seeds to stuff pillows and life-belts.

The tree's big cheerful yellow flowers will definitely brighten any gloomy day in the gardens. It is worthwhile to visit the Gardens early in the mornings to catch the flower carpets before the sweepers and the winds sweep away the delicate fallen beauties.



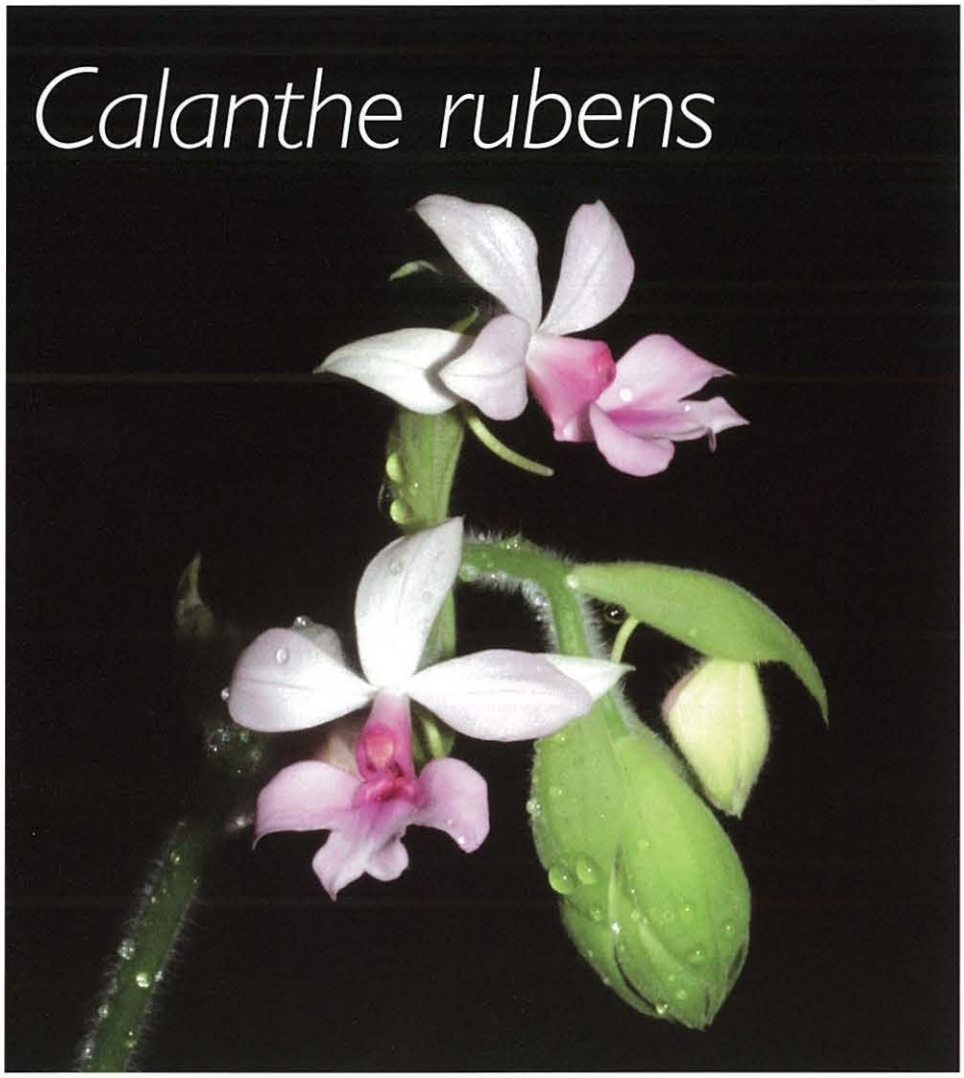
The immature velvety pods of the buttercup tree.

Nura Abdul Karim
Living Collections

Photos by Nura A. Karim

The buttercup tree in full bloom.

Calanthe rubens



A *Calanthe* species from Thailand flowered for the first time recently at Singapore Botanic in the Gardens and could be positively identified as *C. rubens*. This species is of considerable interest here in the Singapore Herbarium as the Thai species of the genus *Calanthe* are currently under revision for the Flora of Thailand.

Calanthe rubens belongs to a small group of only eight *Calanthe* species which are botanically known as '*Calanthe* subgenus *Preptanthe*', characterised by prominent swollen water-storing pseudobulbs, short-lived annual leaves and frequently hairy stems. The large pseudobulbs and the annual leaves can be understood as adaptations to seasonally dry climates. In fact this *Calanthe* group is mainly distributed in countries which have rather dry seasons, like Myanmar, Thailand and countries in Indochina; however, two species in this group also range further eastwards as far as the Philippines and New Guinea. The large pseudobulbs found in this group also explain why the plants often grow on rocks which is a periodically dry habitat type, and one species, *C. vestita*, is even predominantly epiphytic (living on trees) and is therefore even more exposed to periodical drought. Both the growth on rocks and on trees is somewhat unusual in the genus *Calanthe* where most species grow on the ground (terrestrial). Species of *Calanthe* subgenus *Preptanthe* have attractive and often large flowers and are therefore quite popular in cultivation. Plants are also not too difficult to grow in a well-drained medium but in contrast to the evergreen calanthes, require a definite resting period in the leafless state. Species in this group which are commonly found in cultivation are *C. vestita, C. rubens* and *C. rosea* together with their hybrids and cultivars.

Calanthe rubens has pink, pale pink or rarely white flowers, frequently with a darker lip and column. Flowers measure 15–25 mm across and are therefore comparatively large in the genus. They last for a few days and are borne in few-flowered inflorescences on hairy stalks that are about 50 cm long. Its lips are three-lobed with large spreading side-lobes, and the midlobe is two-lobed in its upper part. *C. rubens* is found in lowland forest, on the edges of swamp forests and in rocky outcrops in rubber plantations in Peninsular Malaysia, southern and central Thailand and the Philippines. The first plants of this species were collected by C. Curtis in 1890 on the island of Langkawi (Peninsular Malaysia) — the 'herbarium type specimen' which botanists use to fix the identity of a plant name is stored here in the Herbarium at Singapore Botanic Gardens. The species was subsequently described by Henry Ridley, one of the former directors of the Gardens.

