Gardenwise

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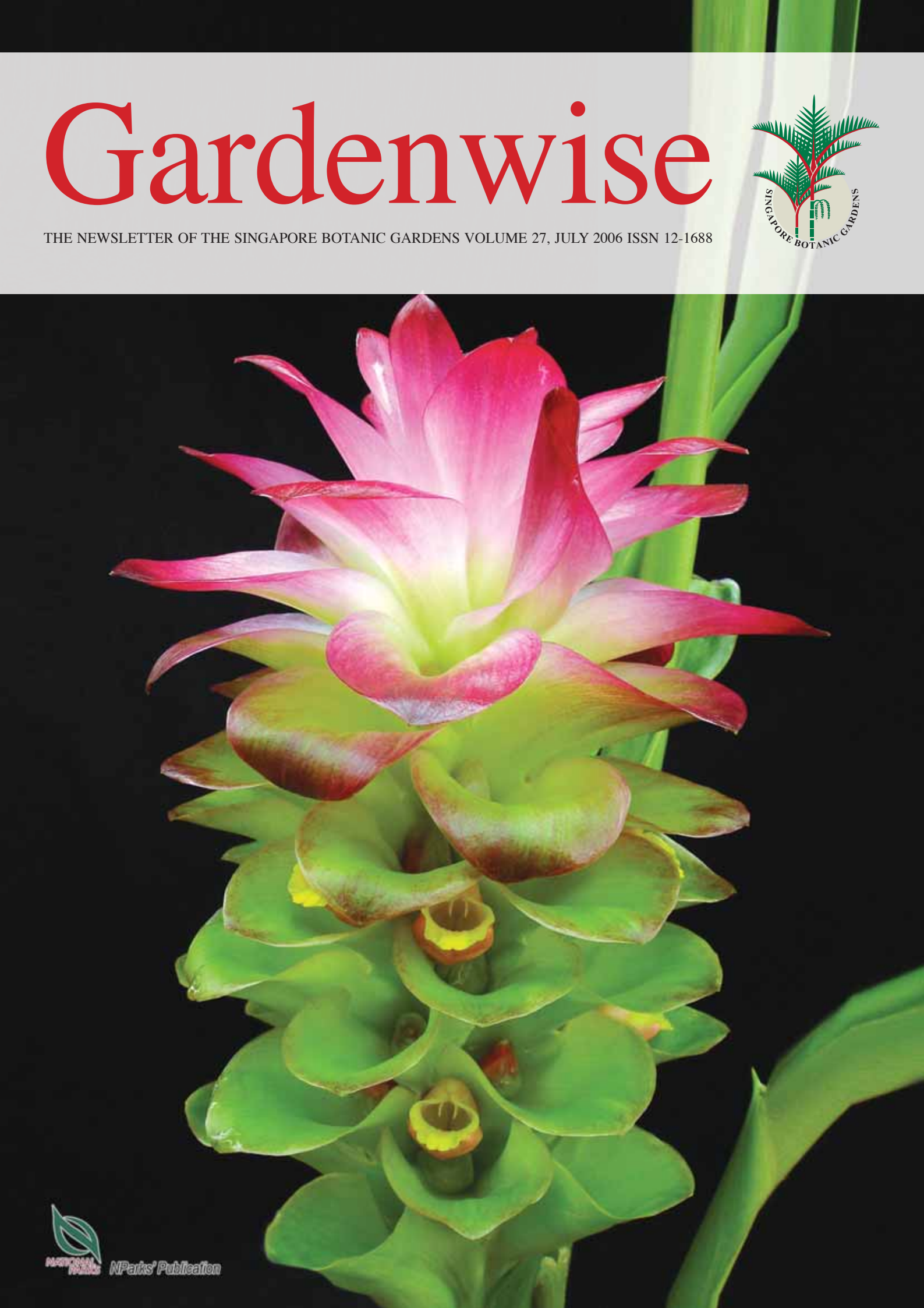

NParks' Publication

Contents

Front Cover:
Curcuma zanthorrhiza

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Message from the Director

This has been an unusually challenging year for all of us in the Gardens. On 15th February, Dr Tan Wee Kiat stepped down as Chief Executive of the National Parks Board (NParks) and Executive Director of the Gardens after two decades of leading the rejuvenation of the Gardens. Mr Ng Lang took his place as Chief Executive. Dr Tan remains very much involved, as advisor to NParks and as Director of the 'Gardens by the Bay' project, as well as chair of the organizing committee for the inaugural Singapore Garden Festival.

The stretchable completion date of the Tanglin Core redevelopment project continued to stretch, with the many 'finishing touches' that needed close attention, increasing. Finally on 8th May we started the phased move to our new premises, the Botany Centre, though it was still unfinished and behind hoardings. Phone, water and electricity were unreliable but at least we were on site daily to 'keep an eye'. Packing the herbarium, library and the laboratories was a massive task taking many weeks. We finally moved the last box at the end of August. In all, more than 14,000 boxes were moved.

Dr Lim-Ho and her team worked very hard planning and executing the many phases of the move, dealing with delays and unexpected postponements as promised completion of the respective premises were not delivered time and again. Alan Tan together with the development team often worked long into the night trying to meet tight deadlines for various phases of the planting works.

Others rushed to complete the outdoor hardscapes as well as the buildings, in particular the basement car park and the food centre, both of which had been leased out and faced commercial urgencies of time.

Simultaneously, the Gardens' team worked on organizing the 4th International Ginger Symposium scheduled to be held at the Botany Centre's new Function Hall from 3rd – 6th July. They continually tried to push for completion of the premises in the midst of packing, unpacking, planning and organising while worrying all the time that the premises will not be ready. In the end, the premises were not fully ready, the food centre and car park were not opened, and the air conditioning failed on the opening morning of the symposium. But despite the physical misgivings, the symposium was a resounding success thanks to good organisation and our 180 participants from 19 countries who ensured a good mix of papers and posters and a lively discussion. The facilities at our premises attracted much interest and admiration.

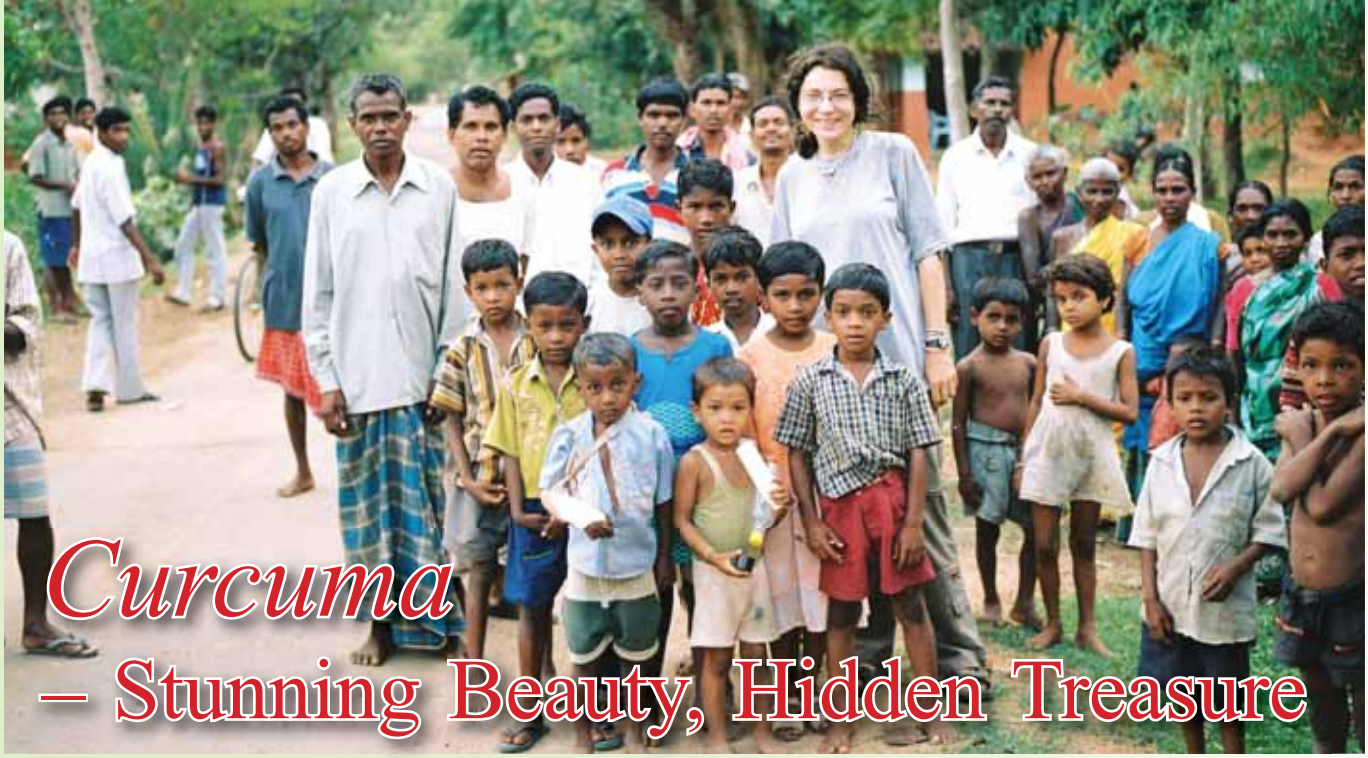
Also in July, we implemented charged parking for the first time in the Gardens' long history when the new basement car park providing 234 lots at the Botany Centre was ready, giving us a total of about 700 lots in the Gardens. The initial emotional outburst from some visitors was predictable and understandable.

