Gardenwise

THE NEWSLETTER OF THE SINGAPORE BOTANIC GARDENS VOLUME 35, JULY 2010 ISSN 0219-1688

flower power

SINGAPORE GARDEN FESTIVAL 2010

A gift from the rain forest - yams in history, food, sex and medicine

Bamboozled by Southeast Asia's bamboos

Revisiting the Gardens masterplan

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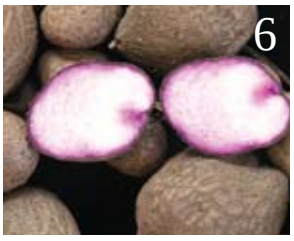
VOLUME 35, JULY 2010



ARTICLES

REGULAR FEATURES

Cover
The Man Who Planted Trees, Singapore Garden Festival

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MESSAGE
FROM THE DIRECTOR

On July 17 it poured outside the Suntec Convention Centre, causing flash floods in parts of Singapore. Within its cool, comfortable cocoon on levels four and six, thousands of visitors enjoyed spectacular garden and floral displays, attended talks or floristry demonstrations, shopped, or discussed plants, gardens and flowers with experts present. It was the 3rd Singapore Garden Festival, a spectacular and inspiring show not to be missed, and 300,000 did not.

All members of the Gardens were actively involved with the show, working together as a team with the Garden Festival organising crew. They were aided by hundreds of their colleagues from the National Parks Board and volunteers. From 5 July when we 'took over' the space at Suntec, till show-time from 15 to the 22, many of us were literally camped in the cavernous halls of levels four and six.

An event like this illustrates perfectly the incredible capacity, creativity, energy and productivity of a motivated and collaborative team who are able to work long hours together to stage complex multi-faceted events. This success follows closely after the successes in 2009 when we celebrated the Gardens 150th anniversary by staging many public events linked to our scientific and social heritage, and history.

As activities go somewhat back to normal after the Festival, we resumed planning for a number of events that are important to our scientific and social roles. Three years ago, taking cognizance of the fact that the United Nations had declared 2010 as the International Year of Biodiversity, we successfully bid to stage the 8th International Flora Malesiana Symposium.

This Symposium is held once every three years. It is the most important platform for research exchange on the plant diversity of the Malesian floristic region that includes Malaysia, Singapore, Indonesia, the Philippines, Brunei, Timor Leste and Papua New Guinea. This region contains the second largest rain forest blocks in the world. Preparations for the flora of the region started in the 1930's. Today more than 60 years later, taxonomic documentation of this rich flora of some 42,000 species is less than 25% completed. However natural habitats are rapidly being lost with the consequent lost of species.

Plant species play critical roles in the natural ecosystem, play socio-cultural-religious roles and sustain societies. Many have vital economic and pharmaceutical value. Some have in the past stimulated voyages of discovery or caused social upheavals and have changed the course of human history. Today, there are species that remain unknown to science that may have the potential to provide incalculable benefits to all humankind. The task of exploration, documentation and research has never been more urgent.

As a garden and botanical institution with a long history of achievement in taxonomic research we will continue to strengthen our research capabilities and take a leadership position in documentation of the flora of the region. The Gardens has been supportive of Flora Malesiana since its inception. We are therefore especially pleased to be able to host this symposium for the first time in Singapore, and significantly, during the International Year of Biodiversity.

While botanic gardens around the world celebrate the Year of Biodiversity, they will also need to review their individual strategies to promote and implement conservation efforts. Botanic gardens as the only global net-work of institutions dedicated to conservation have a critical role to play in this area as well as to communicate plants and conservation to the public. In addition to specialist events like the Flora Malesiana Symposium , the Gardens will continue to stage public events to reflect its science, history and public roles. The Gardens' team is working hard at this and our many visitors will continue to be able to delightfully connect with plants and the environment.

Wong Wei Har

THE JEWELS, THE CHEATS AND THE ONE-DAY WONDERS

One day wonder: *Thrixspermum pinocchio*

A jewel: *Macodes lowii*

A cheat: *Bulbophyllum* species belonging to section Epicranthes

You could almost categorise them as horticultural rejects.

I am referring to the 'other orchids'. The ones that do not bask in the limelight except perhaps in scientific publications. They dwell most happily in the forest, though occasionally, they may have to 'dodge' the pilfering hands that could render them as sought-after rare collectibles.

These are the species orchids of Southeast Asia and many of them are unglamorous looking. They may not compare well to the horticultural chiseled looks of *Dendrobium phalaenopsis*, the showy *Vanda dearei*, the dainty slipper orchid, *Paphiopedilum sanderianum* or the proud beauty of *Phalaenopsis amabilis* that has spawned multitudes of man-made hybrids. But they are inspiringly unique and have charming characters of their own. This article features three groups of species.

One day wonder: *Dendrobium crumenatum*

The jewels

Like precious stones, these forest jewels are rare in their natural habitat. Collectively known as the jewel orchids, they belong to the sub-tribe of Goodyerinae in the orchid family. They are better appreciated for their colorful leaves than their insubstantial flowers, which are distorted in some species. In the dimness of the forest floor or on the wall of a limestone face, a sudden ray of light playing on the iridescent venation of its red, black, purple or dark green leaves would set it aglow, showcasing its beauty. It certainly adds luster to the drab forest floor covered by leaf-litter. Unfortunately these are not easy to grow in mass plantings and so are not exploited horticulturally other than for the occasional potted plants being sold. Examples of the jewel orchids are species from a number of genera including *Goodyera* and *Macodes*.

Below:
A jewel: *Macodes lowii* showing an interesting leaf colouration.

The cheats

Many plants proffer a reward of nectar for their pollinators such as birds, bees and butterflies. Some orchids (the misery ones) resort to trickery. A well-known example is the European species of the genus *Ophyrs* (known as the bee orchid), which uses sexual deception by producing the sex pheromone of the female pollinators. In addition, it provides visual attractions by mimicking her appearance that stimulates the mating behavior in the male pollinators, which then attempt to copulate with the flower. In the process, the flower is pollinated. The silly bee is duped and gets nothing in return. On a recent trip to a peat swamp forest in Borneo, I encountered a *Bulbophyllum* species of the section Epicranthes that have flowers with parts that look like an insect or spider. The flower has grayish-black appendages that quickly become animated into mobile limbs in a slight breeze or when the plant is slightly brushed. The lip resembles its colorful body. I suspect similar principles to the *Ophyrs* apply to this case.

The one day wonders

These are the plants that look very unassuming for most part of the year, till some biological clock suddenly triggers them to flower and for a day or even less, they are suddenly transformed into orchid Cinderellas. However, as suddenly as the flowers appear, they hastily wilt. So it is especially frustrating to see the fading flowers only to realise that you have missed their magical moments. Examples of the one-day wonders are species of *Diplocaulobium* and *Thrixspermum*. A local species, *Dendrobium crumenatum* known as the pigeon orchid could also be included into this group.

In their natural habitat, it is quite typical to see less than ten percent of species orchids encountered in flower. Hence there is a certain joy to stumble upon them in bloom. No matter how difficult the terrain that you might have to traverse, or how long it would take to reach their abode, you would always have a sense that it is all worth it!

Paul Leong
Herbarium
Photos by Paul Leong

A SPREADING ALIEN FERN IN SINGAPORE - *Tectaria incisa* Cavanilles

The introduction of alien plants into Singapore, intentionally or not, from other regions of the world has a long history. Often, plants with beautiful foliage and colourful flowers and fruits are brought to the island as garden plants. While many of these exotic plants fail to find a niche outside the gardens without human intervention, some do. Among the increasing number of introduced alien plants that subsequently become naturalised in situ, there is a little known fern, *Tectaria incisa.*

Originally from Central and South America, the exotic *T. incisa* belongs to the family *Tectariaceae* and was also known under the synonym *T. martinicensis* (Spreng.) Copel. Like other members of the family, it can be recognised easily in the field by its large and somewhat pinnately divided fronds that have variously anatomosing veins, which form numerous enclosed spaces called areoles. In addition, the stipe, which is light to dark brown, is sparsely scaly. The pinnae or leaflets of the compound leaf are entire in outline, and at most slightly undulating. In large plants, the basal pinna has a downward pointing extension, the basiscopic lobe. Likewise, the terminal pinnae are lobed and, thus, having a fork-like appearance. On the under surface of mature and fertile fronds, rows of indusiate sori are positioned on the anastomosing veins, along both sides of the costules. The indusium is round to kidney shaped and attached to the leaf blade at its margin. Habitat wise, this species favours disturbed and slightly shady environments.

Tectaria incisa, can grow up to about 0.5 m in height. It was first recorded in Singapore in 1907 as shown by a specimen collected from Bukit Mandai kept at the Gardens Herbarium and originally named *Tectaria* sp. Subsequently, the species was grown in the Plant House of the Gardens under its old binomial, *T. martinicensis*, as shown by two herbarium specimens made by the former director of the Gardens, Prof. R. E. Holttum, in the years 1918 and 1922. About four decades later, the same species was spotted again off Bukit Timah Road, an indication that the fern had gradually gained expansion of range, probably through garden activities and a subsequent escape from cultivation. Today, after 103 years since

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the first record of the species in 1907, this alien fern has spread further inland. A 2009 survey of the island plant diversity revealed its presence in the Tyersal forest adjacent to the Singapore Botanic Gardens. Similarly, it was collected early in 2010 from a forested site at MacRitchie Reservoir Park by the second author.

Already a weedy fern known in other parts of the world, the spread of this fern across the island within a century is slow but alarming. It reflects the potential of a non-indigenous fern to invade into the island's remaining primary and secondary forests, possibly threatening native ferns. Although at present, populations of *T. incisa* remain to be found near and around forest edges, the possibility that it will invade the natural forests remain. Further monitoring of the spread of this species is needed to protect the native fern species on the island from being displaced.

A similar case on hand in Singapore is the establishment and spread of another alien fern, *Adiantum latifolium* Lamarck, an introduced ornamental fern from tropical America that has spread across the entire island in semi-open places.

Benito C. Tan
Herbarium

Jon Tan Siu-Yueh
DBS, NUS

Top:
A compound leaf of *Tectaria incisa* showing the fork-like terminal pinna or leaflet, and also two basal pinnae, each with a downward extension of a basiscopic lobe.

Bottom:
A historical specimen of *Tectaria incisa* collected in 1922 from the Plant House of the Gardens by R.E. Holttum and named *Tectaria martinicensis.*

Top, page 4:
A mature plant of *Tectaria incisa* showing the pinnately compound leaf. Seen in the background is the other invasive fern species, *Adiantum latifolium.*

Bottom, page 4:
A close up photo of the sori of *Tectaria incisa* showing the location of each sorus inside an enclosed space of areole. Note the indusium of the sorus is round to kidney shaped.

Dioscorea alata leaves are heart-shaped while the square stems have narrow purple wings.

A GIFT FROM THE RAIN FOREST - yams in history, food, sex and medicine

Yam is the common name for species of *Dioscorea* grown primarily for their starchy tubers that are used as food. The word 'yam' is derived from a West African name and is also used to refer to other root crops. In America and Canada, sweet potatoes are called 'yam' and locally, the tubers of *Colocasia* and *Xanthosoma* are 'yam'. The name *Dioscorea* was created by Linnaeus after a 1st Century Greek physician and herbalist, Dioscorides.

There are over 600 species of *Dioscorea* (family Dioscoreaceae) distributed throughout the tropical world with a few from temperate regions. All are tuberous, herbaceous or semi-woody climbers, except for one upright species. Yam tubers can be enormous ranging from several to over 100 kilograms. Many species are toxic to humans. In addition to those widely cultivated for food, some are treated as an emergency source of calories. These require specialised cultural knowledge to tediously transform an otherwise toxic tuber into something edible. Others are a source of medicine, fish or arrow poisons, insecticides or tannin.

Food for humans and the gods

Most human societies depend on starch staple crops as key components of their diet. These may be from grains, for example, rice, wheat, corn or barley or products derived from grains, or may be from root or tuber crops. Examples of the latter include potato, tapioca, sweet potato, taro and yam. Starting some 12,000 years ago the human mode of subsistence gradually evolved from one based on gathering, hunting and fishing to one based on the cultivation of plants. In Southeast Asia, early agriculture was probably defined by a cropping-complex of yam, taro and sago.

Yam was represented by a number of species of *Dioscorea* native to the region, the most important being *Dioscorea alata*. Another 'yam' that was more important in the past is the elephant yam, *Amorphophallus paeoniifolius*. This, however, is not a true yam, but an aroid from the family Araceae. The cultivation of taro was centered on *Colocasia esculenta* with *Alocasia macrorrhiza* a minor crop.

There are over 600 species of *Dioscorea* (family Dioscoreaceae) distributed throughout the tropical world with a few from temperate regions.