There are twenty species of *Calanthe* in Thailand, seven species belonging to subgenus *Preptanthe* while the remainder are evergreen and lack prominent pseudobulbs and belong to subgenus *Calanthe*. There are species that belong to basically Malaysian and Indonesian groups but which have their northern-most limits of distribution in southern Thailand (like *C. ceciliae, C. pulchra, C. angustifolia* and *C. speciosa*) while most others have strong Indochinese, Himalayan or NE Asian affinities. *C. simplex* is narrowly endemic and is only found on the Doi Chiang Dao massif near Chiang Mai in northern Thailand. Another noteworthy Thai *Calanthe* species is the widespread *C. sylvatica* that is found in nearly the whole of Africa and Asia (in Asia perhaps better known under it synonym *C. masuca*). The most commen species in Thailand is the very variable *C. triplicata*, which also has a widespread distribution from Madagascar and the Seychelles through the whole of southern and south-eastern Asia to Australia and the islands of the Pacific Ocean.

Hubert Kurzweil
Herbarium

Photo by Hubert Kurzweil

Scaphochlamys kunstleri – colours in the shade

S. kunstleri var. *rubra*

S. kunstleri var. kunstleri, red-bract form

S. kunstleri var. kunstleri, green-bract form

S. kunstleri var. *speciosa*

Scaphochlamys kunstleri was first described by J.G. Baker in Hooker's Flora of *British India*. Baker based his description on a drawing made in 1882 from plant cultivated in Calcutta Botanic Gardens. Unfortunately the original locality in the Flora of British India appears as Pegu (Burma) by mistake, but in fact this species was originally discovered by H. Kunstler in Perak, which is the locality mentioned on the drawing Baker worked with and which is now deposited at Royal Botanic Gardens Kew. So far it is known to occur naturally in the Malay Peninsula and has also been reported from Thailand. Its bracts can be light green in colour or flushed with red, reaching in some cases deep crimson maroon-red. They form pouches resembling those in the genus *Curcuma*, and hence the species was named as *Curcuma kunstleri* when first described in 1890. The plant subsequently 'suffered' another two name changes, as it appeared in genera *Hitcheniopsis* and *Gastrochilus*, of which none is currently recognized. In 1950, a director of Singapore Botanic Gardens R. E. Holttum, who worked extensively on Malayan gingers, finally placed this species in the genus *Scaphochlamys*. The leaves are widest at the upper third and have long, soft and silky hairs underneath; this and the very open flowers and unilocular ovary easily distinguish it from the genus *Curcuma*.

This is one of the few gingers which occur naturally in several flower colour forms. The original description referred to a plant with light green bracts and yellow flowers, but a beautiful bright red coloured variety was discovered in 1894 in Malaysia and described by H.N. Ridley in 1907 as *S. kunstleri* var. *rubra*, while the white-flowered variety, *S. kunstleri* var. *speciosa*, was named as recently as 2001.

Scaphochlamys kunstleri is an increasingly popular ornamental plant, commonly available in Singapore and Malaysian nurseries. It is suitable for the shady damp corners of your garden, where it gives nice ground covering foliage and also beautiful flowers for several months of the year. The form with a dark red flush on the lower side of leaves is particularly pretty. It happily grows and flowers in several parts of the Ginger Garden - so look out for it!

Jana Škorničková
Herbarium

Photos by Jana Škorničková

Earth Day Special Programmes - a first time collaboration with the Green Volunteer Network

In celebration of Earth Day in April 2008, two Earth Day Special Programmes were conducted at the Children's Garden: a nature tour and a hands-on workshop. These were carried out in collaboration with the Green Volunteer Network, the volunteer arm of the Singapore Environmental Council. This collaboration has further strengthened our role in educating the public, especially our younger visitors, about the importance of appreciating our natural environment and doing our part to protect it.

Earth Day Special Tour

Green Volunteer Ms Grace Ang was the guide for this tour. To bring across the message of "caring for nature" to our participants, Grace first got their attention by highlighting interesting plants growing around the Children's Garden. The Sensory Garden was one of the most popular features in the tour. Plants for smell, touch, taste and sight drew much attention from our participants, who were even adventurous enough to sample the herbs. They were also excited to see coffee plants and cocoa trees, and fascinated to learn how their favourite drinks were made from them.

Later in the tour Grace explained the important nutrient cycling process, where dead plant parts are digested by bacteria, fungi and other microorganisms in the soil, releasing nutrients which are subsequently reused by other plants for their growth. Knowing that plants do their bit to recycle was an important message to our young participants, emphasising that we also need to play our part to care for the environment by recycling.

Grace used the pond area in order to highlight the message of water conservation. The children were excited on seeing many lush water plants (e.g. cattails, water lilies, water lettuce and duckweeds) and different kinds of water creatures (e.g. dragonflies and water skaters). Some went on the floating platform, while others explored the water plants by feeling them in the water tanks. What particularly drew our young participants' attention was

Grace's message about how we should protect our water bodies so that these beautiful water plants and animals will not be harmed.

It was a simple one-hour walk around the Children's Garden on a Saturday morning, but to the children, it was an educational experience for them regarding the importance of protecting nature. It was also useful to many of the parents who attended, a "time well spent lesson on conservation" according to one.

Earth Day Special Workshop

In protecting our environment, actions speak louder than words. Led by Green Volunteer Ms Ong Lay Keng, we took the opportunity to teach about conservation by using recycled materials to create interesting gifts.

Don't throw away old calendars and magazines, but recycle them into beautiful bookmarks and greeting cards. Together with dried pressed leaves and flowers, the participants created their own bookmarks and Mother's Day greeting cards.

Water bottles can also be recycled into useful and cute little piggy banks. They were painted for the body and four small branches glued on to form the four legs. Drawing in eyes and a tiny mouth together with cutting a slot for inserting coins completed the piggy bank.