Before the excitement from the Symposium and implementation of charged parking was over, staff were already preparing and rehearsing to deliver our Ministry's National Day Observance Ceremony on the 8th August, with the traditional Botanic Gardens' quality. Others were also busy with organizing the Singapore Garden Festival where the tempo of work is increasing with its December date drawing ever closer. The amazingly wide ranging work involved details of site design and landscape to logistics, publicity, working with garden designers from around the world and local contractors, selling of tickets and the retail booths, to fund raising.

The popularity of the Botany Centre, despite its teething problems, augurs well for the Gardens. It will be a hub for learning and research, formal and informal exchanges and sharing between professionals in horticulture, botany and landscape. The Centre will be where the science behind the Gardens interfaces with the public.

I would like to thank all my colleagues in the Gardens for their humour and hard work and in particular Dr Wong Wei Har, for directing the operations and keeping everything in order.

Chin See Chung



Curcuma – Stunning Beauty, Hidden Treasure

Jana in one of her many collection trips in India

Since time immemorial, species of the genus *Curcuma* (Zingiberaceae) have been used in medicine, religious rituals, food and as a dye. It is reported that there are about 80 to 120 species of *Curcuma.* They are native to tropical Asia, especially in areas with a monsoonal climate, with a few species extending to China, Australia and the South Pacific. Many species can also be found cultivated for their economic uses or as ornamental plants.

What are Curcumas?

Curcumas are perennial rhizomatous herbs. Their leafy shoots die back during the dry period in monsoonal areas. Most of them are medium-sized plants about 0.5–1.5 m tall. The smallest species, *Curcuma bhatii* or *C. gracillima*, are only about 10–20 cm, but the genus has some real giants like *C. latifolia* or *C. zanthorrhiza*, which can easily reach 2–3.5 m.

The genus *Curcuma* can be easily distinguished from other ginger genera by their peculiar inflorescence. The inflorescence is formed by bracts fused at their sides to the neighbouring bracts, resulting in pouches. The bracts at the basal part of the inflorescence are called fertile bracts and each encloses 1–8 (rarely more) flowers, opening one after another. These

Curcuma bhatii, one of the smallest Curcumas

Jana with the large *Curcuma zanthorrhiza,* with close-up of the inflorescence

bracts are mostly green to white or some other less conspicuous colour. The upper part of the inflorescence (approximately one third) is made up of sterile bracts collectively called coma. These are usually bigger and brightly coloured serving to attract pollinators, mostly bees. A few species have no conspicuous coma bracts and all of their bracts are of a similar colour. These, however, have usually large showy flowers.

The conspicuous coma of *Curcuma prakasha*

Curcuma mutabilis has no obvious coma, but mainly flowers

In most species, the stem is a pseudostem or 'false stem' formed by closely embracing leaf sheaths. The lamina or leaf blade is usually long and oval-shaped, rarely linear, bright to deep green above and usually paler green beneath. Some species have a beautiful red patch on the upper side of the lamina, which in some is also visible beneath.

Curcuma aeruginosa, with the red patch on its leaf blade

Underground Treasures

All curcumas hide their treasures underground. This refers to their rhizomes, which help them to survive dry periods as well as to allow the plant to reproduce vegetatively. The rhizomes are usually light brown externally, but internally, they can be surprisingly colourful with different shades of yellow, blue to violet, orange, grey, cream or white. The end of the roots running from the rhizomes often bear ovoid tubers. These are not capable of sprouting, and their function is exclusively for the purpose of sustaining the plant during its dormant period when the leafy shoots dry up.

Taxonomic Puzzles

Sadly, the botanical identity of many *Curcuma* species is still unclear, especially those described in the 18th and 19th Century. Many species look similar and in addition, they may hybridise naturally. As it is difficult to make good preserved specimens of the very delicate floral parts, living flowering plant materials need to be studied. Scientific names mentioned in many publications or used in the horticultural trade are rarely attached to the correct plants. Even the names of the commonly cultivated *Curcuma* species like *C. longa*, *C. aromatica* or *C. zedoaria* are often misapplied on several similar looking, yet different taxa.

Inflorescence of Turmeric (*Curcuma longa*)

Curcuma caesia, its inflorescence and the stunningly blue rhizomes

Rhizome of Turmeric (*Curcuma longa*)

Yellow, Yellow, Yellow…

The root of the Latin name *Curcuma* goes back to the Arabic word *'kurkum'*, which originally referred to Saffron, but now is used for Turmeric, *Curcuma longa*, only. There is also connection to Biblic Hebrew word *'karkom'* which also means saffron. The connection between these two plants is apparent, as Saffron and Turmeric were the best-known yellow dye-yielding plants in the Ancient World suitable for dying clothes, food and various fibre. No surprise then that Turmeric is often called as Indian Saffron in several languages. It is interesting to note, that the yellow colour has been reflected also in most of the common names of Turmeric not only in Asia, example *Haldi* (Hindi), *Manjal* (Tamil), *Kunyit* (Malay), which all mean literally yellow, but also in many European languages; example *Žlutý kořen* (Czech; = yellow root), *Gelbwurz* (German; = yellow spice) or *Keltajuuri* (Finnish; = yellow root).

Sacred Turmeric

In Indian folk customs, Turmeric plays an important role literally from childbirth till death. Tamil women traditionally use it after delivery, in bathing rituals as well as in soups or specially prepared medicines to support quick recovery. Hindus of central India have a ritual of burying umbilical cord of newborn baby

Turmeric, as dried rhizome or powdered form

together with turmeric. In some parts of South India, when a girl undergoes her first menstruation, she is given a massage using Turmeric followed by an elaborate bath. Marriage invitations in Bengal are often stamped with freshly cut turmeric rhizome. Tribal people in central India cuts a rhizome when the girl leaves her parent's house after marriage, a ritual meant to represent cutting roots with her own family. Another tribe of central India, the Mundas, places slices of Turmeric over the graves of close relatives.

Due to the strong antiseptic properties, Turmeric is also one of the commonest home remedies for cuts, bruises and various skin disorders. In India, it can be found growing in almost every homeyard.

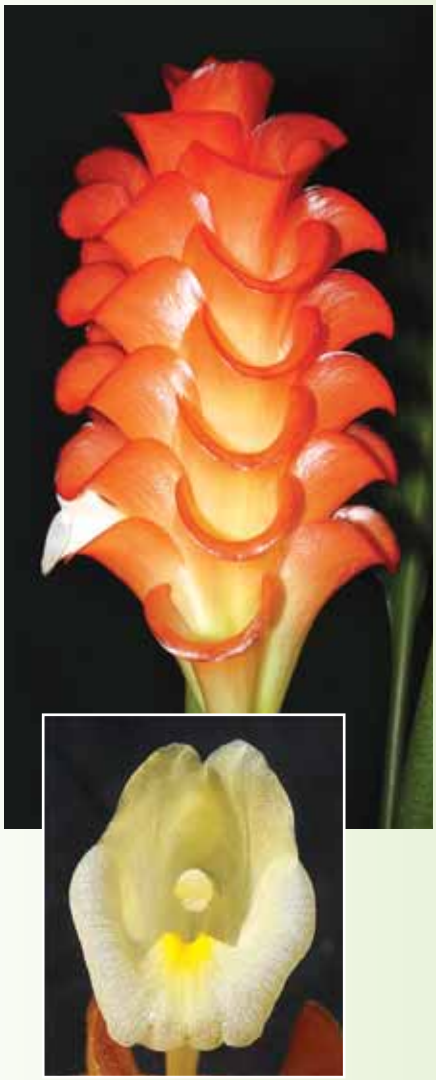
Beauty Queens

Several *Curcuma* species are stunningly beautiful inspite of their rather inconspicuous fragile flowers, which last no more than several hours. The brightly-coloured bracts are longer lasting and thanks to them Curcumas have earned their place in the horticultural trade as garden and potted plants, or even as cut flowers.