Sago or starch from palms was extracted chiefly from the swamp sago, *Metroxylon sagu*, and to a lesser extent *M. salomonense* and *M. amicarum* in *Melanesia* and *Micronesia* respectively. In the upland areas of Borneo, *Eugeissona utilis* was a key species providing starch.

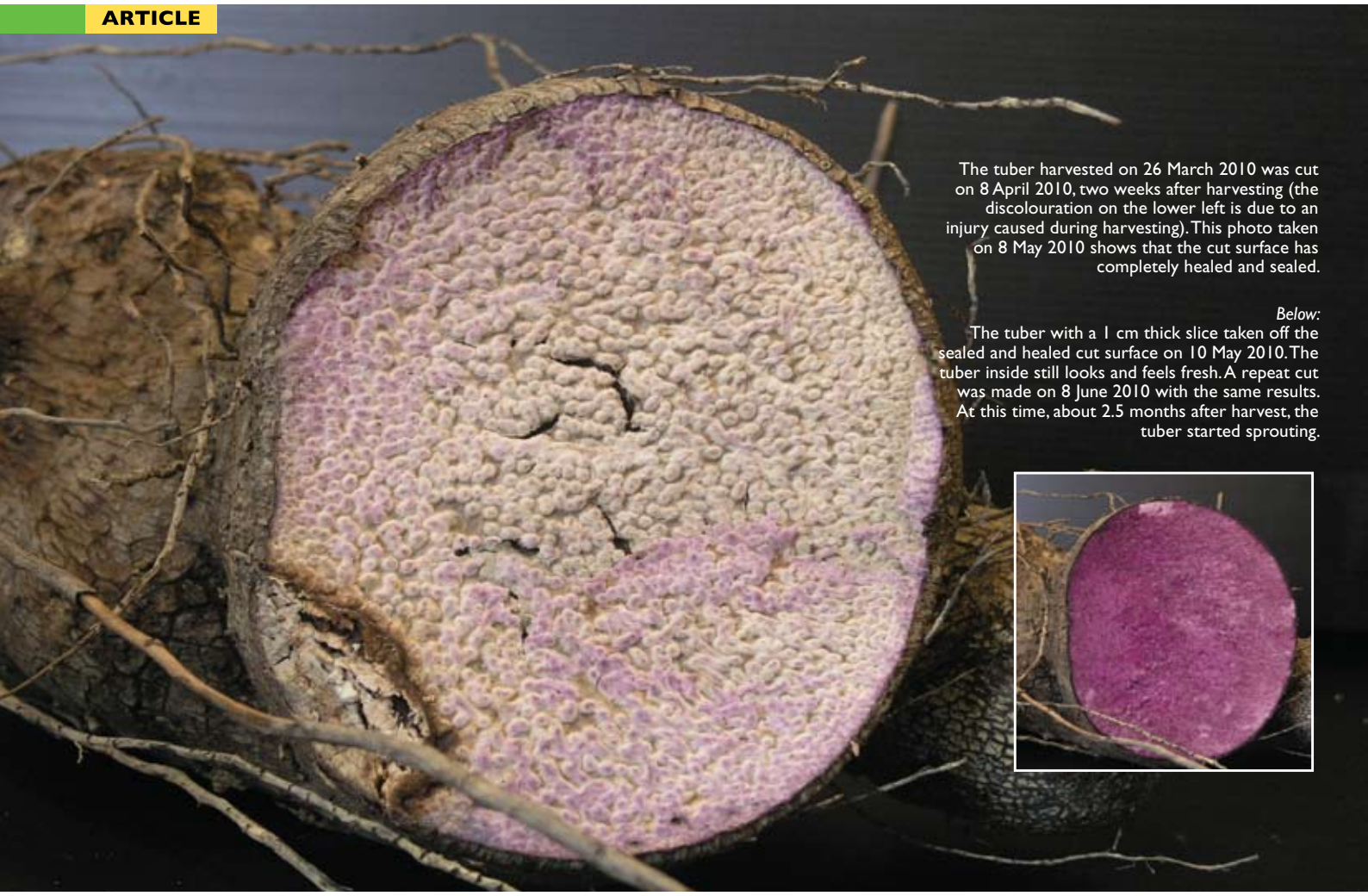
Other important starch staples like corn (*Zea mays*), tapioca (*Manihot esculenta*), potato (*Solanum tuberosum*) and taro (from *Xanthosoma* spp.) are recent introductions. These crops of tropical American origin were brought by Europeans to the east, in the decades following their discovery of America in 1492.

Today, the peoples of tropical and sub tropical Asia predominantly have cultures based on the growing and the eating of rice as a staple food. The language of food, the rituals of a meal and the recipes of side-dishes, evolved around the eating of rice. The socio-religious events of farming revolved around the growing of rice. Rice cultivation is thought to have began over 5000 years ago in Asia. Carried by migrating communities, it gradually spread throughout Southeast Asia, replacing the yam-taro-sago cropping complex. While still important, these ancient crops are now secondary to rice.

There are however, certain areas of the world where root and tuber crops are still important as carbohydrate staples. They are, for example, an important food in many parts of West Africa where they also play a significant role in socio-religious life. In Nigeria and Ghana, an annual Yam Festival is held to celebrate this food and to offer it to gods and ancestors as a thanks giving. Today, Nigeria is by far the world's largest producer of yams.

Now the most common species grown for food are *Dioscorea cayenensis* and *D. rotunda* in Africa, *D. trifida* in tropical America, *D. alata*, *D. bulbifera* and *D. esculenta* in tropical Asia and *D. opposita* in China, Japan and Korea. In the last two years, imported fresh tubers of *D. opposita* have become a standard item in Singapore markets. Yams, because of their fair vitamin C content and ability to store well for five to six months without refrigeration, were important as food on ships during trans-oceanic voyages.

Freshly harvest multi-lobed tuber of Dioscorea alata from the Gardens weighing 8.0kg. A cut shows the purple flesh; photo taken 8 April 2010.



The tuber harvested on 26 March 2010 was cut on 8 April 2010, two weeks after harvesting (the discolouration on the lower left is due to an injury caused during harvesting). This photo taken on 8 May 2010 shows that the cut surface has completely healed and sealed.

Below:
The tuber with a 1 cm thick slice taken off the sealed and healed cut surface on 10 May 2010. The tuber inside still looks and feels fresh. A repeat cut was made on 8 June 2010 with the same results. At this time, about 2.5 months after harvest, the tuber started sprouting.

In the 1800s *Dioscorea alata* became a major crop in Hawaii when tubers were sold to visiting ships. Their usefulness to humans on long voyages also means that the edible yams were carried about and distributed throughout the tropics. As a food, yams are boiled, fried, stewed, grated, dried and powdered or prepared in deserts.

Sex hormones and medicine

In the 1930s the molecular structure of female hormones, including progesterone, were determined. Progesterone is a hormone produced in the female body that helps regulate the menstrual cycle. Its potential use in medical therapies was then explored, however extraction from animal sources was prohibitively expensive. In 1939, a method to synthesize progesterone and other steroid hormones from steroid-like plant sapogenins was discovered. Initially the raw material was sarsasapogenin, from the plant called sarsaparilla, a species of *Smilax.* However the molecular manipulation required to transform sarsasapogenin to progesterone made this source extremely expensive.

This ancient crop plant, now no longer found in the wild, was probably domesticated in continental Southeast Asia. Early explorers and migrants took it on their boats, aiding its dispersal to Madagascar, New Guinea and the Pacific. It is now planted all over the tropics and is the most widely cultivated yam.

An intensive botanical search was launched to find a plant steroid with a molecular structure closer to that of progesterone. In the early 1940s the solution was found. The answer was diosgenin, a steroid-like substance from tubers of wild *Dioscorea* in the rain forests of Mexico. The abundance of wild plants made the mass production of progesterone possible. By the 1950s Mexico was a world leader in the production and export of steroids based on raw materials from a number of species of local *Dioscorea*, mainly *Dioscorea mexicana*, *D. composita* and *D. floribunda*. The content of diosgenin can be amazingly high, apparently up to 10% on a dry weight basis in *D. floribunda*. The price of progesterone dropped dramatically from a thousand dollars a gram to a few dollars. The ability to produce steroids cheaply also led to the development of the contraceptive pill and corticosteroid anti-inflammatory drugs. The medical benefits of steroids and sex hormones reached millions, revolutionizing medical care. They allow women to make confident choices about sex and their lives, and steroids are now the most widely used class of drugs. Diosgenin still provides about 50% of the raw material for the synthesis of steroids.

Bulbils from *Dioscorea alata*.

They are commercially extracted from *Dioscorea* and a number of other plants. As *Dioscorea* is a very large genus with about 600 species and many species contain diosgenin or related steroidal compounds, it is likely that many compounds remain to be discovered. Today, 'wild yam' extracts and creams are sold over-the-counter, apparently for their oestrogen-like effects. Elsewhere yams are used in traditional medicine with *Dioscorea opposita* a common ingredient in Chinese medicine where it is a tonic. It also enters into various Chinese herbal recipes to treat a wide range of ailments.

The greater yam, *Dioscorea alata*

This ancient crop plant, now no longer found in the wild, was probably domesticated in continental Southeast Asia. Early explorers and migrants took it on their boats, aiding its dispersal to Madagascar, New Guinea and the Pacific. It is now planted all over the tropics and is the most widely cultivated yam. *Dioscorea alata* is a variable species with twining stems that are square and winged. It is grown by planting a tuber or part of a tuber. As fresh tubers need a resting period of two to four months, nothing will happen after planting. One day though, a vigerous stem will emerge! As the stem climbs, a support should be provided. Any structure, including a section of a fence in a sunny spot, where a 4 to 7 metre stem can twine would be sufficient. After 7 to 10 months the leaves and stems will start drying. It is now time for the hardest and most satisfying part of growing a yam, digging the large tuber out without damaging it. The tubers are typically lobed with a rough, dark coloured skin and are usually 2 to 10 kgs in weight, but may exceed 50 kgs. Sometimes bulbils, like aerial potatoes, develop in leaf axils.

The flesh of the tubers and bulbils are white or reddish purple. They have amazing keeping properties as well as a remarkable property to heal. A large yam can be eaten a section at a time. The cut surface will heal, quickly sealing off and protecting the remaining of the tuber. When next required, another section can be sliced off. This storage and healing properties when first encountered must seem nothing short of divine.

Yams are truly one of the miraculous gifts from the rain forest.

Chin See Chung
Principal Botanist
Photos by Chin See Chung

BAMBOOZLED…
by Southeast Asia's bamboos

M. Sugumaran

The grass family (Poaceae) is our most valuable plant family, yielding staples and numerous food items (just think: wheat, rice, oats, sugar, barley, fodder for livestock, and you'd be on the right track…), crafting materials, fibre, ornaments… the list goes on. And, of course, grasses include bamboos! Bamboos, too, have been a useful natural resource for human society since ancient times. They are grasses but mainly develop woody stems and have a complex branching system (there are also herbaceous bamboos, but these are fewer and generally rarer). They can invade rainforests, which otherwise have relatively few grass species.

There is still much to be discovered about the wilderness and its biodiversity. In Borneo, surely Southeast Asia's most iconic island, the bamboos most familiar to people are the tall, tree-like bamboos of erect habit, such as the commonly encountered village or countryside *buluh betung, Gigantochloa levis*. The genus name gives away the fact that most *Gigantochloa* species are giant grasses, with sizeable strong woody stems (or culms, following the grass term) that are useful in different ways. It was in Brunei, a kingdom in the species-rich, northwestern part of Borneo, where another common Bornean village bamboo called *Gigantochloa balui* (*buluh balui*) was diagnosed as new to science only some two decades ago. This bamboo with a covering of pale silvery hairs all over the sheaths that protect the young shoots did not have any formal scientific name. It has all the characteristics of a plant in cultivation: not or only rarely producing fertile seed, which is likely when relatively few introduced plants have a narrow genetic base, and not found in truly wild undisturbed natural sites. Thus it did not appear to be native (indigenous) to Borneo, a notion reinforced by the subsequent confirmation of its natural occurrence as wild, freely seeding stands in Peninsular Thailand. Was this bamboo carried along with the ancient migrations of people from the Asian mainland across to Borneo?

In Southeast Asia, the plant world continues to yield amazing examples of rare and unique species that are the very hallmark of tropical rain forests. The undoubtedly native bamboos are full of interesting examples too. Who but residents familiar with forest life would expect there to be twining bamboos, exemplified by the genus *Dinochloa* ('headquartered' in Borneo, where there are most species), which have pencil-thin culms twining up tree trunks? *Dinochloa* bamboos (*buluh badan*) are also unusual in producing fleshy, rounded fruits resembling berries, rather than the dry grains that grasses typically bear. Elsewhere a few other bamboos, including non-climbing ones, also have similar fleshy fruits: what adaptive situations could have caused this feature to evolve in different lineages?