Participants also learned to reuse plastic containers as pots for their favourite plants. They not only learn to pot a plant but could also take it home with them. One young participant commented, "This is a fun workshop. Recycling is not hard at all!"

We would like to thank Grant Pereira and his Green Volunteers for their time and effort in making the programmes a success. We hope the tour and workshop have made a lasting impression on how we can all do our part to care for our environment and use our precious resources sustainably.

Page 26:
Green Volunteer, Ms Grace Ang, showing a water plant, cattail, to young participants and parents on the Floating Platform.

Top left:
Young participants with their parents learning about how plants recycle nutrients during the Earth Day Special Tour at the Children's Garden.

Top right:
A young artist in the Earth Day Special Workshop creating his piggy bank by adding colours to his recycled water bottle.

Bottom left:
Young participants with their parents exploring water plants during the Earth Day Special Tour at the Children's Garden.

Bottom right:
Carefully gluing small branches to the recycled bottle for the legs of the piggy bank. A young participant creating her art piece in the Earth Day Special Workshop.

Winnie Wong
Koh - Low Neok Chein
Education

Photos by Koh - Low Neok Chein

What is JBCG? Come and explore...

Jacob Ballas Children's Garden (JBCG) at the Bukit Timah end of the Gardens is dedicated to all children of Singapore. It provides a place for them to play, explore and leave with happy memories. Developed along the theme "All Life On Earth Depends on Plants," it is a unique and interactive fun place where children up to 12 years of age can discover how plants provide their daily needs. Our dearest wish is that JBCG will stimulate a sense of wonder for plants in our young visitors, cultivating an appreciation for plants, nature and the environment.

To help your children make the best of their visit to the JBCG, bring along this worksheet and help them learn more about plants! Suitable for children aged 5 to 12. A copy can also be downloaded from the Singapore Botanic Gardens website : www.sbg.org.sg

Fascinating Facts!

1. Plants can make their own food. Yes, plants are Food Making Factories! What is their secret recipe? What ingredients do plants need? Plants take in _____ _____, a gas from the air, and release _____ (another gas) back into the air. But in order to do this, _____ and _____ are also needed. This process called _____ can only happen with a green pigment called _____ present. All four ingredients must be present ; even if one is missing, the food making process in plants cannot go on.

2. You have five very special senses. You can find three of them on your face. What are they? Here are some clues : You use your eyes for _____, your nose for _____and your tongue for _____. The other two are : your ears for _____ and your fingers or hands for _____. With all your special senses, explore the Sensory Garden.

3. Some plants live in luxury penthouses! They do this by growing on other plants. Their aim is to get plenty of light! These plants are called _____. The subwords from which this Greek word comes from are epi- which in Greek means _____ and, phyton which in Greek means _____. Study the plants found here. Name 3 of them. _____, _____ and _____.

4. What is the name of the process through which plants recycle nutrients? _____ To do this, they need the help of decomposers and healthy roots. Name 3 types of decomposers which help plants breakdown vegetation. _____, _____ and _____. Once nutrients are broken down, plants can re-absorb them through their roots. Plants recycle! Do you?

5. Rain Forests cover only 6% to 7% of Earth's land surface. Yet, they house what percentage of the plant and animal species on Earth? _____. What are the many everyday things that originate from Rain Forests? Name them. _____, _____ and _____ _____.

6. Singapore's incidence of thunderstorms and lightning is one of the highest in the world! This giant tree was struck by lightning in 2002. Its trunk has since been conserved and moved to JBCG in 2007. What is the name of this giant? _____ Around this giant 100-year-old tree trunk are parts of large roots from other trees. What is the name given to this type of support roots? _____.

7. Can plants live in or on water? Some water plants have adapted to just this! These plants have many ways to help them stay afloat. What are some of these adaptations? _____, _____ _____, _____ _____ _____. Name 3 types of water plants which can be found at the Pond. _____, _____, _____.

Still have time to spare? Don't miss checking out the :

- **Maze**
- **Suspension Bridge**
- **Secret Cave**
- **Tree House**

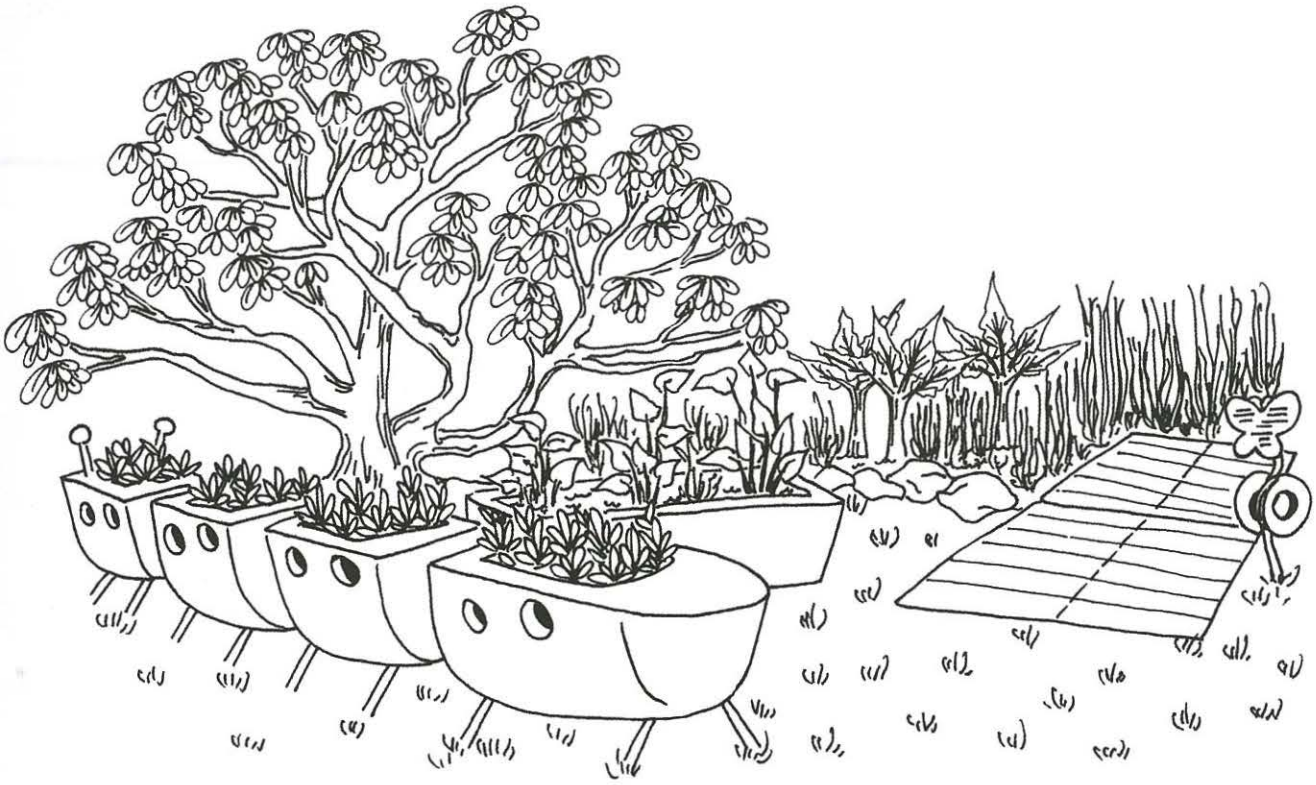
Need a reference ?
Here are answers to the worksheet :