The Siam Tulip (*Curcuma alismatifolia*) is one of the species that has caused a stir. Its long inflorescence with huge coma bracts reminds of Tulips and is available nowadays in various shades and variegations from pure white to deepest pink. Another interesting and widely produced species is called the 'Jewel of Burma' or 'Pride of Burma' (*C. roscoeana*). The whole inflorescence is strikingly red-orange and its bracts are arranged in neat rows. One of the most amazing Curcumas, *C. rhabdota*, has been described as new to science very recently (in the year 2000). Yet, this species was already available in the markets of Thailand for its ornamental value and has been known among horticulturists under the name 'Candy Cane'. There are many *Curcuma* species with great ornamental potential that have yet to be selected for the horticultural trade.

Curcuma alismatifolia

Koh Sin Lan



Curcuma roscoeana and close-up of its flower

The colourful *Curcuma rhabdota* and detail of the flower

Other Economically Important *Curcuma* Species

Apart from the true Turmeric, there are other commonly cultivated *Curcuma* species that greatly enhance the pot of curry or give a relief from various maladies. Commonly cultivated examples due to their aromatic rhizomes and medicinal properties include *C. zedoaria*, *C. aromatica* and *C. zanthorrhiza*, the latter sometimes being used as a substitute for Turmeric. Two species, the Indian *C. amada* and Indonesian *C. mangga*, possess the smell and aroma of unripe mangoes, and are perfect for vegetable pickles or curries. Rhizomes and root tubers of *C. angustifolia* and *C. pseudomontana* are boiled by tribal people in central India and eaten as a staple food during the periods when grain is scarce. The East Indian Arrowroot – easily digestable starch extracted from the rhizomes of several *Curcuma* species in India and Bangladesh – is used for preparations of various sweet meats, milkshakes, for feeding infants and as a health drink to support convalescence. It is also used for curing stomach disorders (especially dysentery) and part of common ayurvedic rejuvenating tonics. The young inflorescences of several species are boiled and eaten as a vegetable, while some *Curcuma* leaves make perfect wrappers for fresh meat and fish in local markets, or for baking fish to add a pleasant flavour.

Curcuma pseudomontana

Visit the **Ginger Garden** to see many other gingers and related plants.

Of the five colours, the red and yellow powder used in the South Indian temple art of Kalam are derived from Turmeric

Jana Škorničková
Charles University, Prague
Czech Republic,
now at Herbarium

Photos by Jana Škorničková, unless otherwise stated.
The author also acknowledges RBG Edinburgh, where some of the photos were taken

Orchids of Central and Southern Africa

(From www.nationalgeographic.com)

Map of Central and Southern Africa

African orchids are generally not very well known and are not among the most popular plants in cultivation. Few have large flowers in brilliant colours unlike some of their relatives in tropical America and Asia. Nevertheless, many epiphytic and terrestrial species there are fascinating with their often delicate blooms and deserve more attention from growers.

Vast areas of sub-Saharan Africa are covered in a vegetation type that is called **savanna** or woodland, and this is essentially a forest-grassland mix; that is grassland

Dry savanna landscape

with interspersed trees and shrubs. Such savannas may be arid or can also be situated in a very high-rainfall zone like the Miombo woodlands of central Africa. Humid areas like these woodlands are rich in both terrestrial and epiphytic orchids.

An orchid from a humid savanna

Another important vegetation type in central and southern Africa is the **grassland**, which is for example found in large parts of Drakensberg of South Africa, in much of Lesotho, in large areas of the Chimanimani Mountains in eastern Zimbabwe and on the Nyika Plateau in northern Malawi. Many of these grasslands are found at high altitude (above 1,000 m). Orchids here are terrestrial, but the forests in some of the gullies or gorges harbour many epiphytes too. The orchid flora of the grasslands is astoundingly diverse, and well-represented by the major African genera like *Disa, Satyrium, Holothrix, Habenaria, Brachycorythis, Corycium, Pterygodium* and *Disperis*.

Grassland landscape in Drakensberg

Corycium nigrescens (left) and *Disa ukingensis* (right), two orchids found in grasslands

Tropical and subtropical forests are found in the more humid parts of central Africa. In South Africa, the largest closed forest is found in the George-Knysna area of the southern Cape coast. Some other patches are located in the eastern and northern provinces of the country. Small patches of temperate forest are found in sheltered ravines in the Western Cape mountains. There are some terrestrial orchid species found in forests from the genera *Holothrix, Stenoglottis, Disperis, Huttonaea, Cynorkis, Brownleea, Nervilia, Liparis* and *Calanthe*. However, this is the vegetation type where most of the central and southern African epiphytic orchids are found, like from the genera *Bulbophyllum, Polystachya, Aerangis, Angraecum, Mystacidium, Cyrtorchis* and *Diaphananthe*. Many African epiphytic orchids have small or medium-sized, whitish, yellow or brownish flowers.

Orchids found in forested areas (clockwise L to R): *Cynorkis anacamptoides*, *Cyrtorchis arcuata* and *Mystacidium brayboniae*

A remarkable orchid flora has evolved in the southernmost parts of the African continent, the Cape Floristic Region, which is the area of highest orchid diversity in southern Africa. The region is rather mountainous with a Mediterranean-type climate - cool, rainy winters and hot, dry summers. Fog is common throughout the year in high-lying areas. The dominating vegetation of the region is an evergreen, shrub-land called **fynbos** where the plants are drought-resistant and often with stiff and thorny leaves.

Fynbos region

A high-altitude fynbos region

Oscar Kurze

Disa venosa, a fynbos orchid with a fringed lip

An interesting aspect of the Cape orchids is that their flowering is strongly stimulated by previous veld fires - some species flower exclusively within the year after such fire, which may be only every 40 years!

Disa racemosa and *Pachites bodkinii* are two orchids in the fynbos region whose flowering is stimulated by fire

Around 200 orchid species found here are terrestrial and have attracted the attention of nature-lovers ever since these plants became known. Many are curious because of their complex and intriguing pollination mechanisms,

which are still not fully understood. The South African Red Disa (*Disa uniflora*) is widely admired for its large, brilliant red or orange flowers - among the largest in the terrestrial orchids of the world.

Disa uniflora

The South African orchid subtribe Coryciinae is well known for its strange and extremely complicated flowers. Its flower parts are twisted and variously fused to each other to such an extent that they often give the flower a somewhat bizarre look. In some cases, it is hard to see that this plant belongs to the orchid family!

Disperis circumflexa (left) and *Pterygodium acutifolium* (right), two orchids from the subtribe Coryciinae

The two largest orchid genera in Africa are *Disa* and *Satyrium*. Both are widespread on the entire African continent (*Satyrium* also thrives into temperate and subtropical Asia). Many other genera are endemic to small areas in the Cape only, including *Bartholina, Ceratandra, Evotella* and *Pachites*.

There are a number of specialised habitats in this fynbos, each with its characteristic orchid flora. An interesting one is the rock flushes where orchids grow in moist or even dripping-wet mossy sandstone rocks and cliffs. Five *Disa* species in this fynbos region are only found on the edges of perennial mountain streams.

Disa rosea grows on mossy rock ledges

Disa cardinalis found growing near a stream

A few of the large Southeast Asian genera are well represented in the subtropical parts of this African region, for example *Habenaria*, *Nervilia, Eulophia* and *Bulbophyllum*. However, the affinities of Southeast Asian genera to the fynbos region are very weak. Only one species of *Liparis* and five of *Eulophia* are represented here.

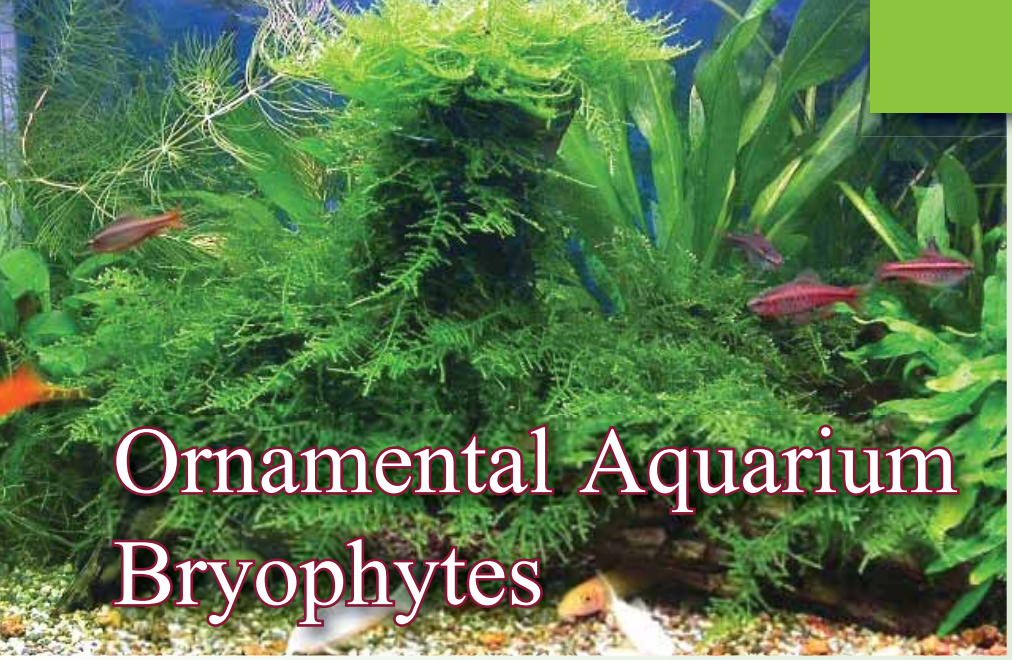
Eulophia tabularis from the fynbos region

Satyrium hallackii ssp. *hallackii*

Bartholina burmanniana

Hubert Kurzweil
Herbarium

Photos by Hubert Kurzweil, unless otherwise stated



Ornamental Aquarium Bryophytes

Over the past five years, the popularity of growing decorative bryophytes in aquaria is gaining wide acceptance among hobbyists, aquarists and aquatic plant collectors, not just locally, but also worldwide.