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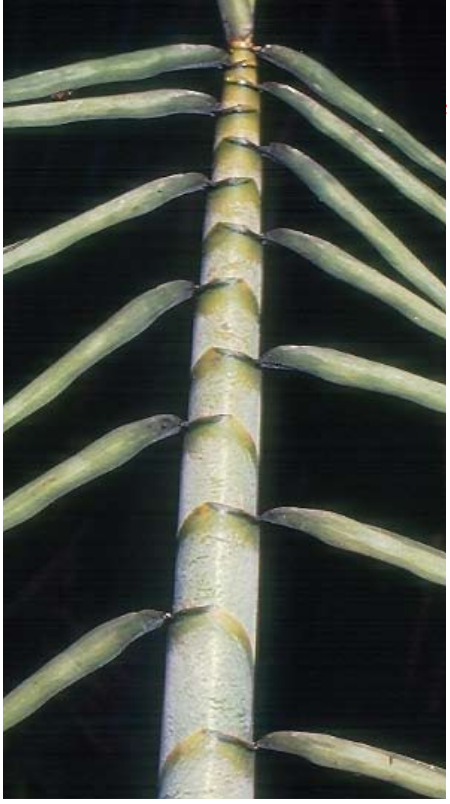
Rare bamboo species include some very curious forms. Some, like *Kinabaluchloa nebulosa*, are restricted to mountain chains in northwest Borneo, from the Kinabalu massif, via the Crocker Range



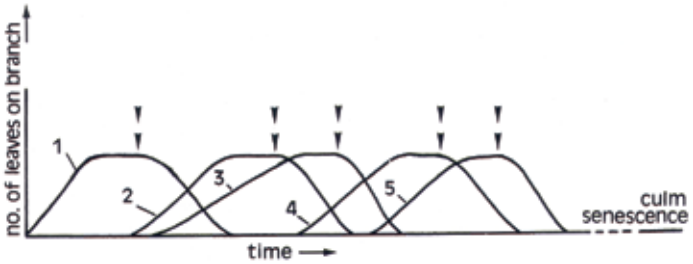
Pg 10:
Gigantochloa levis, a giant bamboo common in Borneo.

From the Top:

Sheaths with pale silvery hairs adorn the young shoot of *Gigantochloa balui*.

Peculiar twining culms of a slender *Dinochloa* bamboo ascending a tree trunk.

Dinochloa trichogona fruits, most unusual for grasses or bamboos.



Idealised sequence of five cycles or orders of branch development in a *Schizostachyum* bamboo, with branch elongation marked by initial increase in number of leaves, and branch senescence marked by subsequent loss of leaves following onset of flowering development (arrows) at branch tips.

and higher Temburong mountains of Brunei, to Sarawak. Their closest relatives are to be found across the South China Sea, in the mountains of the Malay Peninsula and perhaps farther north. This disjunction could have come about by the splitting of the lineage between mainland southeast Asia and northwest Borneo caused by sea-level changes during the Pleistocene that separated ancient populations present in the region. These separated populations then became the basis of today's species. Another curiosity is *Temburongia simplex*, a slender scrambling bamboo developing flattened extensions around its culm nodes and little stiff, hornlike structures called auricles at the junction between leaf blade and leaf sheath. There is but one species in this remarkable genus, restricted to Brunei's Temburong valley, and it was passed unnoticed by a retinue of botanists travelling on the Temburong until its formal naming in 1996. Still, we have no firm clues on its closet relatives and how to classify this oddity in the complex alliance of Asiatic bamboos.

For some, the greatest mystery about bamboos is their flowering. Much has been made of the extreme longevity of many bamboos, temperate or tropical, that includes long periods (of over a century, even) of vegetative growth. Such prolonged vegetative phases are terminated only by a massive reproductive event that often involves the near-synchronous (or so-called gregarious) flowering and seeding of many individuals of a species in one locality. Some ecologists believe this habit evolved so that a massive availability of seed more than satiates potential seed predators, leaving enough to ensure survival of the bamboo's next generation. The 'over-production' is indeed immense, and in India past bamboo seeding has variously precipitated the population explosion of rodents and predisposed the incidence of plague, or been of some relief through the grain they supply in times of famine.

That, too, is not the end of the story. In Southeast Asia, many *Schizostachyum* bamboos have an alternative lifestyle in their continuous flowering and seeding habit. Such bamboos have leafy branches that develop flowers and seed and just as these branches senesce at their tips, a second batch of branches develops lower down on the initial branches. Such secondary branches elongate and repeat the leafing, flowering and seeding sequence and in turn senesce and are replaced by a third batch of branches. Over a period, a single culm in a clump of *Schizostachyum* goes through an average of 4-5 orders of branching and seeding before it dies, but the clump as an individual survives and continues the habit with culms of various ages. In the Gardens, we can even observe this in the popularly cultivated yellow-stemmed *S. brachycladum*. So far, this continuous flowering habit is only known in the wet tropics. We may yet be surprised by many more discoveries about bamboos in time to come!

From the top:

The nodal patella in the strange *Temburongia simplex*.

Temburongia leaves with stiff horn-like auricles.

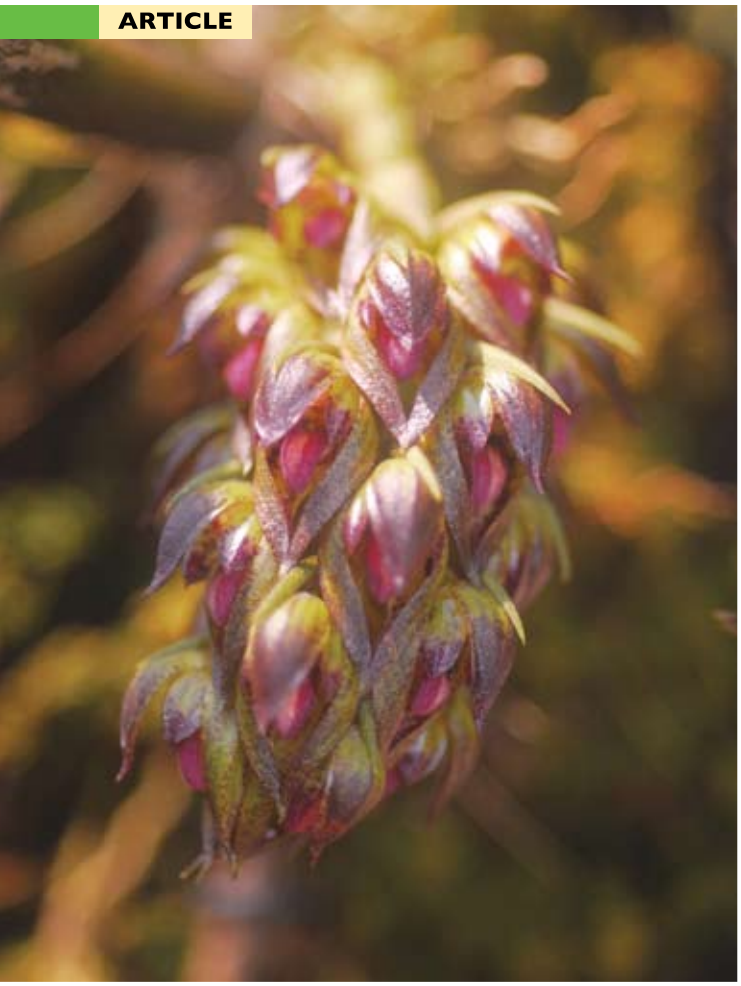
Schizostachyum brachycladum, showing a spent initial branch (between tips of index finger and thumb) with similarly spent second-order branches following flowering, and third-order branches with leaves and not yet flowering.

Pg 13:
Kinabalu nebulosa, a highland bamboo ('*nebulosa*' in latin alludes to an occurrence 'among the clouds').

Khoon Meng Wong
Herbarium

All photos by Khoon Meng Wong unless otherwise stated

M. Sugumaran



THE RE-DISCOVERY & CONSERVATION OF *Bulbophyllum singaporeanum*

The Central Nature Reserve Branch, Conservation Division, National Parks Board, in collaboration with the Gardens, National Biodiversity Centre and Pulau Ubin, has been carrying out a series of tree flora surveys from 2008 to 2010 at Bukit Timah Nature Reserve and the Central Catchment Nature Reserve. During these surveys an orchid thought to be extinct in Singapore and last collected more than a century ago was rediscovered - *Bulbophyllum singaporeanum.*

Thirty-six circular sampling plots, each of a diameter of 50m, have been established at selected sites within the reserves. The aim of the surveys is mainly to record and measure tree species for long-term monitoring of growth, forest health, vegetation succession, etc. The sampling plots cover a wide variety of forest micro-habitats, from young secondary forests to mature primary forests, from sites at top of hill knolls to sites near stream valleys. One of these sampling plots was sited in the Nee Soon Freshwater Swamp, which we visited it on 17 February 2009 and re-visited on 2 and 3 March 2010.

Habitat of the plot under study

The Nee Soon Freshwater Swamp is a wet-forest area of around 80 ha, consisting of a mixture of old secondary and primary forests, with the Nee Soon Stream running through it. The plot we visited is about 10 m above sea level and generally flat with thick leaf litter, but surface water is visible within the gaps among the root mat at some portions of the plot. Most of the trees within the plot have trunks of around 30 to 60 cm girth, and the plot has an average tree height of around 27 m. The tree canopy coverage within the plot is around 70%. This means that there is a 30% canopy opening, contributed by several tree-fall gaps. There are a few big trees belonging to the Sapotaceae family, e.g., *Palaquium xanthochymum*, with trunk girth of around 2-3 m and with magnificent stilt roots. There are also abundant amounts of climbers, some belonging to the genera Pandanus and Korthalsia that are typical of the wet primary forest flora.

Pg 14, top left:
The flowers of *Bulbophyllum singaporeanum emit a foul smell which resembles rotting fish.*

Pg 14, Bottom left:
These seed capsules of *Bulbophyllum singaporeanum* resulted from artificial pollination.

Pg 14, Bottom right:
Bulbophyllum singaporeanum climbing up the trunk of a large forest tree.

Above:
The canopy of Nee Soon Swamp Forest. Some unidentified epiphytic orchids can been seen growing on this branch.

The study

On our first visit we took a tree flora inventory and carried out plot mapping. We also looked for orchids in the vicinity, and it was noted that orchids are relatively prolific in the area as we managed to locate five species just through a cursory survey. We re-visited the plot in 2nd to 3rd of March this year. In addition to the tree flora re-inventory, two officers devoted themselves solely to a search for orchids within and near the plot. While the trees are being measured and recorded, the tree inventory team also made it a point to look up tree trunks and branches for any epiphytic orchids. All in all within the two days in March this year, around 14 species of orchids were found around the area, including the exciting rediscovery of *Bulbophyllum singaporeanum*.

Bulbophyllum singaporeanum

The first specimen of *Bulbophyllum singaporeanum* was collected in 1889. The species was formally described in 1896 by Henry Ridley, the first Director of the Gardens under the name *Bulbophyllum densiflorum*. Ridley based his description on specimens collected from Kranji, Selitar, Bukit Timah, Bukit Mandai and Choa Chu Kang, all collected within a span of six years (the specimen collected by Ridley from 'Choa Chu Kang' in 1894 was actually from 'Chan Chu Kang'. These two localities were commonly mixed up when translating Ridley's writing from his herbarium labels). A few years later in 1911, the famed German orchid taxonomist Friedrich Richard Rudolf Schlechter discovered that Robert Allen Rolfe, a British botanist, had already described a *Bulbophyllum* species in 1892 using the name *Bulbophyllum densiflorum*. As no two species can have the same botanical name, he renamed Ridley's *Bulbophyllum densiflorum* as *Bulbophyllum singaporeanum* in honour of the place where the plant was discovered. At that time, the plant was only known to occur in Singapore, although subsequently it has been recorded from the lowland rain forests of Peninsular Malaysia and Borneo.