1) carbon dioxide, oxygen, sunlight, water, photosynthesis, chlorophyll
2) Sight, Smell, Taste, Sound/Hearing, Touch
3) epiphytes, upon, plant, ferns, bromeliads, orchids
4) nutrient cycling, bacteria, fungi, creepy crawlies
5) more than 50%, foods, medicines, building materials
6) *Pometia pinnata*, buttress
7) swollen spongy stems of water hyacinth, flat and large leaves of waterlily, hairy surface of water lettuce leaves, (Choose 3 from this list : cattail, water fern, water banana, duckweed, hydrilla, papyrus)

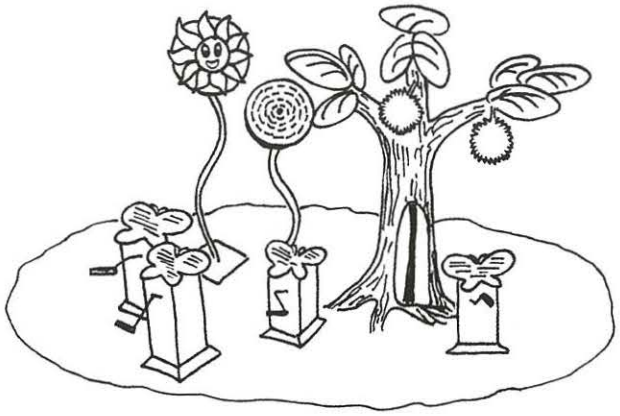
Janice Yau
Winnie Wong
Education

Dina Gallick
Living Collections

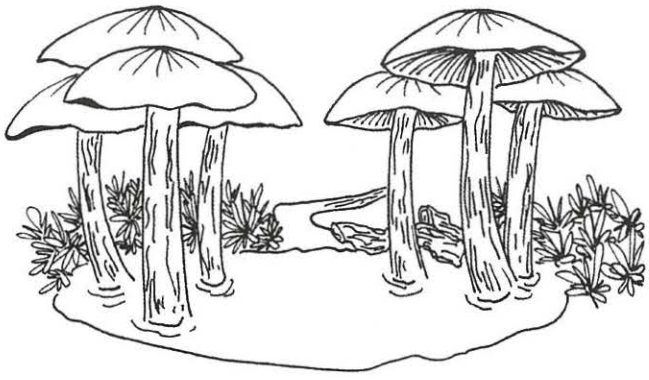
Explore JBCG to help you colour in these pictures



At the Pond - water plants & the floating platform

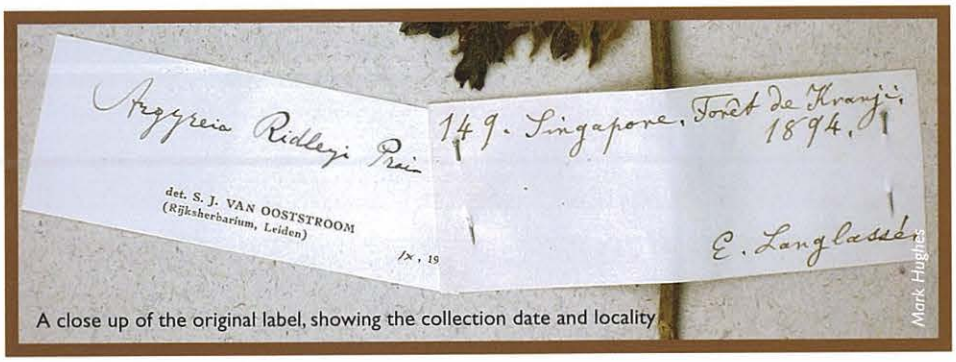


Plant are Food Making Factories!



Plants recycle! Do you?

A specimen from Singapore returns *(just for a visit)*



A close up of the original label, showing the collection date and locality

In the course of botanical research activities in the herbarium, it often happens that something unusual comes to light—an interesting bit of history, for example. This happened recently with a specimen loaned from a herbarium halfway round the world, which shed light on the early botanical exploration of Singapore. Two herbarium specimens of *Argyreia* (Convolvulaceae) had a locality on the label, written in French, that looked very familiar: forêt de Kranji. These specimens were loaned from the historic herbarium of the city of Geneva, Switzerland – how did specimens from Singapore end up there?

Further investigation showed that the collections, by one E. Langlassé, were indeed made in Kranji in 1894, which was still forested at that time.

These specimens are mounted in three separate folders in the style distinctive to the Geneva herbarium, which uses straight pins to attach the dried plant on the mounting paper, rather than glue or linen tape (see photo).