Today, in Singapore, the number of moss species grown in small aquarium or large fish tank, both in private homes and at business offices, has increased from one, the well known Java Moss (*Taxiphyllum barbieri*), to at least five other tropical moss species, namely, the Christmas Moss (*Vesicularia montagnei*), Singapore Moss (*Vesicularia dubyana*), Erect Moss (*Vesicularia reticulata*), Taiwan Moss (*Taxiphyllum* sp., possibly *T. alternans*), and Weeping Mosses (*Vesicularia* sp., possibly *V. ferriei*). Except for the last two mentioned mosses, the first three are common in wet places in Singapore and Southeast Asia.

Claudia King

Taiwan Moss

One can add to the list four other equally popular aquarium liverworts, namely *Riccia fluitans*, *Monoselenium tenerum*, *Riccardia* sp. and *Pellia* sp. These liverworts are a group of plants closely related to mosses, but have a thalloid body.

The preference for growing aquarium mosses over the many species of aquatic flowering plants lies in the ease of keeping alive the bryophytes in water, and also in their aesthetically verdant to light green and finely branching plant habits. With the creation of water current using a pump and the installation of artificial illumination, the immersed moss populations grow rather fast and, within months, can blanket driftwood and rock pieces placed inside the tank. On a bright day, the formation of thousands of tiny air bubbles at the tip of the branchlets of the plant population, called "bubbling" or "pearling" by the aquarists, creates a fascinating and beautiful scene to behold and appreciate.

In recent years, aquarium mosses of exotic origin, such as the temperate species of *Fontinalis, Amblystegium, Leptodictyum* and *Fissidens*, have also found their way to several aquaria and commercial shops in Singapore. A vivacious population of *Fontinalis antipyretica* is on display in a large and beautifully decorated tank labelled "Photosynthesis" set up at the Maritime and Alcove area in the Singapore Science Centre.

The temperate moss, *Fontinalis* sp., growing locally in aquariums and demonstrating pearling

In local aquarium plant and fish shops, the current market price for the common aquarium moss, Java Moss, is about S$5 for a small amount of plant materials placed inside a 10 x 10 cm plastic bag. Other tropical mosses, such as Singapore Moss, Christmas Moss and Erect Moss, are sold locally at about S$10 per unit of metal mesh or plastic bag measuring 15 x 10 cm. But the exotic species, depending on the rarity of supply in the market, will command a much higher price for the same amount of plant materials, ranging from S$50 to S$100.

We were told once by a fish shop owner at Marine Parade that he had sold an aquarium set up with a piece of large-sized driftwood completely overgrown with Christmas Moss for a thousand Singapore dollars!

It goes without saying that the growing of exotic aquarium mosses of temperate origin is more challenging in Singapore. A water temperature of 2–3 degrees Centigrade lower is required to make these temperate moss species feel at home.

A survey conducted by one of us (Q.L. Chan) documented that in the year 2003, Singapore imported about 5–10 kg of Java Moss from Thailand for sale to local consumers. In the same year, Singapore exported a significantly larger quantity of locally farmed aquarium bryophytes of various species worth about S$100,000, to Europe, Japan, USA and Canada. This amount of business transaction does not include the individual sales of home grown aquarium mosses posted by local growers over the internet.

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The authors are grateful to Mr Loh Kwek Leong (webmaster of Killies.com) for his comments of the manuscript and for the photos used in this article.

Conservation and Reintroduction of Singapore's Native Orchids to Pulau Ubin

The small island of Singapore (about 700 km^2) used to be the home of a large number of orchid species. This diversity was due to the existence of a wide range of habitats and the favourable equatorial climate. However, owing to habitat destruction, more than 90% of the 221 species of native orchids are endangered, vulnerable, rare, or extinct. This estimate is based on lists in a preliminary report on the conservation status of plants native to Singapore.

Neuwiedia veratrifolia flowered beautifully in Pulau Ubin

Vanilla griffithii growing profusely in its natural habitat

Close-up of flowers of *Thrixspermum amplexicaule*

The Gardens initiated an orchid conservation programme to find ways and means to conserve the germplasm of native orchids and to propagate them for subsequent reintroduction into appropriate habitats in nature reserves, parks and on roadside trees.

Pulau Ubin, the name literally means Granite Island, is situated just off the northeastern corner of mainland Singapore. The 1,020-hectare island consists largely of a series of undulating, granite hills. Much of the original vegetation was cleared for the cultivation of rubber and crops like coffee, pineapple, coconut and jasmine. Today, we can still see the remains of old granite quarries, surrounded by secondary forests and grasslands.

Many orchids were found at Pulau Ubin. According to the Gardens' herbarium records, the following species grew on the island: *Spathoglottis plicata, Corymborkis veratrifolia*, *Neuwiedia veratrifolia, Eulophia graminea, Vanilla griffithii, Thrixspermum calceolus, Zeuxine clandestina, Thrixspermum amplexicaule, Phalaenopsis cornucervi* and *Dendrobium crumenatum*. In addition, H.N. Ridley, the first director of the Gardens, recorded that species such as *Bulbophyllum medusae, Renanthera elongata* and *Grammatophyllum speciosum*, the tiger orchid, were also found on this island. Despite the change of habitat, several very interesting and pretty orchid species still occur there. They are *Vanilla griffithii, Eulophia squalida, Neuwiedia veratrifolia,* and *Thrixspermum amplexicaule*.

Grammatophyllum

The first species to be reintroduced was the tiger orchid, *Grammatophyllum speciosum*, in 1999. It last occurred naturally in Singapore in Pulau Ubin.

Seedlings of the tiger orchid were raised from seeds produced by self-pollinating a flowering plant at the Gardens. The reintroduction into Pulau Ubin was carried out from 1999 to 2004. The seedlings were affixed onto the larger trees including durian, rambutan, mango, angsana, tembusu, and rain trees.

These seedlings we planted have been growing for 2 to 7 years in their new homes. Except for plants affixed to trees which were removed due to development and a few plants which died, the majority are doing well. New shoots have developed, and roots are firmly established on tree trunks.

Several factors appear to play a major role in the survival of introduced seedlings. These include the microclimate of the area (relative humidity, for example), texture of the bark of host trees, presence of other epiphytes, and seedling size.

Seedlings planted in areas with high relative humidity tend to survive better

Reintroduced plants of *Grammatophyllum speciosum* have taken root and thrive extremely well in their new home

than those in drier areas. For example, seedlings established in a damp area inside a secondary forest are healthier and more vigorous than those growing near the sea where the breeze tends to dry the bark faster. Texture of the bark is important because certain barks tend to retain more moisture. For instance, rain trees are generally better hosts than tembusu. Trees that support more epiphytes tend to be better hosts than those with fewer epiphytes. It seems that if the conditions are suitable for other epiphytes, they also are more appropriate for *Grammatophyllum speciosum*. Seedlings that were bigger and older when they were planted tend to survive better than the smaller ones.

Bulbophyllum

In 2002 to 2004, two other native orchids, *Bulbophyllum vaginatum* and *B. membranaceum* were successfully propagated and reintroduced. Seeds of these species were collected from plants growing in their natural habitats elsewhere in Singapore. Seedlings were grown on culture media until they became 2–3 cm tall before being transferred to the nursery. Approximately ten seedlings were planted on fern-bark slabs measuring 7 cm by 5 cm and grown at the nursery for 6 months, until new shoots began to develop. Host trees were selected based on the same criteria used for reintroducing the tiger orchid. When a suitable tree is selected, fern-bark slabs with established seedlings were secured on the tree trunk by nails.

Bulbophyllum vaginatum flowered in June 2006

Bulbophyllum membranaceum has grown substantially since planting

Thus far, about 200 seedlings of *Bulbophyllum vaginatum* and *B. membranaceum* have been reintroduced. Except for those that are planted in area that are too shady, most seedlings have become established and are growing well. We have learned that these seedlings are best planted in areas with at least 50% shade to prevent scorching. It is very pleasing and encouraging to report that most of these seedlings have produced new shoots and new roots are growing onto the bark of the host tree. Several reintroduced seedlings of *B. vaginatum* have flowered.