No further collections of this plant were made from Singapore since Ridley published his description, and the species has been listed as "nationally extinct." However, in 2009 (more than 100 years later), our rediscovery of the plant in Nee Soon Freshwater Swamp changed this status. As well as collecting a herbarium specimen as a permanent record, a second specimen was collected from a plant growing on a *Palaquium xanthochymum* and grown at the orchid nursery. It flowered in May and allowed us to confirm its identity. It is actually rather easy to identify the plant even when it is not in bloom because of its distinctive vegetative characteristics. Each pseudobulb is about 5 cm long and 6 mm wide, and slightly flattened. It bears narrowly linear dark glossy green leaves, about 30 cm long by 4 cm wide, the underside of which is suffused with a degree of purple. The youngest, yet to be fully opened leaf is completely purple. The rhizomes are covered closely with the leaf sheath, and is about 4 mm thick. The distance between the pseudobulbs is about 10cm. The flower scape is about 1.5 cm long, covered with several sheaths, and the portion of inflorescence which bears the flowers is 4 cm long, with many small flowers. Each flower is pale purplish green in colour with dark purple spots, not open completely, and the pedicel and ovary are 5 mm long. The concave dorsal sepal measures 10 by 5.5 mm, and is keeled on the back. The mentum is 4 mm long, at an obtuse angle to the ovary. The lateral sepals are 1.4 cm long, their lower edges continuing almost in the line of the mentum, with the area toward the apex

Ridley collected this *Bulbophyllum singaporeanum* specimen at Chua Chu Kang in 1894.

strongly keeled and acute. The petals are 7 mm long by 3 mm wide, with a pointed apex. The lip is 6 mm long, 4 mm wide at the base, curved strongly, with a pointed tip, its upper surface deeply grooved throughout, almost to the tip. Our observations in the nursery on our living specimen show the flowers emit a very unpleasant smell which resembles that of rotting fish. Small flies were observed to fly around the flowers.

Despite its name, *Bulbophyllum singaporeanum* is not common in Singapore. In Southern Malaysia, it is found growing on the ground scrambling across large boulders and fallen trees but never higher than a few metres from the ground (Jaap Vermeulen, personal communication). The habit of the plant discovered in the Nee Soon Freshwater Swamp suggests that it started as a terrestrial. Having long thin rhizomes, the plant climbed onto the surrounding trees trunks it encountered.

Conservation

Bulbophyllum singaporeanum is notoriously known to be picky and not easy to grow in cultivation. A few cuttings were collected and grown in our nursery. The cuttings were mounted on fern bark which is covered by a layer a sphagnum moss. They were placed under 50% shade and watered twice a day. One of the cuttings flowered on 4 May 2010, and several flowers were pollinated with the aid of a magnifying glass. It is very exciting to report that pollination was successful and several seed capsules have formed! We hope to collect seeds and propagate these species for subsequent reintroduction.

The natural habitat of *Bulbophyllum singaporeanum*.

Yam Tim Wing
Orchid Breeding and Micropropagation

Paul K F Leong
Herbarium

Chew Ping Ting
NParks Conservation Division

Derek Liew
NParks Conservation Division

William Ng Kar Huat
NParks Conservation Division

All photos by Yam Tim Wing

REVISITING THE GARDENS MASTERPLAN

Singapore Botanic Gardens (SBG) with its partners conducted a course on the management of botanic gardens some months back. The International Certificate in Botanic Garden Management in the Asia-Pacific Region is a comprehensive 3-week course equipped to arm students from a diverse range of countries with knowledge on all relevant aspects of the subject. Although not part of the botanical or scientific fraternity, I found myself contributing a lecture to one of the modules. This was at the request of the Gardens as it was felt that the physical aspects of setting up a botanic garden was something the students needed to know, and that SBG provided a good case study.

Images of the old gardens (image source: Singapore Historical Postcards, © The National Archives)

Backdrop

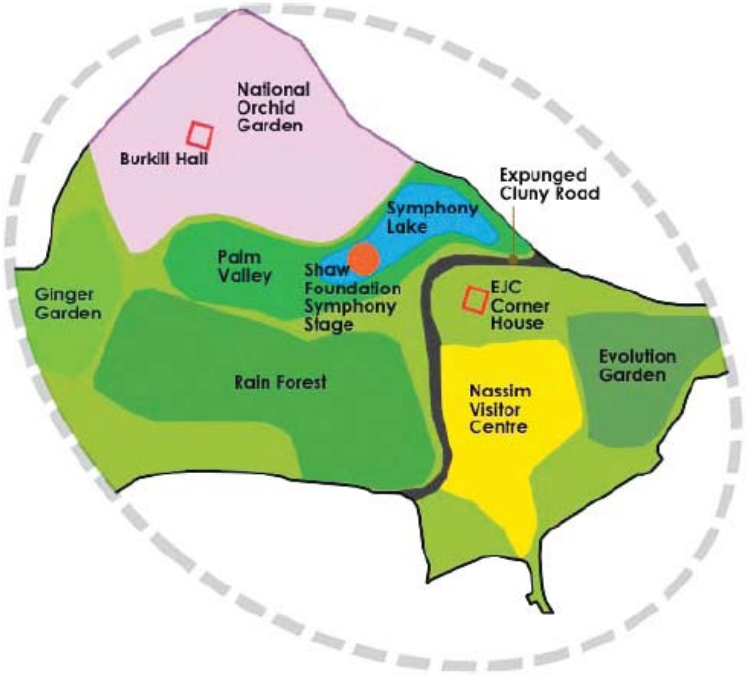
A large part of the present SBG grounds was laid out by the British during the colonial period when the Gardens served as an agricultural experimental station and botanical institution. Since then, the Gardens evolved to become a popular recreational green lung in the heart of the city and an important tourist attraction in post-independence Singapore. A new initiative to transform the Gardens was put forth in 1988. About that time Singapore went through one of its periodic rebranding exercises and the Gardens then found itself the subject of a major remake to enhance its international profile and standing. Although tourism was the key aspect driving the make-over, necessitating the creation of new horticultural displays and visitor amenities it was soon realized that other aspects of the Gardens had to be strengthened in tandem. These include diverse botanical collections in ex-situ conservation, scientific research programmes, public education and outreach, businesses and visitor services. The vision was to turn the Gardens into the premier botanic gardens in the tropics and this had to be done holistically.

The outcome was a new masterplan which was drawn up jointly by the National Parks Board, the Public Works Department, and Jones & Jones – an American landscape design consultancy firm. This masterplan provided the framework for a series of improvements implemented in a coordinated fashion over the next 20 years –transforming the Gardens to what it is today.

Those of us of a certain vintage will still remember what the Gardens was like before. Simply called the Botanic Gardens, ("Singapore" was added subsequently as part of the re-branding) it was redolent with history – especially the role it played in the propagation of rubber. To most of us, it was a charming but laid-back place. Its grounds were beautiful and well-cared, and apart from the Orchid Enclosure which the Japanese tourists loved, it didn't have many big-ticket attractions. The masterplan changed that. Over a period of 20 years, the Gardens underwent a series of continual modifications. SBG celebrated its 150th anniversary last year so perhaps it is an appropriate moment, somewhat belated nonetheless, to take stock of what has been done.

Seamless integration

It' s probably little known now, but one of the main achievements in the masterplan was a bold stroke of integration. Prior to 1988, the Gardens was effectively dissected into two by Cluny Road, resulting in two distinctly different portions. The portion closer towards Napier Road was the well-established old garden, while other portion closer towards Bukit Timah was a relatively new tract of land returned to SBG as a result of the relocation of the adjacent university campus in the 80's, and considerably less developed and visited. A decision was taken to expunge Cluny Road along the stretch where it dissected the Gardens, resulting in one part of Cluny Road renamed as Cluny Park Road while the other was diverted to join up with Evans Road. This helped integrate the two halves of the Gardens seamlessly – the



The old black and white bungalow on top of the knoll, formerly the residence of the Gardens' Director during the colonial days, was renamed Burkill Hall and became the events and reception space for SBG.

join is located within the footprint of the Nassim Visitor Centre and Palm Court. The EJH Corner House, which now houses the upmarket Les Amis restaurant, used to overlook a bend in the now-expunged section of Cluny Road and an underground pedestrian tunnel which used to connect the two garden halves is probably buried somewhere under the water fountain.

Overcoming geography

Most visitors are aware of the distinctive site configuration of the Gardens as it appears on the signage boards and brochures. You will notice the Gardens is remarkably long and extended (about 2.5 km walking distance from end to end) making it a somewhat of a challenge for a visitor who wishes see the entire Gardens in a single trip on a hot humid day. This was especially so prior to redevelopment when the main entry was from the Main Gate situated at extreme end of the Gardens at the Napier/Cluny Road junction. To deal with this the masterplan adopted the core concept with each core holding a critical mass of attractions and having its own independent access. Three quite separate cores were carved out and each has its distinct identity eg the Central Core has most of the big attractions including the orchid collection, while the Tanglin Core's focus is on heritage, scientific education and public outreach. The potential of the Bukit Timah Core, with its focus on education and discovery, centering around the Ecolake, economic plant collection and more recently the Jacob Ballas Children's Garden, however, will be fully realised only when the MRT station is ready and the public linkages properly formed. The core concept incidentally also allowed the development to be implemented in a coordinated manner and in cohesive packages that minimised the adverse impact of construction.

Achieving early success

Given that the masterplan would be implemented in stages over a prolonged period, it was important to develop a strategy that would allow it to achieve early success. This would then help secure the buy-in from stakeholders and the public, providing support and maintaining the momentum to propel the implementation further. The first core to be developed was the Central Core as the Cluny Road expunction had resulted in new vacant land which could be developed for a new visitor centre. Moreover, the existing orchid collection was also in the Central Core. A much enlarged new orchid attraction, the National Orchid Gardens (NOG) was constructed on a knoll adjacent to the existing Orchid Enclosure. The old black and white bungalow on top of the knoll, formerly the residence of the Gardens' Director during the colonial days, was renamed Burkill Hall and became the events and reception space for SBG. In a subsequent development the abandoned Orchid Enclosure was revamped as the Ginger Gardens, accommodating an F&B outlet (Halia) and a new coach drop- off along Tyersall Avenue to cater to tourists heading to the NOG.

Left:
Burkill Hall

Above:
Ginger Garden

At the other end of the Central Core, the Nassim visitor centre was constructed. Designed as an airy tropical building arranged around a signature Heritage Tree, the Gardens for the first time could offer proper visitor arrival and orientation facilities including commercial outlets like a café, a souvenir shop, coach and car parking. Until the Tanglin visitor centre was built, the Nassim visitor centre served as the main point of arrival for visitors, especially those who drove as well as those on organized trips.

The completion of these two major projects, including the subsequent improvement of the Palm Valley, with its magical nightscape lighting, Symphony Lake / Shaw Foundation Stage and the Marsh Garden eventually helped the Central Core fulfill its potential as one of the most visible and photogenic portions of the Gardens. The acceptance and approbation of it helped pave the way for the development of the other cores.

Creating attractions

The masterplan called for a slew of new and exciting world-class attractions and diverse plant collections that would beef up the interest quotient. While some were entirely new attractions, others were enhancements of what already existed in the Gardens but required more creative horticultural skills and better interpretative displays. The orchid collection which was a traditional draw of the Gardens, was greatly expanded and improved. The NOG was not only beautifully laid out in a stunning colour-themed arrangement, but included an orchidarium for native species, mist houses for an accompanying bromeliad collection and a cool house for tropical high altitude orchids. With its extensive species, imaginative displays and a collection of specially created hybrids named after visiting VIPs and dignitaries – NOG is frequently rated as having one of the orchid displays in the world.

The Cloud Forest Biosphere – featuring high altitude equatorial flora - was originally planned as one of the new signature attractions of the revamped Gardens. The Cool House in fact was developed as a scaled-down prototype that would help develop and nurture the horticultural skills necessary for this project. Had the Cloud Forest Biosphere been built as proposed in the masterplan it would it would have been a stunning first-of-its-kind in this part of the world.

Not many people remember the original pond at the Bukit Timah core. Constructed as part of a drainage system serving a catchment extending beyond the Gardens, the concrete-lined pond was actually a stormwater retention pond which accounted for the murkiness of its water. Transformed into a more naturalistic waterbody with gently sloping vegetated banks the Ecolake is now the hub of the Bukit Timah core. Together with the backdrop of gentle mounds, worked in to create interest and to block views of the surrounding roads, the Ecolake is a scenic feature with an interesting collection of economic plants in the vicinity.