Who was E. Langlassé and why was he in Singapore? The Cyclopedia of Collectors for the Flora Malesiana series is an excellent resource for finding out about anyone who has ever collected plants in Southeast Asia. The Cyclopedia had this to say about Mr Eugène Langlassé: he was a French horticulturist, birth date unknown, who traveled to French Indochina, the Dutch East Indies (now Indonesia) and Singapore in 1894–1895. He stopped at Singapore twice, the first time for a few weeks in 1894, from about July 10 until August 17, and collected plants at several localities: Bukit Timah, Bukit Mandi, Chan Chu Kang, as well as Kranji. After visiting Borneo, he stopped at Singapore again from September 15th to the 18th, 1894, before traveling on to the Philippines. Langlassé then returned to France for several years and later ventured to Mexico and Colombia, where he died of yellow fever in 1900.

What makes this specimen, and the story behind it, intriguing is that Singapore's biological heritage is widely scattered around the globe. Over the course of hundreds of years, many scientists and plant collectors have passed through Singapore and the specimens they gathered are now housed in herbaria and museums all over the world. Langlassé was not the first, nor even one of the earliest to collect Singapore plants—we know that Archibald Menzies, a Scotsman, collected some bryophytes during a stop in Singapore as early as 1789—more than a hundred years before Langlassé visited the island.

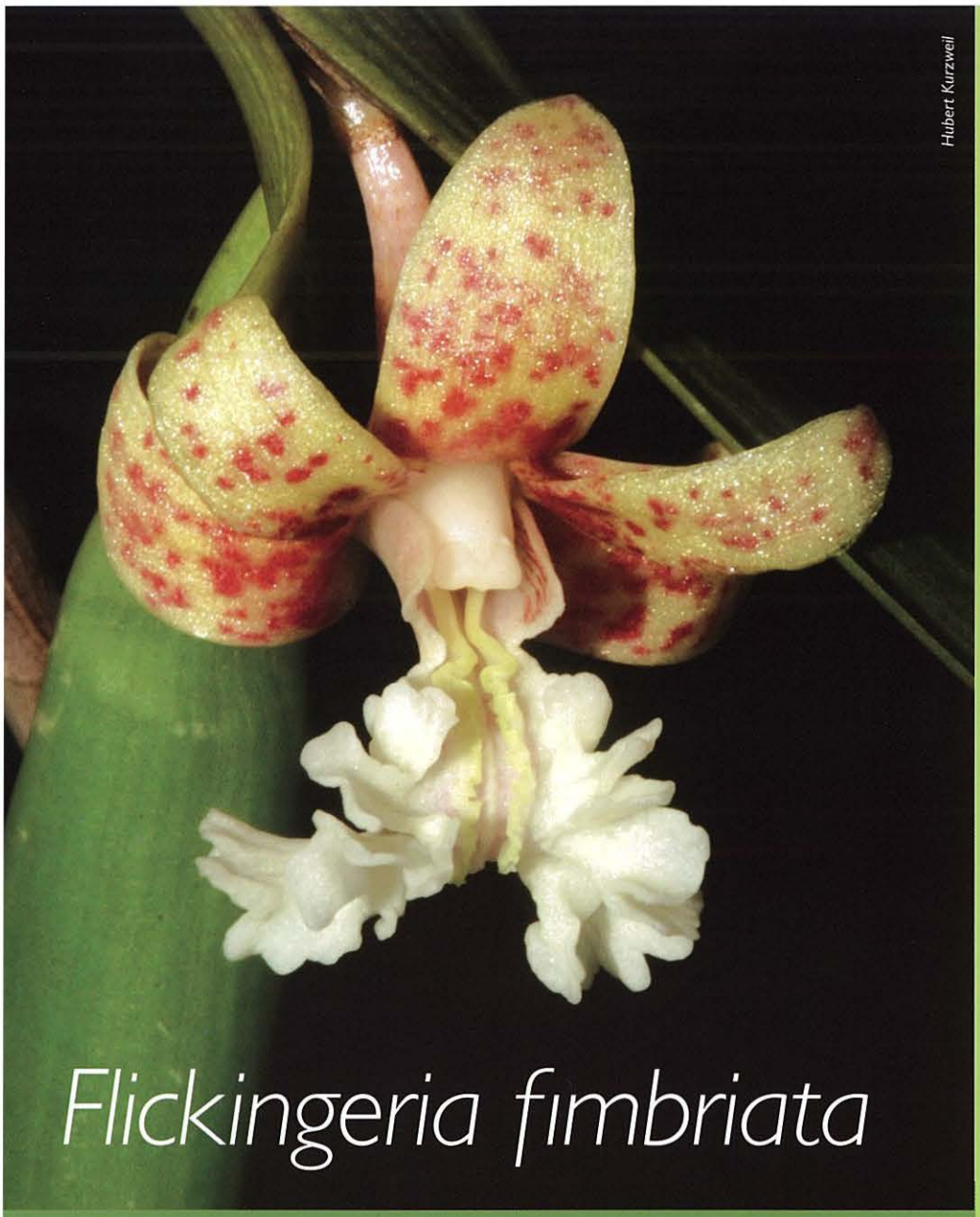
The other thing remarkable about the specimen is that it has come back to Singapore, where it was collected more than a century ago, for scientific study. And all it required was a request from the Keeper of the Gardens' Herbarium to the Keeper of the Herbarium at the Conservatoire et Jardin Botanique de la Ville de Genève, in Switzerland. Such loans have been integral to taxonomic research for centuries and are still widely practiced today, though they are now more regulated than in the past, when a handshake was all it took to borrow specimens from a colleague's private herbarium.

The herbarium of the Gardens not only receives loans, it also makes them. At any given time there may be many loans outstanding, as well as many loans from other herbaria that are being stored here while they are studied. As this note is being written, we have about 60 loans from foreign herbaria being studied by our researchers, from countries as diverse as Denmark (AAU Herbarium), New Guinea (LAE Herbarium), Scotland (E Herbarium), The Netherlands (WAG & L Herbaria) etc. Complementing these in-loans, there are 145 loans of Gardens' specimens that have been sent out for study by taxonomists elsewhere, to countries as far a field as Australia, Ireland, Japan, Poland, Spain, Taiwan, USA and more. Taxonomic research has become a global enterprise and scientists around the world depend upon loans of specimens to keep this enterprise moving forward.