Other Species

We have also collected seeds from three other species found in the island, *Thrixspermum amplexicaule*, *Eulophia squalida* and *Neuwiedia veratrifolia*. Seeds of the first two species have been germinated and seedlings will be sent to the nursery soon. Although seeds of *Neuwiedia veratrifolia* were sown, they have not germinated. We are still waiting for capsules of *Vanilla griffithii* to be formed.

Results in June 2006

Recently in June 2006, *Robiquetia spathulata* was discovered in Pulau Ubin. This interesting epiphyte was discovered by Park Ranger Mark Lim. It is growing on a *Vitex pinnata*, next to a Bird's Nest Fern. The plant is very strong, having one main stem and a few young shoots. It produced several inflorescences with numerous small but beautiful flowers.

The newly discovered *Robiquetia spathulata*

Seed capsules of *Robiquetia spathulata* formed 10 days after pollination

The species is distributed from Sikkim eastward through Indochina to Hainan, and south through Thailand to Sumatra, Java, Borneo and Halmahera. In Malaya it is found in many lowland locations. A search at the Gardens' herbarium shows that the species was recorded only once before in Singapore by Ridley. It was collected at Dalvey Road, near the Botanic Gardens. Although ants were seen around the flowers, they do not seem to be the pollinators as no capsules were found naturally. Since this is the only plant in Singapore, the flowers were self pollinated on 5th June 2006. It is very exciting to report that pollination was successful and several seed capsules have formed! We should be able to collect seeds and propagate this species for subsequent reintroduction.

Yam Tim Wing, Aung Thame
Orchid Breeding & Micropropagation

Robert Teo, Choi Yook Sau, Ali Ibrahim, Jacky Soh
Pulau Ubin

Photos by Yam Tim Wing

Addicted to Seeds

Monique with her fruit and seed arrangement

My husband works for an oil company and I have been lucky enough to follow him on his business trips. Over the years, I have visited 54 different countries and I enjoy discovering new people, new customs, new fauna and above all new flora.

I started gathering sea beans on the beach and pretty seeds from all over the world. When displayed in a large bowl, everybody would admire them and invariably ask, "There are so pretty. What are they?" A good question, but tricky to answer. There are countless books on flowers, plants and trees, but almost no literature on fruits and seeds.

After a dramatic display of beauty or intrigue to charm its pollinators, its flowers fade and the plant channels its energies into the growth of fruits and seeds. Plants show great creativity in developing chemical compounds, structure, gadgets and highly specialized devices that assure the protection and the dispersal of the seeds.

Proboscidea jussieuii (Pedaliaceae)

Terminalia calamansanai (Combretaceae)

Adenium obesum (Apocynaceae)

Barringtonia lanceolata (Lecythidaceae)

Elaeocarpus angustifolius (Elaeocarpaceae)

The Traveller's Tree, *Ravenala madagascariensis* (Strelitziaceae)

The gorgeous fan-shaped *Ravenala madagascariensis* is common in tropical gardens, and in Singapore, used as the logo for Raffles Hotel. Unfortunately, it seldom flowers here due to the ever wet conditions, but if you are lucky, one day you may see the huge inflorescence with flowers resembling those of *Strelitzia reginae*, the Bird-of-Paradise, followed by what looks like a bunch of woody bananas.

Each woody 3-lobed capsule splits open into three parts to reveal the black seeds clothed in a thin, glossy and magnificent electric blue tissue. The bright blue aril attracts many birds that eat the seeds. The plant is not usually propagated by seeds but by suckers that develop from the base.

Travellers are said to quench their thirst by drinking the water that collects in the leaf sheaths, but this is not so easy, even if you can reach it, the water leaks everywhere!

The Traveller's Tree is very particular about its orientation and is said to prefer growing in a north-south direction.

Ravenala madagascariensis and its inflorescence

Fruits

Fruits split open to show the bright blue aril surrounding the seeds

This is thought to be helpful to travellers and perhaps another reason for the tree's name. To be sure though, take your water with you plus a compass and GPS!

Nature gives us an astonishing diversity of fruits: berries, drupes, legumes, samaras, capsules, nuts, achenes, follicles …within these 'shrines' the precious seeds are protected and nicely packaged in fibre, cork, paper, jelly, juicy pulp or wax - often attractive to animals that help their dispersal. The fruits and seeds wait at just the right time to pop out before or after a short, long or very long journey. Every day billions of seeds invade the surface of our planet – in the form of parachutes and shuttlecocks that glide in the air, waterproof vessels or floating rafts that drift on the oceans, exploding mechanisms that propel themselves in the air, and – for the laziest which prefer hitchhiking – hooks or sticky hairs or small harpoons that cling onto animals or even our socks! Yet others are deposited by animals far and wide, after having consumed the tasty pulp around the seeds.

The seeds and fruits come in an endless variety of colours, shapes, sizes, and scents. They can be papery, leathery, woody, bony, winged, ridged, glossy, dull, smooth, rough, spiny, scaly or sticky. They are fascinating, useful and while some are poisonous, others are delicious. Can you imagine a day without rice, wheat, coffee, spices or even worse without chocolate?

Trapa spp. (Trapaceae)

Trapa spp. (most commonly called Water Caltrop) are aquatic plants anchored to the bottom of ponds by slender stems feeding a rosette of thick, bright green leaves. The leaves are triangular in shape with a saw-toothed margin and an inflated petiole to make them float. The plant is native to tropical Africa and Eurasia.

Trapa japonica, showing (from top in clockwise direction) the rosette leaves, a flower and fruit

Trapa bicornis, is available locally and eaten during the Chinese moon festival. The single white starchy seed inside the very hard black shell is toxic if eaten raw but edible once boiled or roasted. Certainly one of the most bizarre of edible fruits! It seems to be a double-sided, funny-faced creature with a big nose and two horns, looking like a bull, buffalo, goat, bat or even a devil!

Fruits of *Trapa bicornis*

Although sometimes useful, *Trapa* spp. have a dark side and can be a pest due to their invasiveness. The sharp horns can puncture tires, even impale animal's hooves or the sole of your shoe. The four-pointed *Trapa quadrispinosa* is particularly vicious. One of its points is always facing upward, so mind your feet or your tires! A metallic device similar in shape called a caltrop has been used since ancient times to cripple people, horses, or more recently military vehicles.

Trapa quadrispinosa

Monique Desvoyes
Bandar Seri Begawan, Brunei

Photos by Monique Desvoyes

Butterflies Through The Lens

The crystal-clear detail of a sapphire compound eye; the crisp colours of a beautifully patterned wing; the sharp rendition of an uncoiled proboscis sipping sweet nectar from a bloom – this is the secret world of butterfly photography.

The beauty and diversity of butterflies never fail to fascinate and capture the imagination of an ever-growing number of butterfly watchers and photographers around the globe.

Photographing butterflies is a challenging, but most satisfying pastime. A well-composed photograph of an exotic butterfly basking in the warm afternoon sunshine never fails to please our aesthetic senses. It is in the pursuit of a perfect shot of a butterfly in its natural environment that inspires and motivates the macro-photographer to enthusiastically seek out these gentle and harmless insects.

Singapore is blessed with over 270 species of butterflies. On our tiny "island in the sun", these colourful insects survive, and even thrive within a variety of habitats ranging from open grassy fields to shady forested areas.

This series of butterfly shots depicts the great diversity in shape, size and colour of these insects. It is hoped that in enjoying these photographs, more Singaporeans and visitors alike will appreciate the beauty of our tropical butterflies, and share in our joy of observing, photographing and conserving these "Flying Jewels".

Khew Sin Khoon
Butterfly Circle
(A photographic club)

Yellow Vein Lancer (*Pyroneura latoia latoia*)
Family : Hesperiidae
Sub-Family : Hesperiinae
The Yellow Vein Lancer is often found flying around flowering plants in secondary forests. The wings are dark brown above with yellow spots. Its name comes from its brightly coloured undersides, with its veins highlighted in yellow. Here, it was photographed feeding on the flowers of *Leea indica*.

Khew Sin Khoon

Dwarf Crow (*Euploea tulliolus ledereri*)
Family : Nymphalidae
Sub-Family : Danainae
The Dwarf Crow was a recently rediscovered species on Pulau Ubin. It is seasonally common there, and can be found feeding on flowering plants around the island. Its forewings are deep blue with pale blue submarginal spots. The undersides are brown with white spotting along the wing margins.

Chan Soon Chye

Five Bar Swordtail (*Pathysa antiphates itamputi*)
Family : Papilionidae
Sub-Family : Papilioninae
The Five Bar Swordtail is remarkable for the very long, slender and tapering tail on the hindwing. They are forest butterflies and are very swift on the wing, with an erratic flight. It is seen here "puddling" – an activity where the butterfly imbibes nutrients from damp soil.