Above:
Green Pavillion

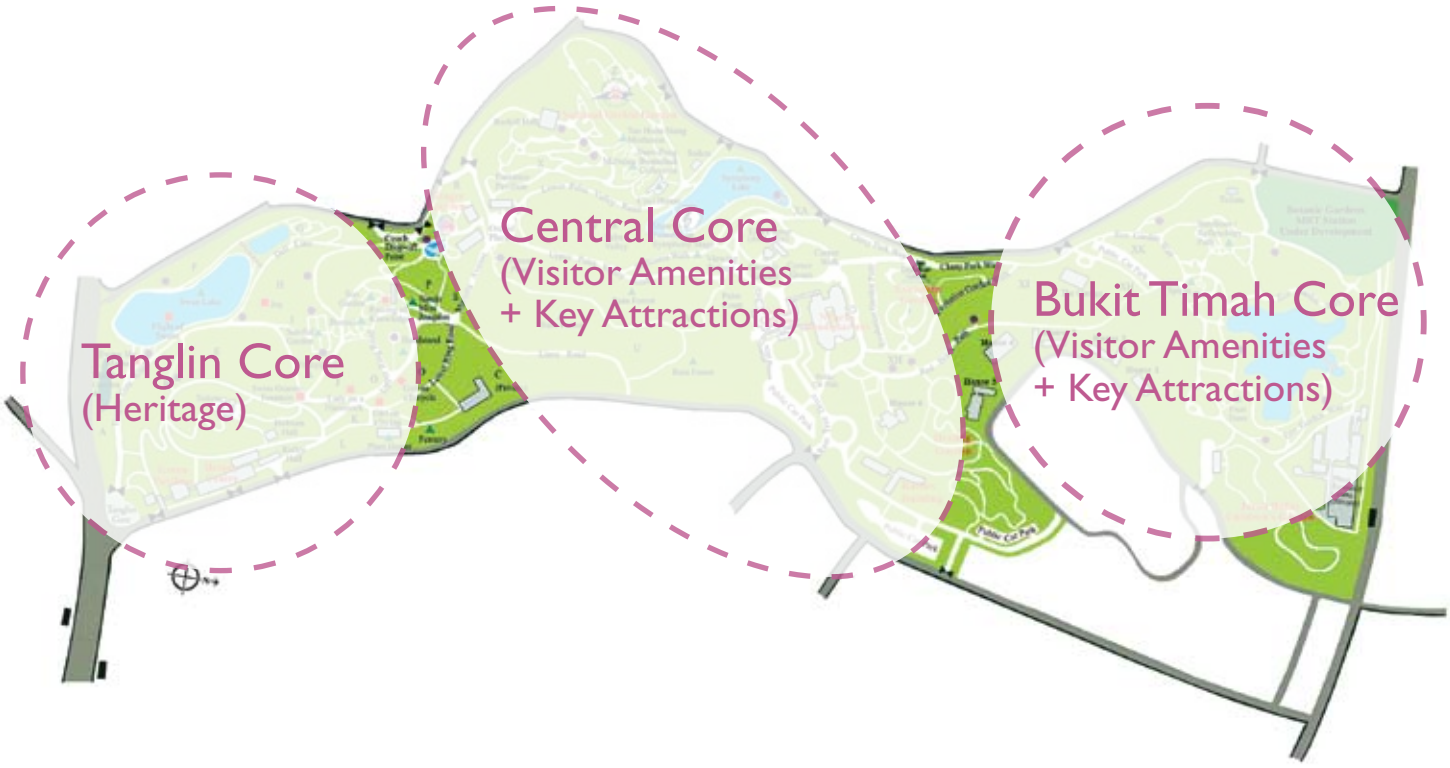
Left:
Visitor Centre

Page 21:
National Orchid Garden

Other attractions such as the Evolution Garden and the Jacob Ballas Children's Garden are more thematic in nature. The Evolution Garden is particularly inventive, boldly making use of a spiraling landform to evoke the grand sweep of time across aeons and the transformation of plants that accompanied this.

Imaginative nomenclature also played a small but nonetheless significant part in creating interest. Swan Lake and Symphony Lake replaced the more mundane-sounding 1st and 2nd Lakes, and upgrading works made them live up to their names. It is noteworthy too that many of the new place names hark back to the past and highlight the Gardens' heritage eg Burkill Hall, Ridley Hall, Holttum Hall etc. which commemorate the legacies of eminent personalities who made significant contributions to the Gardens and to tropical botany.


TAN HOON SIANG
Misthouse


Tanglin Core
(Heritage)
Central Core
(Visitor Amenities
+ Key Attractions)
Bukit Timah Core
(Visitor Amenities
+ Key Attractions)

Planning for flexibility

In many instances, a masterplan for long-term development invariably falls short, or is rendered obsolete by changed circumstances. The SBG masterplan has however, remained remarkably true to what it set out to be. The Core concept has worked out very well and many of the proposals were implemented as originally envisaged. Still there were plenty of deviations along the way. As mentioned the Cloud Forest Biosphere is unbuilt and probably will remain so, as two major conservatories coming up in the new Gardens-by-the Bay would render it unnecessary. In the original masterplan, an internal transit system was proposed to facilitate movement within such an elongated Gardens. Perhaps because of the effectiveness of the core concept, there now seems to be little need for it. The location of the MRT station at the Bukit Timah end (an interchange station at that) was not anticipated in the masterplan; neither was the possibility of a further alignment of Cluny Road that brought the old Taman Serasi food centre into the grounds of the Gardens. In 2004, a 11.7 hectare addition was given to SBG from the adjacent campus land – requiring a new masterplanning exercise to integrate this plot with the rest of the Gardens.

In addition there were numerous instances where plans were modified to accommodate site conditions, the prevailing political/economic situation, public needs, donors and stakeholders, as would be the case in the implementation of any major long-drawn public project. It is therefore important that the masterplan had intrinsic flexibility to accommodate such unforeseen circumstances.

Looking back I find it immensely satisfying that a masterplan crafted more than twenty years ago could have guided the development of the gardens for so long in the face of ever-changing circumstances, notwithstanding the numerous modifications and refinements to respond to dictates of time and place.

Page 22, clockwise from left:

Symphony Stage

Evolution Garden

MistHouse, National Orchid Garden

This page, clockwise from top left:

National Orchid Garden

Eco Lake

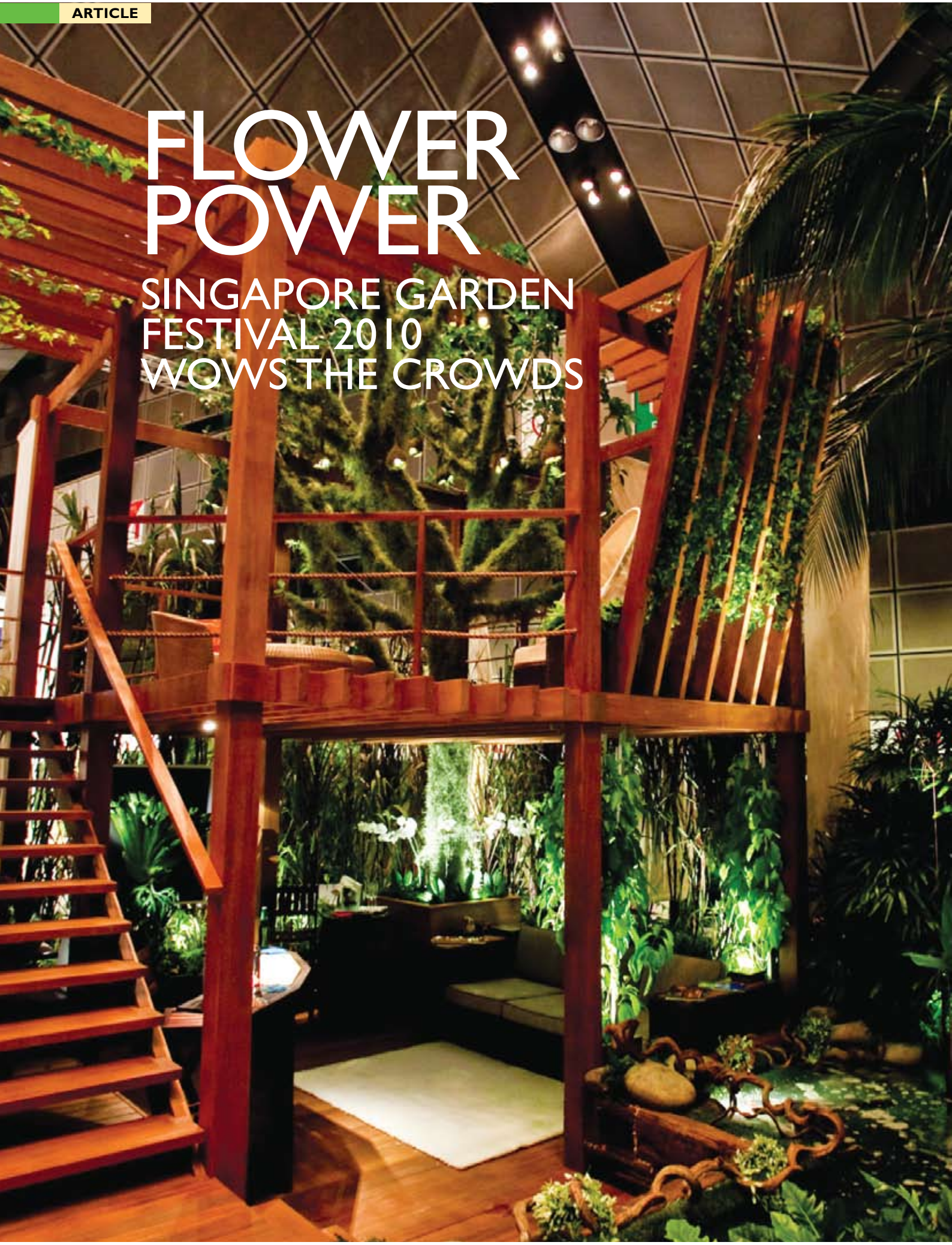
Jacob Ballas Children's Garden

Peter How
Director (Design),
CPG Consultants Pte Ltd

(Peter was part of the original team handling the formulation of the masterplan when he was with the now defunct Public Works Department, and was involved in the subsequent implementation of many of the projects in the Gardens.)

FLOWER POWER

SINGAPORE GARDEN FESTIVAL 2010 WOWS THE CROWDS



Best of Show for Landscape Garden was awarded to designer John Tan (Singapore) and implementing partner Esmond Landscape and Horticultural Pte Ltd for the creation entitled "The Tree House"

Gardenwise brings you highlights of Asia's Best Garden & Flower Show.

Over eight days from 15 to 22 July, over 300,000 visitors streamed into Suntec Convention Centre and were treated to a garden and floral extravaganza at the third presentation of the Singapore Garden Festival (SGF). The SGF is the only garden show in the world to showcase creations from an international cast of award-winning garden and floral designers under one roof. This year's Festival featured 15 show gardens and 16 floral displays by gardening luminaries from 17 countries. A perennial favourite of the Festival, the Singapore Orchid Show, also attracted entries from 12 countries. Over 250,000 tropical and temperate plants were used for the displays. This includes plants that are uncommon to Singapore such as elements of the African flora and other plants and orchids specially brought in by the garden designers, floral artists and exhibitors from all around the world.

Two Singaporean designers walked away with the top honours for the Best of Show Landscape and Fantasy Gardens categories. John Tan won Best of Show (Landscape Garden) with his creation entitled "The Tree House – Modern Kampong Lifestyle and Damian Tang clinched the Best of Show (Fantasy Garden) with his garden entitled "The Mysterious Jungle of Pandora". Jim Fogarty of Australia, a three-time gold medal winner of the SGF, was the inaugural recipient of the SGF Horticulture Excellence Award with his garden entitled "Daintree". Brigitte Heinrichs from Germany won the Best of Show for the Floral Windows to the World Competition. The Festival gardens and displays were judged by international panels of judges.

Three-time gold medallist Jim Fogarty received the inaugural SGF Horticultural Excellence Award. The garden titled "Daintree" was implemented by Nyee Phoe Flower Garden Pte Ltd.

One for the album - Winners of the inaugural Gardeners' Cup with Minister Mentor Lee Kuan Yew. More than 800 community gardeners (grouped into eight teams) vied the top prize with their witty and imaginative designs.

A world first – Singapore's largest flower bouquet was created at the Singapore Garden Festival by 50 Nobleman School of Floral Design students in a 12-hour marathon session. Made with 179,593 blooms and measuring a staggering 105.7 metres, this feat is awaiting certification by Guinness World Records

The Best of Show for Fantasy Garden went to Damian Tang for his garden entitled "The Mysterious Jungle of Pandora". The display was implemented by Kiat Lee Landscape & Building Pte Ltd

The People's Choice - "Hortus Inclusus" by John Cullen and Michael Cullen clinched the 2010 Singapore Garden Festival People's Choice Award. The display was implemented by Prince's Landscape & Construction Pte Ltd.

"The sophistication and ingenuity of the beautiful displays and exhibits have captivated many and we are extremely heartened that the Festival has managed to achieve this level of international acclaim..."

Fashioned from the timbers of a reclaimed centennial Michigan barn, fieldstone from an 18th century Pennsylvania wall and uniquely shaped espaliered pear trees trained in the foothills of Tennessee, the serene "Hortus Inclusus" (The Interior Garden)" creation by John Cullen and Michael Cullen was crowned this year's winner of the Singapore Garden Festival People's Choice Award. The People's Choice Award is given to the most popular garden exhibit voted by visitors to the show. Visitors voted for their favourite garden through SMS, from 10am on 15 July to 10 pm on 22 July when the Festival came to a successful conclusion.