So although Mr Langlassé lived in France and died in Colombia, his specimens, collected in Singapore and Southeast Asia, can be studied by botanists anywhere, either by visiting the beautiful city of Geneva, or by requesting a loan through scientific channels. Once this particular specimen has been studied it will be sent back to Geneva, a tiny piece of Singaporean biodiversity that is stored safely away in a far corner of the world.

George Staples
Serena Lee
Herbarium

One of the specimens of Argyreia collected in Singapore in 1894, on loan from the Geneva Herbarium



Hubert Kurzweil

Flickingeria fimbriata

More than 220 different orchid species were once native in the forests of Singapore, which makes the orchid flora fairly rich given the small size of our island. Unfortunately most of them, in fact over 80 %, have now disappeared following habitat destruction, largely as a consequence of forest clearing for agriculture in the 19th Century. Illegal over-collecting for horticultural purposes has also played a role in their local extinction of many species. In addition, the continued existence of most of the orchids that are still found in the wild today is also threatened, and their conservation status is therefore classified as either 'endangered', 'vulnerable' or 'critically rare'.

One of the most attractive orchids that were once native to Singapore is *Flickingeria fimbriata*. This species occurs from the Eastern Himalayas through the whole of South-east Asia as far eastwards as the Lesser Sunda Islands and as far southwards as Sumatra and Java. Its flowers are comparatively large for the genus and can measure up to 35 mm across; but they are frequently smaller in some specimens that have the sepals curled back. The flowers have yellow-cream sepals and petals with red or purple spots and a creamy white lip. Unlike many other species in the genus *Flickingeria* this lip is crisped and strongly wavy on the margin. Once there were seven different *Flickingeria* species found in Singapore, but sadly all of these are now extinct in the wild. The photograph of *Flickingeria fimbriata* shown here is from a specimen in the Gardens' research collection.

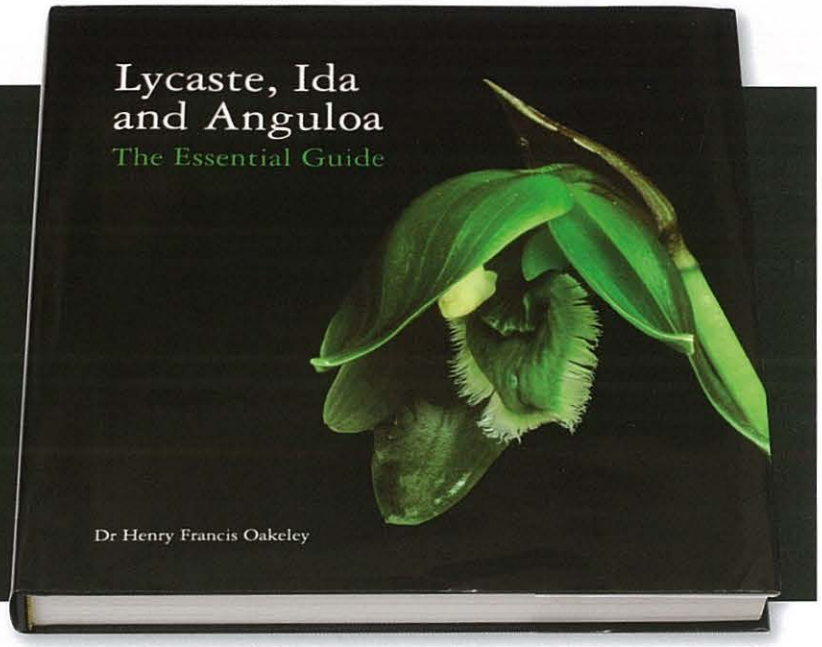
The epiphytic genus *Flickingeria* is a relative of the well-known genus *Dendrobium* and was previously treated as its section *Desmotrichum* (for example by Eric Holttum in his book 'Orchids of Malaya', published in 1953). *Flickingeria* is a genus of about 75 species and is widespread in Asia and the Pacific Islands. The genus is characterised by branching stems that only root at their bases and by one-leaved pseudobulbs. The frequently fragile flowers are borne singly or in groups of two in front of or behind the base of the leaf and last only for a few hours. Suitable habitats are lowland and montane forests, where the plants can sometimes be fairly common. Due to the short-lived flowers *Flickingeria* is not very popular in cultivation.

Once there were seven different Flickingeria *species found in Singapore, but sadly all of these are now extinct in the wild.*

Hubert Kurzweil
Herbarium

Lycaste, Ida and Anguloa - The Essential Guide

by Henry Francis Oakeley
Published in 2008 by the author. 445 pages, about 2000 colour illustrations.
Price GBP 50.00 (equivalent to about SGD 135).



This book is a magnificent publication on three fascinating orchid genera from Latin America. Despite their elegant flowers, *Lycaste*, *Ida* and *Anguloa* are not very well-known here in South-east Asia with its abundance of other attractive orchids, but the three genera are quite popular in other parts of the world where they are frequently seen in amateur collections as well as in exhibitions.

Lycastes, idas and anguloas occur from Mexico southwards through the whole of Central America as far as the South American countries of Venezuela, Colombia, Ecuador, Peru and north-western Brazil, where they grow on the ground, on rocks or on trees in forest or grassland from sea-level to 3600 m altitude in the Andes mountain range. *Ida* is also found on some Caribbean islands. Botanically speaking, *Lycaste*, *Ida* (which was only very recently separated from the former) and *Anguloa* are a small group of closely related genera and comprise a total of 79 species, 49 varieties and 22 natural hybrids. The plants are often fairly tall and have large short-lived and pleated leaves borne on top of prominent pseudobulbs. Flowers are usually solitary and quite showy; they are most commonly yellow, green, white, pink or orange, and can measure up to 11 cm across. Although waxy in texture and often also fairly long-lasting they are not suitably as cut-flowers as they bruise easily. While *Lycaste* and *Ida* have typical 'orchid-like' flowers, *Anguloa* is unusual with its deeply cup-shaped or somewhat semi-globose flowers which have earned it the common names 'tulip-orchid' and 'boat-orchid'.