Simon Sng Ban Guan

Horsfield's Baron (*Euthalia iapis puseda*)
Family : Nymphalidae
Sub-Family : Nymphalinae
The Horsfield's Baron is seasonally common in Singapore, often encountered along sunny footpaths. The butterfly has an interesting habit of gliding back to a favourite perch, often basking at the edge of a large leaf. The male shown here has velvety black forewings with a broad bright blue marginal border on the hindwings.

Sunny Chir Chor Pang

Common Mormon (*Papilio polytes romulus*)
Family : Papilionidae
Sub-Family : Papilioninae
The Common Mormon is one of the "Swallowtail" butterflies, which can be found in the forests as well as in urban areas in Singapore. The host plant of the caterpillar is the Indian Curry Leaf Plant (*Murraya koenigii*). The female, shown here, has red submarginal spots on its hindwings. It is shown taking a rest and basking in the sun.

Khew Sin Khoon

Scarce Silverstreak (*Iraota rochana boswelliana*)
Family : Lycaenidae
Sub-Family : Lycaeninae
The Scarce Silverstreak is a small but fast-flying butterfly. It is readily recognisable by the buff to reddish brown undersides with areas of white streaks and spots. The butterfly is found in urban areas and is relatively common where it occurs. Its caterpillar host plant is *Ficus microcarpa*, a common roadside tree.

Khew Sin Khoon

Dark Glassy Tiger (*Parantica agleoides agleoides*)
Family : Nymphalidae
Sub-Family : Danainae
The Dark Glassy Tiger is a common butterfly in Singapore, and is even seasonally abundant. Its caterpillars feed on lactiferous milkweeds, which make the adult butterfly distasteful to predators. Here it was photographed whilst feeding on the flowers of the Golden Dewdrop bush (*Duranta* sp.)

Khew Sin Khoon

Black-Veined Tiger (*Danaus melanippus hegesippus*)
Family : Nymphalidae
Sub-Family : Danainae
The Black-Veined Tiger is a distant cousin of the famous American Monarch Butterfly (*Danaus plexippus*). The butterfly, with its bright colours, is distasteful to predators like birds. The caterpillar of this species is believed to feed on a species of milkweed.

Simon Sng Ban Guan

Tawny Palmfly (*Elymnias panthera panthera*)
Family : Nymphalidae
Sub-Family : Satyrinae
The Tawny Palmfly is a denizen of the shady forest understorey and is normally found within the nature reserves. When at rest, the butterfly is well camouflaged. Its caterpillars are known to feed on certain species of palms found in the forested areas of Singapore.

Khew Sin Khoon

Malay Lacewing (*Cethosia hypsea hypsina*)
Family : Nymphalidae
Sub-Family : Nymphalinae
The Malay Lacewing is one of Singapore's prettiest butterflies. It is bright orange-red above with broad black borders. The wings are scalloped, giving the hindwings an almost sawtooth-like appearance. The undersides are orange-red with white fasciae and are spotted with black forming an intricate pattern, which probably gave the origin of its name "Lacewing". Here it was photographed feeding on nectar from the flowers of *Lantana camara*.

Khew Sin Khoon

We are a group of nature photographers who share a passion for, and enjoy photographing butterflies in their natural environment. Photographic equipment range from basic prosumer digital cameras to the more sophisticated and dedicated equipment for nature macrophotography. Our members spend their weekends and spare time observing, photographing and documenting butterfly biodiversity in Singapore, and conducting butterfly surveys for the National Parks Board.

Website : www.butterflycircle.com

An Orchid Journey to the Singapore Botanic Gardens

A 'Fantasy & Reality' garden (left) and the wall of orchids (right) at the publicity launch of the tropical flower show

Singapore Botanic Gardens

Singapore was awarded the right to hold the World Orchid Conference in 2011, and is already preparing for it. Starting December 16th-25th 2006 (see page 26) there will be a biennial tropical flower show with gardens, exhibits and orchids, modelled on the Chelsea Flower Show. In September 2005, I went to the publicity launch in the Botanic Gardens, where there was a small, stylish, 'Fantasy & Reality' garden and a wall of orchids. The garden had an Australian touch (Jim Fogarty, the Australian designer is a medal winner at Chelsea), with *Xanthorrhoea preissii* (known as the 'grass tree' and 'black boy') as a highlight plant. The genus name refers to their yellow resin, which was used to coat the inside of cans during World War II in the Pacific, so preventing contamination of food by rusting metal. I brought a plant back to the Royal College of Physicians new medicinal garden – while it does not cure anyone it does prevent people becoming ill. The garden, designed as an international garden with a Singapore flavour, was unveiled by Mr Lim Swee Say, then Second Minister for National Development. It featured plants and sculptures from around the world using 1,500 plants, 1,000 of which were specially flown in from Australia.

Singapore's role as the Garden City of the East (or even the world) seems assured. All developments from skyscrapers to roads are required to have a 'green' element, so even among the high-rise buildings there is pleasant shade to be had. Three new huge gardens – horticultural ones – are now planned, and the proposed new cool greenhouse may be as much as two hectares in size. The air-conditioning for this will be a major undertaking. The present cool orchid house in the Botanic Gardens

The Garden City

is seen as a pilot project, and is most successful, with its plants establishing themselves on the imitation rocks and trees.

The Cool House in the National Orchid Garden

I was most impressed with the *Dendrobium* species that are growing on the trees in the Gardens – some extremely rare, some new, some well known, along with the hybrids and the massed bedding of *Dendrobium phalaenopsis* hybrids. Many of these hybrids are very impressive, like the pure white *Dendrobium* Masako Kotaishi Hidenka named after Princess Masako of Japan.

Dendrobium Masako Kotaishi Hidenka

Dendrobium capra is not the easiest to grow, liking temperatures between 70°F (21°C) at night to 90°F (32°C) in the day with 65-85% humidity, watered heavily when growing and kept dry when not. The species is found in the Lesser Sunda Islands and in eastern Java.

Peter O'Byrne

Dendrobium capra

There are many synonyms for *Dendrobium discolor*, which is known in the Hybrid Lists as *D. undulatum*. Temperatures in its habitat range from 110°F (43°C) to 43°F (6°C). It grows in full sun as an epiphyte or lithophyte from coastal margins to 550 m (1,800 ft) from Northern Australia to New Guinea.

Dendrobium discolor

Dendrobium hasseltii is a cool-growing species, which enjoys moist shade, so would be more practical in an English climate. They grow on mountain ridges at 1,500–3,000 m (4,900–9,850 ft) with temperatures around 52°F (11°C) at night and 67°F (19°C) in the day.

Dendrobium hasseltii

The small-growing, scarlet-flowered *Dendrobium jacobsonii* was growing in the cool house in Singapore. In the wild it is cool-growing, with day-night temperatures of 67°F (20°C) - 34°F (1°C) at elevations above 2,700 m (8,850 ft) in mountainous mist forest in Eastern Java. It is only found on Mount Lawn and Mount Semeru and needs heavy watering in the growing season.

Dendrobium jacobsonii

By contrast, *Dendrobium leonis* is a widely distributed species throughout tropical Southeast Asia, growing as an epiphyte in lowlands up to 1,450 m (4,750 ft). It needs heavy watering and warm conditions, night temperatures over 72°F (22°C) and day temperatures up to 90°F (32°C) or higher.

Dendrobium leonis

Dendrobium macrophyllum is another orchid with many synonyms, being found in many Pacific islands from Borneo to the Philippines and Samoa. It is an epiphyte in hot jungles from sea level up to 1,700 m (5,600 ft) and enjoys night temperatures around 67°F (19°C) and day temperatures up to 80°F (27°C). It is another plant that likes plenty of water when in growth and less when resting.

Dendrobium macrophyllum

Keeping *Dendrobium mirbelianum* in England is not easy, unless you have no difficulty in providing full tropical sun and 90°F (32°C) temperatures in the day and 74°F (23°C) at night, all the year round. The cost of fuel would only make it realistic to grow this orchid in a glass-fronted case in one's house, with artificial lighting and high humidity. It comes from lowland forests and coastal swamps in the Molucca Islands through New Guinea to northeastern Australia.

Dendrobium mirbelianum

With similar requirements are *Dendrobium terminale* from Sikkim to Indochina and Yunnan, which is also found in Thailand and Malaysia, *D. strebloceras* whose habitat is uncertain but possibly from lowlands in the Molucca Islands, *D. strepsiceros* from coastal Irian Jaya and *D. antennatum* from New Guinea to the Solomon Islands and in the north of Queensland in Australia.

Dendrobium terminale

Dendrobium strepsiceros

Dendrobium strebloceras

Dendrobium antennatum

Dendrobium sutiknoi was only described this year, by Peter O'Byrne, an English expatriate in Singapore, whose book, *An A to Z of Orchids of South East Asia*, is well-worth having. This orchid comes from Indonesia, and looks as if it needs the hot temperatures of other *Dendrobium* in the main part of the Singapore Botanic Gardens. As always, there are numerous genera to be seen when overseas whose names I do not even recognise.