Dr Wong Wei Har, Director of the Singapore Garden Festival, said: "The Singapore Garden Festival 2010 has been a tremendous success, and the response we've received from participants, exhibitors and visitors has been overwhelmingly positive. The sophistication and ingenuity of the beautiful displays and exhibits have captivated many and we are extremely heartened that the Festival has managed to achieve this level of international acclaim despite this being only the third installment of the festival. I am also very pleased to see greater participation from the local community in various competitions and activities at the festival. SGF provides them with a platform to showcase our horticultural excellence to an international audience and the community groups have certainly grabbed our attention with their intricate works this time round."

The Festival was a hit with locals and tourists alike. For Ms Marjorie Champagne, a tourist from France, the SGF is truly unique in its own right. "I particularly like how the orchids are displayed in such elaborate landscapes, making it a truly impressive sight. One thing that stood out for me was the wide variety of plants and flowers available. The different plants and colours make for many different possibilities and this has helped the Festival stand out in my memory," she said.

Singapore Orchid Show 2010 - a dazzling display featuring orchids of every hue and colour

Students of Naval Base Secondary school putting in the finishing touches for their orchid display

A Treat For The Eyes, A Feast For The Senses

A perennial favourite at SGF, the Singapore Orchid Show 2010 did not disappoint. Even before stepping onto the show grounds, visitors were greeted with a stunning display of dancing golden arches comprising of thousands of *Oncidium* Goldiana (Golden Shower). Jointly organised by the Orchid Society of Southeast Asia (OSSEA) and the Singapore Garden Festival, the 2010 Singapore Orchid Show provided a foretaste of next year's prestigious World Orchid Conference which will be held in Singapore.

With the tremendous diversity of orchids in different colourful hues and varieties on display, the orchid show was an orchid lover's delight and a photographer's dream come true. From miniatures suitable for growing in tight spaces to the giant Tiger Orchid, the much anticipated floral extravaganza featured over 800 different orchid varieties.

The show comprised three competitions: Landscape Display Competition, Individual Plant Competition and the Cut Flowers competition. Some of the notable winners at the Singapore Orchid Show included: The World Orchid Conference Trust Trophy which was awarded to *Dendrobium* Hiroshi Tokunaga; the Grand Champion Display Trophy to Thailand and the Grand Champion Plant Trophy to Song Orchids.

The Man Who Planted Trees was shaped by Singaporeans and Singapore residents from all walks of life and nurtured at the Gardens before the big move to SGF.

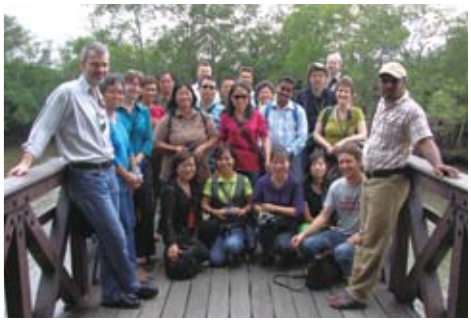
The Man Who Planted Trees

As if keeping a watchful eye over the garden and floral displays, The Man Who Planted Trees took centrestage at SGF 2010. This dazzling centrepiece was inspired by a charming French eco-fable of a shepherd who set out to reforest the ruined eco-system of a desolate and abandoned valley in the foothills of the Alps, near Provence in France. The story underscores our duty as stewards of our environment, and shows how one person's determination and commitment can leave an indelible mark on our planet. It also bears strong similarities with the greening movement in Singapore. Our country's greening journey began about four decades ago when Minister Mentor Lee Kuan Yew's vision of a Garden City took shape. The tireless efforts of local heroes like him have undoubtedly helped nurture Singapore's image as a Garden City. Up to today, Minister Mentor continues to plant a tree annually.

The Man Who Planted Trees celebrates the International Year of Biodiversity 2010, paying tribute to all local heroes who have contributed significantly to the greening of Singapore. To mark the launch of SGF 2010, hundreds of Singaporeans and residents from all walks of life came together on 25 March at the Botanic Gardens for a mass planting activity. It was through the effort of everyone involved that helped shape the look of The Man Who Planted Trees, just as all of us have a hand in nurturing our Garden City. The Man Who Planted Trees was painstakingly nurtured and cared for by the Gardens' horticulturists until its big move to the Festival venue on 5 July.

Terri Oh
Singapore Garden Festival
Photos from SBG Archives

INTERNATIONAL CERTIFICATE IN BOTANIC GARDENS MANAGEMENT
in the Asia Pacific Region



Top:
Participants and trainers of the APBG Management Course.

Left:
Participants learning about seed-embryo development and seed viability.

Extreme left:
Participants being shown proper pruning techniques.

From the 5 – 20 of March 2010, the Singapore Botanic Gardens played host to the inaugural Asia Pacific Botanic Gardens (APBG) management course. The course was organised by the Botanic Gardens Conservation International (BGCI), Botanic Gardens of Australia and New Zealand (BGANZ) (specifically the Royal Botanic Gardens Melbourne, the Botanic Gardens Trust Sydney, the Botanic Gardens of Adelaide), Royal Botanic Gardens Edinburgh (RBGE) and the Singapore Botanic Gardens (SBG). Following extensive discussions, these organisations and gardens developed the training modules for the course as well as provided the necessary trainers.

The course was attended by fourteen garden managers which included horticulturists and botanists from gardens across the region, specifically Brunei, China, Hong Kong, India, Malaysia, Myanmar, Sri Lanka and Vietnam. The course comprised of eight learning modules covering topics that included collection policies, plant record systems, horticulture, master planning, visitor management, business, education outreach and ex situ conservation. It was also structured to support the targets of the Global Strategy for Plant Conservation. Field trips to sites in the Gardens and elsewhere in Singapore were organised for the participants and visiting trainers.

As part of the training, the participants were required to undertake and present a specific group project related to an aspect of the course that would be valuable for future implementation in their own institutions. An online discussion site has been launched at the Google Groups under the name of APBG2010 to serve as a sharing and discussion site and announcement platform for course participants and trainers to continue networking and interact informally.

The participants found the course invaluable as it provided them with a practical programme relevant to their respective gardens. The course taught how botanic gardens are aapproaching key issues such as collection management, plant conservation, community education and climate change. The participants and trainers have picked up interesting ideas and concepts from each other which they believe could be adopted and used in their respective gardens to promote better management of their living collections and contribute to the conservation of their countries' flora. For participants from institutions without a botanic garden or who are planning a botanic garden, the course gave an overview of what a botanic garden is all about and some ideas of the planning requirements.

The course is a successful example of an international collaboration between botanic gardens and institutions and met the need for such training in the Asia Pacific region. We hope that this course will be conducted again and will be further improved by taking into account all feedback and experiences gained from the first.

Nura Abdul Karim
Living Collections
Photos by Peter Symes

WATCHING MURALS GROW!

In mid-March, visitors to the Ginger Garden started to curiously look at the preparation of the wall on the right side of the main entrance at National Orchid Garden Plaza. Soon after the new plastering was done, ever smiling artist Michele appeared on the scene with all her paraphernalia – brushes, pencils, paints and loads of sketches. The growing mural attracted much attention from visitors and Michele was often surrounded by a "fan club", watching the artist transform the plain wall into an overview of the plants of the Ginger order. Members of the eight closely related families, forming the ginger order - bananas (Musaceae), bird-of-paradise (Strelitziaceae), orchidanthas (Lowiaceae), heliconias (Heliconiaceae), gingers (Zingiberaceae), spiral gingers (Costaceae), cannas (Cannaceae) and prayer-plants (Marantaceae) – appeared one by one on the wall. First as pencil sketches, but soon blooming in bright colours, attracting attention from all visitors. The mural was finished and the plastic protective tent removed on 7th May 2010. Michele is currently working on another mural, which is on the outside wall of Halia Villa facing the Banana Gallery and will feature interesting facts about Bananas. Soon there will be yet another project for Michele and that is to create wood sculptures designating each of our geographical areas in the Ginger Garden. Come and watch the murals and sculptures grow!


Michele at work, sketching a banana by pencil.


Michele Piccoli

Meet the artist

Michele Piccoli received her BA Honours in Fine Art Painting from Lasalle College of Arts, Singapore in 2004. She has also studied Chinese painting and sculpture (2007) and ceramics (2008) at the Nanyang Academy of Fine Arts in Singapore, and both taught and studied in Beijing, China and Perth, Australia. You may have recently seen her at Fort Canning Park, where she was 'artist in residence'. Michele has lived for past 9 years in Singapore and loves to come to the Gardens to sketch.

Jana Leong-Škorničková
Herbarium
Photos by Dina Gallick

Close up of the male flowers.

ENSETE LASIOCARPUM – THE END OF THE MONOTYPIC BANANA GENUS *MUSELLA*

One-year old Hedi Leong shows us the scale of the golden lotus banana in the Gardens.

The specific epithet *lasiocarpum* is derived from Greek, meaning woolly/rough hairy fruit. Indeed a name well chosen!

Ensete lasiocarpum in Kunming Botanic Gardens, Yunnan thrives in its natural climatic and soil conditions.

"Our first bud this year appeared right after New Year in early January. By the end of May, all leaves were gone, but the inflorescence will still hold on for next few weeks to come. At the same time, yet another two buds appeared and so there will be always some flowering in the Ginger Garden until October."


6 January 2010


20 January 2010


27 January 2010


25 February 2010

The golden lotus banana or Chinese yellow banana is native to the watersheds of the upper Yangtze River and its branches between northern Yunnan and southern Sichuan, where wild populations appear. It was originally described by Adrien Rene Franchet in 1889 as *Musa lasiocarpa.* Even though some characters point to its relationship with members of the genus Musa, this species resembles some *Ensete* species. This lead Ernest Entwistle Cheesman to suggest in 1947 that it should be called *Ensete lasiocarpum*. At that time, *Musa* with over 40 Asian species and *Ensete* with two species in Asia and three in Africa, were the only two recognised genera within the banana family (Musaceae). So, to which genus does the golden lotus banana belong? Well, maybe neither, or so thought Hsi Wen Li, who in 1978 proposed a third distinct genus *Musella* to accomodate this gorgeous plant, and thus its name baecame *Musella lasiocarpa*. Such a scenario provides fertile ground for taxonomists to quarrel and leaves horticulturists pulling out their hair with every name change.

When morphology leaves us in the lurch, it is time to call on DNA. This was finally what a group of botanists from Xishuangbanna Tropical Botanical Garden in Yunnan did recently. They gathered and analysed nearly 40 species of bananas covering all three genera in order to find out more about the evolutionary relationships within the banana family. The results of their study were published early this year in the botanical journal *Taxon* and seems to end the decades long dispute. The golden lotus banana clearly clustered with members of the genus *Ensete*. So it is time to let go of *Musella*, and the name *Ensete lasiocarpum* should now be used. An interesting bit of information that came out of this study was that this Yunnan native is more closely related to African *Ensete* species than Asian *Ensete*! Citing fossil evidence, the authors of this paper explained that the genus *Ensete* had in the past a much wider distribution, which had been disrupted by changes of climate in the Tertiary or early Quarternary periods.

The golden lotus banana is widely cultivated by farmers on the edges of terraced uplands, marginal lands, plantations and even in local gardens. The stems are rich in starch and can be eaten boiled as a vegetable. More often though, whole plants are used fresh or boiled as fodder for pigs. Other reported uses include soil and erosion control, as a weaving material, medicine, wine brewing and as a source of honey during the winter season. And of course, being such a beauty, this species has great ornamental potential.

Ensete lasiocarpum does not usually exceed 1.5 metres in height and its false trunk made of overlapping leaf sheaths ends in an upright bright yellow compact rosette inflorescence resembling a lotus. It thrives in well drained soil in direct sunshine. This banana will continue to flower for several months, starting with numerous rounds of female flowers positioned at the base of the inflorescence and followed by male flowers later. If pollination by insects occurs, the ovaries of the female flowers will turn into grey-greenish, short and rather fat angled fruits. Their rather thick skin is covered in white, bristly hair. The stone hard, black seeds are covered in a cream-white pulp, which turns into a deep violet mush when fully ripe.

Nurseries in Singapore sometimes carry full-grown flowering plants in pots, where they can be successfully grown. Unlike other *Ensete* species, *E. lasiocarpum* produces suckers freely and so is easy to propagate. Seeds are also available but need a period of cold before they germinate, so it is wise to ask before purchase if the seeds have been so treated. The good news for gardeners outside the tropics is that this banana is cold tolerant and in milder parts of the temperate zone can survive winter without being brought into the home.

Jana Leong-Škorničková
Herbarium
Photos by Jana Leong-Škorničková

TRAVELLING FOR TAXONOMY

Having just returned from a three-week trip to Europe, I was asked by my Gardens colleagues what it is that I do there and why I must make trips to places like Belgium and Germany in order to study the taxonomy of tropical plants. The Taxonomy Corner is a good place to explain how a taxonomist conducts research when trying to resolve naming problems and why herbaria and libraries far away must be consulted for solving the problems.