In nearly 450 pages of text illustrated by about 2000 colour photographs every aspect of this plant group is explained in detail, making the book equally valuable to professional botanists, plant lovers and orchid growers. Every single species is comprehensively treated, with sections on nomenclature (the botanical naming), morphology, etymology, geographical distribution, ecology (including pollination), conservation, bibliography and, for the botanists, location of herbarium specimens. Under each species there is also a section with historical notes, both on the discovery of the species and its taxonomical history. Also details of osmophores (= scent-glands) and the chemicals involved are sometimes given which are important as the flowers of some of the species are strongly fragrant. Appealing to many growers will be the section on cultivation which covers everything from potting the plants to pests and diseases; even advice on preparing plants for exhibitions is given. The book is amply illustrated by colour photographs, most of them in a high quality rarely seen in publications of this kind. The largest number of photographs illustrates flowering specimens in cultivation, flower details such as lip or column and the pollinia (pollinia are the pollen packets of the orchids; they have a stalk in this group of orchids). Of particular interest to anyone interested in wild orchids will be the photographs which show the plants in their native habitat. There are also several colour paintings, and also the occasional line drawing is seen. A detailed list of synonyms, an annotated bibliography as well as an index conclude the book. An appendix lists the species that occur in particular countries.

The author Dr. Henry Oakeley was born in Singapore but moved to the UK early in his life. A medical doctor by profession he has been growing lycastes, idas and anguloas for many decades and has accumulated an expert knowledge on them. His numerous articles in orchid- and other journals as well as his comprehensive book in 1993 (to which the present one is some kind of successor) have helped to make *Lycaste*, *Ida* and *Anguloa* well-known in grower circles. Henry has travelled widely, particularly in South American countries. He is currently the president of the Orchid Society of Great Britain, as well as Honorary Research Associate of the Royal Botanic Gardens Kew (UK) and Honorary Research Associate of the Singapore Botanic Gardens.

Writing a book of this quality and scope is an outstanding achievement, and Henry can be congratulated on his task. Particularly in a time of increased interest in our wild treasures but, sadly, at the same time the sharp decline of our natural environment, a book of this scope is a most welcome addition to the existing literature. As such it will be the standard reference book on the lycastes, idas and anguloas for long time to come.

Hubert Kurzweil
Herbarium

Sealing new collaborations

The future of research in the Gardens has been strengthened as three Memoranda of Understanding (MOU) have been signed recently, bringing new partnerships and connections. The MOU's are with research institutions in Europe (the Royal Botanic Garden Edinburgh) and in southeast Asia (Forest Research Institute Malaysia (FRIM) and the Liceo de Cagayan University in the Philippines).

The Royal Botanic Garden Edinburgh, which was established in 1670, has a long history in exploring Asian plants. The research interests of RBGE encompasses the studies of herbaceous groups like gingers (Zingiberaceae), begonias (Begoniaceae), gesneriads (Gesneriaceae), rhododendrons (Ericaceae), ferns and mosses as well as several woody families including Sapotaceae and Dipterocarpaceae. This greatly complements our research interests and the MOU strengthens the ongoing collaborations between researchers from two of the worlds great botanic gardens.

The research of the Gardens and the Forest Research Institute of Malaysia, a leading Malaysian institution for botanical research, have also been intertwined for a long time given our close historical ties and overlap in our local floras. At the moment, several of our researchers and herbarium staff participate on the new Flora of Peninsular Malaysia project, and join with FRIM staff on numerous exploration and collecting trips.

It is hoped the connection with Liceo de Cagayan University (LDCU) will allow botanists from Singapore and the Philippines to undertake research and training related to the rich and threatened Philippine flora. To this end, there has already been a 2-week visit to Camiguin Island to carry out a survey of the plants found on its volcanic peaks by a combined team from the Herbarium and LCU Research Office.

The official signature of MOU's with these three institutions is thus a welcomed seal on the intentions of all the parties to promote taxonomic research as contribution towards global conservation efforts.

Top left:
Prof. Stephen Blackmore, Regius Keeper and Director of the Royal Botanic Garden Edinburgh and Dr. Chin See Chung signing an agreement on research collaboration.

Top right:
Dr. Chin See Chung and FRIM Director-General Datuk Dr. Abdul Razak Mohd Ali signing the MOU between their two institutions.

Bottom:
Staff of the SBG Herbarium visiting the President of LDCU, Dr. Mariano M. Lerin. Left to right: Dr. Lesley Lubos (LDCU), Dr. Glory S. Magdale (LDCU), Dr. Benito Tan (SBG), Dr. Mariano M. Lerin (LDCU), Dr. Jana Škorničková (SBG), Dr. Mark Hughes (SBG), Prof. Rosario Rubite (UPM), Dr. Genaro V. Japos (LCU).

Jana Škorničková
Mark Hughes
Herbarium

Key visitors to the Gardens (January to June 2008)