Dendrobium sutiknoi

Bulbophyllum is another huge genus. This pretty, but tiny, *Bulbophyllum subumbellatum* occurs in Johor & Borneo, mostly in swamp forests. It is not uncommon, but seldom flowers so it was a treat to see it in flower in the Singapore Botanic Gardens.

Bulbophyllum subumbellatum

Dr Yam Tim Wing in the Botanic Gardens is much involved in breeding hybrids, and hundreds of plants have been named after visitors, distinguished or otherwise. *Spathoglottis* Joyce Stewart (President of the World Orchid Conference up to this year) is one; *Ascocenda* Henry Oakeley is one of the others! They have their own nursery, as well as close relationships with commercial ones.

Spathoglottis Joyce Stewart

Ascocenda Henry Oakeley

There is a lot to see in the Singapore Botanic Gardens, and it is a good place to spend time, looking carefully at what is growing - there is something in flower all the year, and I have only been able to describe a fraction. Whether you are planning a stopover on the way to Australia, or spending Christmas there in 2006 at the time of the first tropical flower show, the orchids in the Garden are worth more than a cursory look.

In 2006, Singapore Botanic Gardens is publishing a book on their orchids, with sections on their hybrids and their species – with the names all properly checked. I am sure it will be a useful addition to all your libraries and for judges wishing to know more about the standards to expect when looking at plants from the region.

Henry Oakeley
President
The Orchid Society of Great Britain,
and Research Associate
Singapore Botanic Gardens

Photos by Henry Oakeley,
unless otherwise stated

(Article adapted from the Orchid Society of Great Britain Journal ***54****: 192-201, 2005).*

EVENTS

May was buzzing with activities with two major events in the Gardens. Firstly, the launch of **Icons in Red and White**, celebrating Swiss-Singapore relationship on 14 May 2006, brought together active participants from Switzerland and Singapore. One of the objectives was to learn from each other and to put up good shows for the public.

The launch in the Gardens was filled with a variety of sights and sounds. It started with the rededication of the **Swiss Ball Fountain** followed by a concert by the 'Swiss Mountain Lions', a Children's Choir of over 100 children from the Swiss School and the Bukit Timah Primary School, and an Alphorn featuring the Gstaad Festival Orchestra with beautiful pictures from Gstaad and the Swiss mountains on the giant screen. A reception prepared by Gstaad's master chefs at Burkill Hall ended it all on a high note. Mr Heng Chee How, Minister of State, Ministry of National Development, was the Guest of Honour.

Orchids from Singapore were brought back to be planted in the Swiss Alps and two Gstaad cowbells ring in sweet memories of this event in the Gardens.

The second event was the **Launch of 2006 "Heritage Orchids of Singapore" Coin Set** and **the Heritage Orchid Display,** by Professor Tommy Koh on 28 May in the National Orchid Garden. *Vanda* Tan Chay Yan and *Aranda* Majula were featured in the inaugural heritage orchids coin issue for Singapore's "Every Coin Tells A Story". *Vanda* Tan Chay Yan won a First Class Certificate at the world famous Chelsea Flower Show in England in 1954. This is the highest award that can be given to a plant. *Aranda* Majula dating from the 1960's is another outstanding hybrid and has won awards from Asia and at the World Orchid Conference in Glasgow. This exquisite coin set pays homage to the flower ambassadors of Singapore.

The permanent Heritage Orchid display in the National Orchid Garden features a selection of orchids named after historical figures and those that have notable success as cut flowers or that have won international awards.

Hassan Ibrahim

The Swiss Ball Fountain is now at a more prominent location

Visitor Services

"Heritage Orchids of Singapore" Coin Set

Visitor Services

Heritage Orchid Display

Audrey Wong
Visitor Services & Education

N E W & E X C I T I N G

Alpinia luteocarpa – The Red Bamboo Ginger

Alpinia is the largest genus in the family of Zingiberaceae with more than 200 species distributed throughout tropical Asia to New Guinea, Australia and the Pacific Islands.

Most species in this genus have aromatic foliage but not fragrant flowers. Some are showy and are cultivated either for their flowers or foliage. Others are used as spice or in medicine. Probably the most familiar or common *Alpinia* to this region is *Alpinia galanga,* commonly known as Galangal or *Lengkuas* (in Malay). It is used as a spice in some local dishes and its rhizomes are sold in all markets for this purpose.

Alpinia purpurata, the Red Ginger Lily – is possibly the commonest species used for cut flowers. Another species worthy of attention as an ornamental plant is *Alpinia luteocarpa*. This slender plant has stems and leaves that are green on the top and reddish purple underneath. It is commonly known as the Red Bamboo Ginger and is native to the Philippines.

Once established, the Red Bamboo Ginger can reach a height of 1.2 m. It prefers to be in the ground rather than a confined pot space. The terminal inflorescences bear flowers that are small and white. This *Alpinia* thrives in bright areas with some shade.

The Red Bamboo Ginger has successfully found its niche in the Ginger Garden. The plant can be found at the entrance to Halia Restaurant and opposite the waterfall.

Alpinia luteocarpa in Ginger Garden

Close-up of the flower of *Alpinia luteocarpa*

Leaves with green and reddish-purple underside

Andrea Kee
Plant Resource Unit

Photos by Andrea Kee

Footnote:
The genus, Alpinia, is named in memory of an Italian botanist, Prospero Alpino, (1553–1616).

A Flaming Bloom Worth Waiting For

While walking through the Gardens, I was pleasantly surprised to find an Australian tree bursting into bloom for the first time in the Gardens. When in full bloom, the **Illawarra Flame Tree** (*Brachychiton acerifolius*, Sterculiaceae) is considered by some as one of the world's most beautiful flowering trees.

This tree is located between the Sun Garden and the Bonsai House. It took over 10½ years to finally bloom.

The species grows to 20 m and is native to the forests of Queensland southwards to the coastal regions of New South Wales, Australia. It is a medium-sized tree that can grow to 20 m in cultivation but much taller in its natural habitat. The leaves are variable from simple to maple-like with several lobes. The tubular flowers are waxy, crimson and 1.5–2 cm long.

Under ideal conditions, it will shed all its leaves before the whole tree is covered with the red flowers. Here in the Gardens, it is semi-deciduous, losing its leaves from only a portion of the tree.

The Illawarra Flame Tree

A burst of waxy, crimson bell-shaped flowers

Little red bells on maple-like leaf

Andrea Kee
Plant Resource Unit

Photos by Andrea Kee

FROM THE EDUCATION OUTREACH

Nature is *FUN!* Children's Workshops in the Gardens

It's tough being a child these days! In a high pressure, fast-paced society like Singapore's, school holidays seem to bring out this growing parenting trend of exposing children to as many new and stimulating experiences as possible - with the objective of giving the child that 'extra' edge over their peers in school.

In the Gardens, we recognize this demand. However, we are also strong advocates that learning should be fun! While we provide the extra enrichment (complementing science lessons in school), we make it our mission to ensure that invaluable lessons from nature are creatively imparted to our young participants. Our strategy is to subtly incorporate this love, respect and passion for nature into as many fun-filled and enjoyable activities in the Gardens as possible.

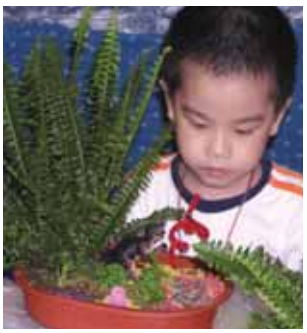
For those of us who were fortunate to have a more relaxed and carefree childhood, filled with plenty of play and opportunities for exploration, we know from experience that much can be learnt from merely observing and enjoying our surroundings – like listening to the delightfully melodious sounds of nature, and getting our hands (and feet) wet and dirty!

This was exactly what we had set out to achieve with the three new nature workshops offered in December 2005 and repeated in June 2006. During the "Trees & Me" workshop, kindergarten children made and compared bark rubbings of the Rain Tree and the Tembusu; collected, crushed and smelled Tea Tree leaves; and learnt how to differentiate the flowers from the bracts and leaves of the Bougainvillea. All these were recorded through drawings and colouring on their specially prepared worksheets. Quite an impressive feat for 5- and 6-year-olds!

Lower primary level children studied at least 12 different types of ferns and fern allies at the Evolution Garden. They investigated fern habitats, observed leaf morphology and unique spore case patterns and arrangements. Our "Young Fern Detectives" studied all these in the field as well as under the microscope indoors. For many, this was their first encounter not only with microscopes, but also with things they cannot see with the naked eye!