The naming problems stem from the last 250+ years of taxonomic effort, during which time some plants were described and named more than once. Ideally, each species should have one scientific name. The redundancy crept in through a combination of factors: botanists tended to work within the political sphere of their own country but a species may grow in many countries, thus leading to multiple "discoveries"; travel was slow and it took months or years for new species described in books and journals to become known in far-away places, if they ever reached there at all; and sometimes egos of botanists got in the way, too.

Taking my own family of specialty, the Convolvulaceae, as an example how many species does it contain, and how many scientific names are known for those species? The precise number of species of Convolvulaceae remains unknown, but the best estimate is about 1,840 species. However, if one consults IPNI (the *International Plant Names Index*), an online compilation of all scientific names for plants that have been published, one comes up with 7,763 names, more than four times as many! So the redundancy factor in naming Convolvulaceae is high; fortunately, other plant families have a correspondence of names to species that is nearer one to one, which makes the job of the taxonomist studying them easier as there are far fewer cases where one species has multiple names.

Specimen of *Ipomoea setosa* in the GOET herbarium. This specimen is original material for the name *Ipomoea macrantha* Peter (1891). The labels added by G. Staples document the status of this specimen and link it (via the literature citation) to the publication by Peter where the species name was published. Credit: George Staples

This sort of detective work in the herbaria and libraries of Europe, UK, and the USA is vital to reconciling the large number of redundant names already in existence for tropical plants, which in turn clears the way for more efficient naming of species.

Because there are so many scientific names already in existence, it becomes hard to determine the correct name for each species and it becomes very difficult to know if an unknown plant already has a name, or is genuinely new to science. For these reasons, I began in 2008 to work through all these published names to reconcile the taxonomy and nomenclature, thereby bringing "order out of chaos" as one recent taxonomic tome has called it.

Among these thousands of published names are many hundreds of old names that have been overlooked for decades or centuries and which we know little about. These mystery names are reported in IPNI and that citation is the starting point for taxonomic detective work.
First one would need to find, in a library, the publication in which the name and first description were published, and get a copy of it, study it, and see if it is possible to work out what species it is. This is rarely the end of the job, though, and typically the next stage is to discover where, in a herbarium, are the specimens that were used by the author of the mystery name in preparing the species' description.
Once the original description is in hand and the plant specimens used to craft the description have been located, it is usually possible to work out the identity for the mystery name.

Thus, the need to travel to places such as Georg August University, Göttingen, Germany, the National Botanical Garden of Belgium, outside Brussels, and the Botanische Staatssammlung, Munich, Germany. Each of these herbaria, and their accompanying libraries, hold pieces of the taxonomic puzzle for tropical American Convolvulaceae. My colleagues and I have a list of about 245 problem names in the genus *Ipomoea*, all described from tropical America, and which can't be recognised today. In order to resolve their identities, it is necessary to go to the herbaria where the original specimens are housed, and search there to locate the specimens linked to the mystery names.

The accompanying photo shows one such specimen, found in the Göttingen herbarium during a recent trip. It settles the identity for a scientific name published in 1891, which has been obscure ever since. The author, a German botanist named Albert Peter, published 34 new scientific names in his account of the Convolvulaceae for the monumental encyclopaedic work, *Die Natürlichen Pflanzenfamilien (DNP)*. His descriptions were short and ambiguous, he did not cite any specimens he examined, and he often stated only a country where the species came from, making it virtually impossible to know today whether his species were genuinely new to science, or merely a redundant name for a species already known.

Patient searching through the entire collection of Convolvulaceae in Göttingen—four long days of sheet by sheet searching—located many specimens Mr Peter used in naming his new species. His handwritten pencil annotation on the left "*Ipomoea macrantha* n. sp." (meaning new species), links this specimen to the name published on page 31 of DNP. And it shows, conclusively, that the Peter name is illegitimate (the name *Ipomoea macrantha* had already been published twice before, for different species) and that the plant on the herbarium sheet is actually *Ipomoea setosa* Ker Gawler, named in 1818. Thus, Peter's name is redundant and it becomes a synonym of the earlier *Ipomoea setosa*. And the list of unresolved species names in *Ipomoea* is reduced by one.

This sort of detective work in the herbaria and libraries of Europe, UK, and the USA is vital to reconciling the large number of redundant names already in existence for tropical plants, which in turn clears the way for more efficient naming of species. What makes this possible today (where it wasn't even imaginable for taxonomists before now) is the ease and speed with which huge amounts of data can be stored, shared, and manipulated electronically—the new and rapidly developing field of *bioinformatics*. The 21st century taxonomist has ready access to information technology solutions that were unthinkable to our forebears.
At last that one to one correspondence between names and species is attainable. Once we get the backlog of old names reconciled and the data stored electronically so that any botanist, anywhere, can access it quickly and freely, we will have made a huge step forward in preparing a biodiversity inventory for one family (Convolvulaceae) of tropical plants, and we will know, at last, exactly how many species it comprises. And that, in turn, will mean it won't be necessary for taxonomists of the future to travel so far to gather information, because they will have it all available electronically at their fingertips. Today's travel makes tomorrow's travel, well—redundant.

George Staples
Herbarium

Prof Robin Moore and Dr Nila Cosco sharing their expertise in outdoor childhood education during the conference at Singapore Polytechnic.

'GO OUT AND LEARN'

Ministry of Education Kindergarten Conference 2010

On 3 and 4 June 2010, the Gardens Education Branch participated in the Ministry of Education (MOE) Kindergarten Conference 2010 through organising and providing two sessions of Teacher Training Workshops at the Jacob Ballas Children's Garden (JBCG). Both workshops on 3 June 2010 were full, enjoying the participation of fifty kindergarten teachers who selected the JBCG as their Pre-Conference Learning Journey. Other partners in the Pre-Conference programme include Singapore Zoo, Bird Park and PCF Kindergartens.

On the day of the MOE Kindergarten Conference (4 June 2010), we supported the event through setting up a booth at Singapore Polytechnic to inform kindergarten teachers about the various types of outdoor activities and educational programmes offered in both the Gardens and JBCG. This attracted much attention from many kindergarten teachers who were keen and enthusiastic to learn the different ways and approaches to bring their classrooms outdoors.

We would like to thank the Ministry of Education for offering us this great opportunity to participate in the conference and to share with kindergarten teachers the many fun and creative ways for their students to 'Go Out & Learn!'

Sharing information with kindergarten teachers about educational programmes offered by the Gardens and Parks during the conference at Singapore Polytechnic.

Winnie Wong
Education
Photos by Paul Chin

THE GINGER GARDEN

The Ginger Garden
by Jana Leong-Škorničkova & Dina Gallick

Published in July 2010 by the National Parks Board. Price, $9.50. Available in the Library Shop and Gardens Shop, Singapore Botanic Gardens

The Ginger family has a long and distinguished history of research and horticulture at the Gardens, where the Ginger Garden itself is a much loved area. Hence this book is a natural and welcome addition to the pictorial pocket guide series covering the Gardens.

It begins with a brief introduction to the Ginger Garden, describing the structure of the planting which is based on a geographical scheme. This is illustrated in a colour-coded map at the back of the book. Then, the volume dives in to nine pages covering the biogeography, pollination and reproduction of the Zingiberales, the Ginger order.

The contribution of the Gardens to this knowledge is highlighted at the end of this section where quotes from previous directors regarding this fascinating group of plants are given. The contribution of gingers to our food, health, culture and religion is spread over twenty pages. This is presented, as is the bulk of the book, in a picture-dominant text-light style, which makes for an enjoyable and accessible read. The uses of these plants are many and varied; imagine life without ginger, galangal, cardamom, turmeric or bananas! Hence the title of this book is a slight understatement. The authors could well have chosen to call it Everything You Wanted To Know About Gingers But Were Afraid To Ask.

Then follows portraits of the eight families of the ginger order: Cannaceae, Costaceae, Heliconiaceae, Lowiaceae, Marantaceae, Musaceae, Strelitziaceae and Zingiberaceae. Each family is colour coded (nicely matched in the index) and has a potted history and a list of characters which are useful for identification. An interesting addition is the etymology of the names for each family, at least some of which are familiar to most of us, but did you know *Helconia* is named after Mount Helicon in Greece where the Muses are supposed to have lived? For each family, the species in cultivation in the Ginger Garden are beautifully photographed, and presented with information on their common names, distribution and flowering. And if you still needed a further enticement to go and visit, there is a brief illustrated guide to the birds you may see whilst there, such as sunbirds and spider hunters.

As the plants are colour coded by family rather than geographic origin, the location of the plants in the Ginger Garden might not be immediately apparent. However, the geographic origin for each species is listed in the text, which allows you to locate the correct area on the Ginger Garden map. In any case, browsing through this delightful area of the Gardens when you have this guide in your hand is no hardship. Indeed, the fact that all of the species photographs were taken within a two year period in the Ginger Garden is truly remarkable, and once I read this I was spurred to immediately go and have a look myself! I am sure this will happen to everyone who picks up this delightful book.

Mark Hughes
Research Associate

BOTANICAL RESEARCH FELLOWS IN THE GARDENS 2009 – 2010

Dr. Wayne C. Rosing (1– 21 March 2009) from Middle Tennessee State University, USA, came to study, for the first time ever, the biodiversity of the plasmodial slime molds of Singapore. During his visit, he delivered a public talk at the Gardens entitled "An introduction to forest Myxomycetes of Southeast Asia", and gave lectures in a special workshop "An introduction to the Myxomycetes/Myxogastrids: collection, specimen preparation and classification" (see *Gardenwise* 33 (2009) 20). He also conducted two guided walks for the public and staff. The walks were a definite hit with a total of 27 participants. He did numerous field trips throughout Singapore (off-shore islands included) with the goal of increasing the information on the local Myxomycete flora and making collections. A total of one hundred and fifty specimens (representing 41 species) were collected, dried, freeze-fumigated, identified, and deposited at SING.

Dr. Somran Suddee (11 – 26 June 2009) from the Forest Herbarium, Bangkok, Thailand was here to study subfamily Vanilloideae (Orchidaceae) and Subfamily Symphorematoideae (Lamiaceae) of Thailand. He placed his determinations on 289 sheets of specimens, of which, 180 sheets were from three genera, *Congea*, *Symphorema* and *Sphenodesme*, which constitute the subfamily Symphorematoideae, endemic to South East Asia and Australia.

Mdm Florfe M. Acma (5 – 18 August 2009) is from the University of the Philippines at Los Banos. She is currently working on her PhD dissertation focusing on the genus *Amomum* (Zingiberaceae) in the Philippines. Whilst here on a SBG Research Fellowship, she took the opportunity to find rare literature from our Gardens' library, examine the type specimens of the genus *Amomum*, and made copies of some of the rare literature held at the newly established Asian Zingiberaceae Information Center (AZIC). Mdm Acma also consulted with Dr. Jana Leong-Škorničková, our resident Ginger expert, on her taxonomic study of Philippine *Amomum* and nomenclatural issues of several historical names. She donated 16 sheets of *Amomum* collected from Mindanao Island in the Philippines to the SING Herbarium. Seeds of 3 *Amomum* species were also given to the Gardens' living collection.

Dr. Barry J. Conn from National Herbarium of New South Wales, Australia and **Dr. Julisasi Tri Hadiah** from Bogor Botanic Garden, Indonesia (15 June – 7 July 2009) are two long time collaborators working on the Urticaceae (Stinging Nettle family) of Malaysia. Their stay at SING as SBG Research Fellows enabled them to study the type material of *Elatostema subscabrum* held at SING. While here they selected the lectotype for this species. A manuscript "Lectotypification of *Elatostema subscabrum* H.Schroet. (Urticaceae)" by both of them has been submitted to *Gardens' Bulletin Singapore* for publication. They have since prepared a draft manuscript the Urticaceae occurring in Malaysia, including Sabah and Sarawak, with 17 genera and twice as many species recognised than before. Barry and Juli curated a total of 1218 sheets of SING specimens in the family Urticaceae.

The Singapore Herbarium (SING) houses a huge collection of Malesian plant specimens that are of great regional importance for plant biodiversity research. The collection is being actively added to at present but also includes a large proportion of historical material which is particularly type rich. The Singapore Botanic Gardens (SBG) offers several grants annually to botanists to carry out research at the herbarium as SBG Research Fellows. Research Fellows are also asked to give public lectures to share their wealth of knowledge in an area of their expertise.

Dr. Rhett D. Harrison
(November – December 2009) from Xishuangbanna Tropical Botanical Garden, China was here for four weeks. As part of the Flora of Peninsular Malaysia project, he revised the fig species of Peninsular Malaysia and Borneo. SING holds a large number of specimens of Malesian *Ficus* species amounting to over 5000 sheets. Whilst at SING, Rhett curated over 416 specimens and gave a talk on the biosystematics of fig species and their wasp pollinators in Southeast Asia.