Name	From
Datuk Dr Abdul Razak Mohd Ali & delegation	Director-General, Forest Research Institute Malaysia, Malaysia
Dr Ahmed Djoghlaf	Executive Secretary of the Convention on Biological Diversity
Dato' Ahmad Fuad Ismail	Secretary General, Ministry of Housing & Local Government, Malaysia
Ms Alison Moore	Royal Botanic Gardens, Kew, England, UK
Ms Anisa Saeed Mohammed	Universiti Kebangsaan Malaysia, Malaysia
Dr Axel D Poulsen	University Copenhagen, Scotland, UK
Mr Brad Horan	Manager Domain & Infrastructure, Royal Botanic Gardens Trusts, Australia
Prof Cao Tong	Shanghai Normal University, China
Ms Chishio Hidaka	National University of Singapore, Singapore
Mr Chukiat Laongpol	Prince Sonkla University, Thailand
Dr Duong Duc Huyen	National Herbarium, Vietnam
Dr Gemma Bramley	Royal Botanic Gardens, Kew, England, UK
Dr Hiroyuki Akiyama	Museum of Nature and Human Activities, Hyogo, Japan
Mr Ho Boon Chuan	Rheinische Friedrich-Wilhelms-Universität Bonn, Germany
Dato' Ishak Bin Haji Ahmad & delegation	Director Selangor Local Authority Institute delegation, Malaysia
Ms Izlamira Roslan	Universiti Kebangsaan Malaysia, Malaysia
Ms Jazreen Jaafar	Universiti Kebangsaan Malaysia, Malaysia
Ms Kanjana Wongkuna	Chiang Mai University, Thailand
Prof Dr Jiří Váňá	Charles University, Prague, Czech Republic
Ketsanee Seehamongkol	President, Dokmai Gardens, Chiangmai, Thailand
Dr Kit Pearce	Sarawak, Malaysia
Dr Kitichate Sridith	Prince Sonkla University, Thailand
Prof Dr Lars Söderström	Norwegian University of Science and Technology, Trondheim, Norway
Prof Mary Gibby	Director of Science, Royal Botanic Garden Edinburgh, Scotland, UK
Dr Masanobu Higuchi	National Museum of Nature and Science, Tsukuba, Japan
Assoc Prof Dr Nashriyah Mat	Universiti Darul Iman Malaysia, Terengganu, Malaysia
Ms Melanie P Medecilo	De La Salle University, Dasmariñas, Philippines
Dr Misha Ignatov	Russian Primary Botanical Garden, Moscow, Russia
Mr Mohamad Mazlan bin Ali & delegation	Assistant Secretary, Pasir Gudang Local Authority, Johor, Malaysia
Prof Dr Monica Suleiman	Universiti Malaysia Sabah, Kota Kinabalu, Malaysia
Dr Monina T Uriarte and delegation	Director, ASEAN Centre for Biodiversity
Dr Mutsuko Nakajima	Kanagawa-ken, Japan
Ms Nur Fatihah	Universiti Darul Iman Malaysia, Terengganu, Malaysia
YM Dato Paduka Awang Haji Hamdillah bin Haji Abdul Wahab & delegation	Deputy Minister, Ministry of Industry & Primary Resources, Brunei
Mr Panlumut Pattamvipiscitti	Prince Sonkla University, Thailand
Ms Phoon Sook Ngoh	Forest Reseach Institute Malaysia, Malaysia
Dr Razali Jaman	Universiti Kebangsaan Malaysia, Malaysia
Dr Richard Saunders	Hong Kong University, Republic of China
Dr Rita Manurung & delegation	COO, Sarawak Biodiversity Centre, Malaysia
Dr Rogier de Kok	Royal Botanic Gardens, Kew, England, UK
Dr Ruth Kiew	Forest Reseach Institute Malaysia, Malaysia
Ms Salizatul Aida Ibrahim	Universiti Kebangsaan Malaysia, Malaysia
Dato' Seri Azahar Muda	Director General, Forestry Department of Malaysia, Malaysia
Mr Siddhartham Surreswaran	Hong Kong University, Republic of China
Prof Stephen Blackmore	Regius Keeper, Royal Botanic Garden Edinburgh, Scotland, UK
Her Excellency Tarja Halonen	President of the Republic of Finland
Dr Tatsuwo Furiki	Natural History Museum, Chiba, Japan
Mr Thamarat Phuttai	Prince Sonkla University, Thailand
Prof Tomas Hallingbäck	Swedish University of Agricultrual Sciences, Uppsala, Sweden
Mr Wang Xianglin & delegation	Vice Mayor of Yuyao City, People's Republic of China
Mr Yong Kien Thai	Rimba Ilmu, University of Malaya, Malaysia
HE Yuichiro Ito Governor	Governor, Kagoshima Prefecture, Japan
Dr Yvonne Su	Hong Kong University, Republic of China
Prof Dr Zen Iwatsuki	Hattori Botanical Laboratory, Okazaki, Japan
Dr Zhang Li	Fairy Lake Botanical Garden, Shenzhen, China
Prof Dr Zhu Rui-Liang	East China Normal University, Shanghai, China

Dendrobium 'Tarja Halonen' named after Her Excellency Tarja Halonen, President of the Republic of Finland on the occasion of her visit to the National Orchid Garden on 20 February 2008.

Vanda 'Choummaly Keosaychay Sayasone' named after His Excellency Choummaly Sayasone & Mrs Keosaychay Sayasone, Spouse of the President of the Lao People's Democratic Republic during their visit on 9 June 2008.

From the Archives

Spices and medicines

The Library recently held an exhibition on the theme of spices within its walls (see article on page 21). The use of spice plants as medicinal herbs has been documented in publications for hundreds of years. On display during the exhibition were a few books from the Library's rare collection, two of which are:

Monandrian Plants of the Order Scitamineae, chiefly drawn from living specimens in the Botanic Garden at Liverpool.

This book, authored by William Roscoe, provides a description on a group of flowering plants, Scitamineae (now considered as part of the plant order Zingiberales). Plants under this order include the common turmeric, ginger and canna. As inscribed on the title page, the accompanying lithographic plates, totalling over 100, were mostly based from live collections that were kept in the Botanic Garden at Liverpool, England. Roscoe founded this botanic garden at the turn of the 19th century. This large work, measuring 55 cm x 42 cm, was published around the mid to late 1820s.

Monandrian Plants of the Order Scitamineae by William Roscoe

Medical Botany by William Woodville

Medical Botany: containing Systematic and General Descriptions, with Plates of all the Medicinal Plants, comprehended in the Catalogues of the Materia Medica.

This work in four volumes contains descriptions of medicinal plants listed in the catalogues of the Materia Medica (or medical material) of London and Edinburgh in 1790. Authored by William Woodville, an English physician and botanist, it includes a description of the medicinal effects and the ailments for which the plants were employed. The Library's copy is of the second edition, published in 1810.

Hassan Ibrahim
Library

Photos by Jassy Phua