Dr. Lesley C. Lubos
(25 January – 13 February 2010) is from Liceo de Cagayan University in the Philippines. He spent three weeks as an SBG Research Fellow, which allowed him to access bryological literature resources not found at his University and personal libraries in the Philippines. At the Herbarium, he worked in collaboration with Dr Benito Tan, our resident Bryologist. As a result, he identified 37 species of Camiguin mosses belonging to 24 genera. He also identified two new species records for the Philippines, 10 new species records for Mindanao, and 19 new species records for Camiguin Island. Lesley gifted the herbarium with 75 packets of Philippine mosses collected from Camiguin Island to add to our bryophyte collection.

Ms. Eliška Záveská
(9 February – 8 March 2010) is pursuing her PhD at Charles University in Prague, the Czech Republic. Eliška studies the evolution and polyploidy of the ginger genus *Curcuma*. Working in collaboration with Dr. Jana Leong-Škorničková, she examined and photographed the floral parts from our entire *Curcuma* spirit collection at SING. She then analysed the images with the methods of geometric morphometrics – a powerful tool for the study of shape changes based on mathematical descriptions and modeling – to gain insights into morphological variability of the *Curcuma* anthers. While in Singapore, she also collected leaf samples for molecular study from our *Curcuma* living collections. Her studies aim to shed light on the problematic questions of allopolyploidization and hybridization in *Curcuma* species. During her visit, Eliška gave a presentation '*Curcuma* anthers: secret window to evolution?' at the Gardens' talk series.

Mr Tran Huu Dang
(28 February – 28 March 2009) from Vietnam National University in Ho Chi Minh City made his visit to the Gardens to examine Zingiberaceae specimens for preparation of a book chapter entitled "Gingers of Cambodia, Laos and Vietnam". He timed his visit to coincide with that of Ms. Eliška Záveská (see above) to allow him to learn the basics of geometric morphometrics and microscope photography techniques from her. Dang is a thesis student supervised by Dr. Jana Leong-Škorničková from the Gardens . He also studied the large living collection of Indochinese Zingiberaceae collected in 2008 and 2009 and grown at the Gardens, and together with Dr. Jana, prepared a manuscript of a new species of *Curcuma* collected in Vietnam 2008 for publication in new issue of *Garden's Bulletin Singapore*.

Benito C. Tan
Serena Lee
Herbarium

THE BULLOCK'S EYES

Secluded in the dense planting around Lawn B (near the Botany Centre), an interesting plant species, *Firmiana malayana*, native to Peninsular Malaysia, Borneo, Java and Sumatra, can be found thriving.

This species is commonly known in this region as *mata lembu* or bullock's eyes. This rather amusing vernacular name may have been derived from the appearanceof the fruits and seeds.

Firmiana is now considered to belong to Malvaceae (hibiscus family), when formerly it was classified in the Sterculiaceae. The generic name *Firmiana* honours Count Karl Joseph von Firmian (1716-1782), an Austrian Governor of Lombardy and a patron of science. The species name *malayana* alludes to Malaya where the plant was discovered. There is only one species of *Firmiana* in Malaysia. In total there are about 15 species of *Firmiana* distributed in E. Africa, India, southern China to Malesia and the Pacific Islands. This species is usually found growing near riverbanks, forest fringes and open forest in the lowlands as well as highlands up to 1200 m.

Bullock's eyes is a deciduous tree that can grow up to 24 m tall. It has beautiful large simple leaves with a heart shaped base and are frequently shallowly trilobed on young trees. The leaves have long stalks that are about 10 - 20 cm. The trunk has been used as timber but is not of a high quality. The thick and juicy bark contains peculiar pockets of gum that sometimes attract boring beetles.

In flower this tree makes a rather attractive sight. In its native home the tree is deciduous after a dry spell and remains bare for 6 to 8 weeks. During this period, it transforms itself from a bare skeletal tree to a gaudy living coral when the flowers develop and display a vivid, velvety, coral-orange mass on the scrawny twigs. On closer inspection, these flowers are tubular, petal-less, and scurfy to the touch and are held in stiff, erect clusters, recalling the closely related *Brachychiton*. The coral-orange calyx which makes up the tubular structure of the flower is about 3 to 4 cm long with five teeth and is curiously pinkish inside. The interesting-looking fruits that develop from the flowers are papery, pale brownish, beautifully veined, boat-shaped follicles with slender stalks. The fruits are about 8 –10 cm in size. There are usually 1 to 2 pale brown seeds attached to the margins of the fruits. The fruits take about 4 to 5 weeks to develop and so the reproduction of the tree is completed before the new leaves appear. These ripe fruits spin rapidly as they are blown off the tree and may travel distances of 100 – 180 m away, a pretty impressive dispersal ability.

The trees in the Gardens are not fully mature but have displayed a few clusters of flowers during the recent dry spell and so we may have to wait awhile before we see the fruits. It also remains to be seen if the tree would be completely deciduous in Singapore, a prerequisite for massive blooming.

Top:
The scurfy coral-orange tubular flowers of *Firmiania malayana.*

Inset:
The lovely trilobed leaves of a young bullock's eyes.

Bottom:
Young trees growing in Lawn B.

Nura Abdul Karim
Living Collections
Photos by N.A. Karim

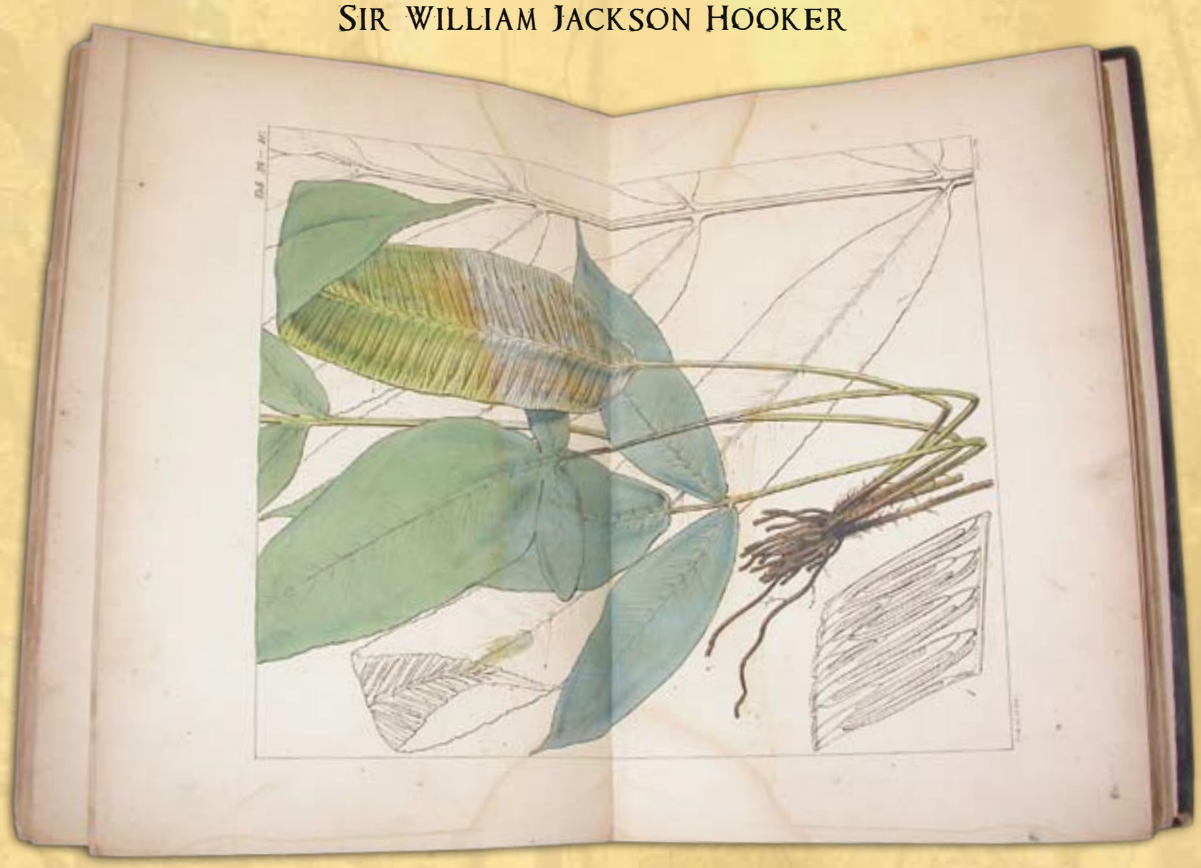
KEY VISITORS TO THE GARDENS (JANUARY-JUNE 2010)

Mr Akira Kiyota	Chairman of Daiwa Securities Group, Japan
Mr Aldrich Richard	Universiti Kebangsaan Malaysia, Malaysia
Ms Beatriz Corredor Sierra	Minister of Housing, Spain
Mr Carl E. Lewis	Director of Fairchild Tropical Botanic Garden, Miami, Florida, United States of America
Ms Chang Mei-Yao	Mayor of Niaosong Township, Taipei, Taiwan
Dr Charles Clarke	Lecturer, Monash University, Malaysia
Mr Cheung Yu-Sang Alex	Leisure Services Manager, (Trees/Landscapes), Hong Kong
Mr Cui Ji	President, Zhoushan Planning Achitecture Design Research Institute, Zejiang Province, People's Republic of China
Ms Eliška Záveská	Charles University, Czech Republic
HE Emomali Rahmon	President of the Republic of Tajikistan
Mr Fuse Kentaro	Counselor, Chiba Prefectural Assembly, Japan
Professor He Xiao Di	Director of the Landscape Design and Tourism Planning Institute of Yangzhou University, People's Republic of China
Mr Houssein M. Ali	Universiti Kebangsaan Malaysia, Malaysia
HM King Letsie III	Lesotho
Dr Kitichate Sridith	Prince of Songkla University, Thailand
Former Secretary-General, United Nations Kofi Annan	Ghana
Ms Kwek Mei Jiun	Universiti Kebangsaan Malaysia, Malaysia
Mr Lech Walesa	Former President of Republic of Poland
Prime Minister Lee Hsien Loong	Singapore
Dr Lesley Lubos	Liceo de Cagayan University, Philippines
Dr Mahmud Hj Yussof	Deputy Director at Forestry Department, Ministy of Industry and Primary Resourses, Brunei
Mr/Mrs Michel Destot	Mayor of Grenoble, France
Mr Narin Printarakul	Chiang Mai University, Thailand
HRH Pengiran Isteri Azrinaz Mazhar	Brunei
Associate Professor Promchit	Head of Department of Pharmaceutical Botany, Thailand
Mr Sandy Riz	General Manager, Planning and Property Services for the Land Corporation, South Australia
Mr Stephen Forbes	Executive Director, Botanic Gardens of Adelaide, Australia
HE Susilo Bambang Yudhoyono	President, Republic of Indonesia
Mr Trần Hữu Đẳng	Vietnam National University, Vietnam
Mr Wen Rikun	Chairman, Housing, Urban and Rural Construstion Bureau of Haikou, People's Republic of China

NATIONAL PARKS NParks' Publication

CENTURY OF FERNS

Sir William Jackson Hooker



Published in 1854, this five centimetres thick book is the tenth and last "*Icones PLantarum*" – an extensive series of published volumes of botanical illustrations initiated by Sir William Jackson Hooker.

The subtitle states that this is a documentation of "one hundred new or rare or Imperfectly Known Species of Ferns". The simple catalogue format throughout features personal commentaries by the author with detailed, full-coloured botanical illustrations of each specimen.

Sir William Jackson Hooker was appointed the first director of the Royal Botanic Gardens Kew in 1840. A leading authority of his time on ferns, he founded famous establishments including the Herbarium & Library, Palm House and the Museum of Economic Botany at Kew. Succeeding him as the director of Kew was his equally brilliant son Joseph Hooker. Father and son are fondly remembered by many as "the Hookers of Kew". Among his many works are *British Jungermanniae* (1816), *Flora Scotica* (1821), *British Flora* (1830), and a number of works on ferns, including *Genera Filicum* (1838), *Species Filicum* (5 vol., 1846-64), and *Synopsis Filicum* (1868).

Sir William Hooker's fervent pursuit in the study of ferns is most evidential in this volume as he wrote: "…it was the want of such Fern-figures, as helps to a more thorough knowledge of these lovely plants, that induced us to devote the whole of the last volume (the Tenth) of our "Icones Plantarum" exclusively, to this Family…" This volume was so well-received that a subsequent publication titled "A Second Century of Ferns" soon followed.

The extensive foreign correspondence and excellent relationships that Hooker shared with institutions such as the foreign and colonial Offices - from the Fiji Islands to China, Japan, Borneo and tropical Africa - proved instrumental in the compilation of this book.

Margaret Tan
Library

Photos by Serena Lee