Winnie Wong

"Trees & Me" participants, with trainer Yeo Kar Hoon, posing with their completed miniature tree-&-bush landscapes



Janice Yau

A "Young Fern Detective" in deep concentration putting in finishing touches on his Little Fernery (complete with *T. rex dinosaur!)*

Janice Yau

"Young Aqua Botanist" participants studying cross-sections of a Water Hyacinth stem under the stereozoom microscope

Children of upper primary level were transformed into "Young Aqua Botanists" for the day. They observed and studied more than ten aquatic and semi-aquatic plants found along the periphery of Symphony Lake, analyzed and hypothesized how these plants float and adapt to the aquatic environment. Indoors, they dissected the bulbous, spongy stems of the Water Hyacinth and tore apart the velvety leaves of the Water Fern (which resembles velcro). They even looked through cross-sections of the drinking-straw-like *Kangkong* stems, amongst other things.

At the end of each workshop, the opportunity was given to create "miniature landscapes" limited only by their imagination! The youngest ones created tree-&-bush landscapes, the older ones created their own little ferneries while the oldest group of children made water gardens in aquariums.

Over the last two school holidays (December 2005 and June 2006), we received more than 100 young, budding "naturalists" for the workshops. Many of these are repeat participants - very loyal followers of the nature workshops in the Botanic Gardens! In order to keep engaging their interest, new themes for the workshops are offered every year!

In the meantime, the Gardens' education team is continually working on new programmes to be offered during future school breaks. So, keep your eyes peeled for more exciting and new adventures in the Gardens!

Janice Yau
Educational Outreach

The Dendrobiums

The Dendrobiums
by Howard Page Wood, published in 2006
by A.R.G. Gantner Verlag K.G., Rugell, Liechtenstein.
Price: Euro 120.

Cover page of the book *The Dendrobiums* by H.P. Wood (*From www.timberpress.com)*

In 1996 Margaret and Charles Baker produced their 852 page *Orchid Species Culture: Dendrobium*, almost entirely given over to an alphabetical list of 3,000 *Dendrobium* species names (including synonyms), without illustrations, sectional information or citation references, but with valuable information on hundreds of valid species, their habitats and culture. This was followed by *Dendrobium and its relatives* by Bill Lavarack, Wayne Harris and Geoff Stocker in 2000, 287 delightful pages with over 400 species illustrated by excellent colour photos on the same page as the descriptive text. The species were described alphabetically in their respective botanical sections, with species from other established genera in Dendrobiinae, *Cadetia, Diplocaulobium*, *Flickingeria*, *Epigeneium*, as well as those from genera that had (then) recently been extracted from *Dendrobium* such as *Eriopexis, Cannaeorchis, Dockrillia, Winika* etc. on the basis of DNA studies. Again there were no citation references – the bibliographical reference to the first description of the plant – but the book expanded on nomenclature, distribution, traditional uses, conservation, ecology and cultivation as well as culture and hybrids, and is one of my favourite books.

Now Dr Wood, a retired Consultant Psychiatrist from Pennsylvania in the USA, has produced a monumental book – 975 pages bearing half a million words, over 900 annotated references and 15 appendices. The last 124 pages are photos (reverting to the dated, economy style of printing that does not put the pictures with the text) of 453 species, 360 of which were grown by the author. Only 142 pages are devoted to describing 537 species, in alphabetical order but each with the citation reference and its section. The text gives a brief description, with distribution, habitat and growing advice, embellished by delightful and often tragic notes on their fate in his cultivation – 'charming but unforgiving'; 'Small thin leaves succumb to mites. Also vulnerable to root rot. But the flowers are gorgeous'; 'All died' – seldom has an author been so honest. It is interesting to look at the plants that did well, for they represent the ones of ease of culture. He also lists the number of plants that went through his hands since he decided to concentrate on *Dendrobium* in 1972.

Clements and Jones in Australia have published around 50 new generic names of plants that we, as orchid growers, prefer to know as sections within *Dendrobium*. Only a few have been accepted by Dr Wood, so we do not have to learn which *Dendrobium* species are now *Abaxianthus*, *Aporopsis, Bouletia* etc. to *Winika*. He has accepted *Cadetia*, *Diplocaulobium*, *Epigeneium* and *Flickingeria* but even these – as Jeffrey Wood at Kew points out in the foreword – may go back into sections within *Dendrobium* on the basis of more detailed molecular studies. He has also accepted the transfer of *Dendrobium* sect. *Oxystophyllum* into Eriinae as a new genus, *Oxystophyllum*. The definitive answers to the ghastly proliferation of names will come in the next volume of *Genera Orchidacearum*, so until then, we wait.

This book must cover every single piece of information related to *Dendrobium*, including evolution, distribution, structure, cultivation, conservation, ethnobotany, pollination, mimicry, gregarious blooming (when all the plants of a species all come into bloom at one time, like *Dendrobium crumenatum* does nine days after a drop in temperature), phytochemistry, history, physiology, ecology, genetics, taxonomy and more, with cladograms and maps. It details everything from how the photographs were taken, the plants recorded and places visited, to critical reviews of the literature and modern phylogenetic studies. It is, of course, not a complete record of every *Dendrobium* species, but Dr Wood has put down his marker and published this milepost after 12 years of writing. Molecular studies are changing the way we name orchids, but this book is right up to date (at the moment!). It is also, of course and alas, too long already but someone else may have to write up the other nine hundred species that are only listed in the chapter on sections. However, the book is worth buying just for the 250 pages of the Geographical Survey of the regions where *Dendrobium* grow, which is so full of information of general interest that it makes one's head swim.

There are few quibbles: there is no index, so finding one's way around is difficult; in places, for no apparent reason, the author interpolates the section name of the species, in parentheses and italics, between the genus and species name – e.g. *Dendrobium (Dendrobium) tetrodon*, *Dendrobium (Crumenata) goldfinchii* – which is confusing as the RHS Orchid Registrar uses this style for previous or proposed genus names; and although he has seen many type specimens,

the locations of holotypes and lectotypes are not listed. It is doubly confusing as sections are usually written in Roman font, and genera in italics, so one is not sure what the name in parenthesis is supposed to be. A few typos have slipped through. A particularly enigmatic one appears to be a proofreader's correction for a photo caption that has been typed in full, but the writing is enormously readable.

In his introduction, Howard Wood writes that in the early years of preparing this book 'I had underestimated my urge to accumulate knowledge...' No one who looks at this book will fail to observe that his urge has been matched by his ability, and that his years of professional listening and understanding has made him able to communicate his findings well.

I can do no better than to agree with Jeffrey Wood that 'this thoroughly researched book provides a wealth of information of value to the professional botanist, amateur enthusiast, and all who grow these elegant orchids' and to recommend, whether you grow *Dendrobium* or not, that you buy it.

Henry Oakeley
President
The Orchid Society
of Great Britain
and Research Associate
Singapore Botanic Gardens

FROM THE ORCHID SPECIES COLLECTION

Calanthe

The name *Calanthe* is derived from the Greek words *kalos* (meaning beautiful) and *anthos* (meaning flower). Though often attractive, the flowers of this genus are not long-lasting. As a result of this and the common perception that these ground-growing orchids are difficult to grow, calanthes are not among the most popular plants in cultivation. However, species of this genus have great potential as an ornamental.

It is possible to cultivate *Calanthe* if adequate care is given. In fact, orchids of this genus were amongst the first to be cultivated in Europe, far away from their native lands. In some species, old shoots have the habit of dying back after flowering. However, new shoots will soon take over. Horticultural maintenance does become necessary to avoid the plants looking unsightly.

Species of *Calanthe* are normally found on the floor of tropical and subtropical forests, both in the lowlands and on mountains. About 185 species are known. Primarily found in Asia from India to China and down to Papua New Guinea, a few have also been recorded on some islands of the Pacific Ocean, in Central America, the Carribean, Africa and Madagascar.

The plants are herbaceous with pseudobulbs and large pleated leaves. The mostly pink, purple, white or yellow flowers are often showy and several centimetres in diameter (most are between 1.5 to 5 cm), but several small-flowered species are also known. An interesting feature is the 2- to 4-lobed (or sometimes unlobed) lip, which is firmly united with the column, and this is the distinguishing feature between this genus and the closely related *Phaius*.

There are about 14 *Calanthe* species in our Orchid Species Collection. They generally like rich, moist but well-drained soil. We pot the plants in a mix of course sand and compost, replenish the compost frequently, and occasionally spray them with foliar fertilizer. Propagation of *Calanthe* is done vegetatively by dividing the clumps of pseudobulbs or through seeds. *Calanthe* species are not very often used in hybridisation. However, it is interesting to note that the first orchid hybrid ever made was a *Calanthe*, namely *C.* Dominii that was made in 1856 by John Lindley, in honour of John Dominy. He used the pollinia of *C. furcata* (now *C. triplicata*) to pollinate *C. masuca* (now *C. sylvatica*), and raised the resulted seedlings to flower. There are even intergeneric hybrids with the related genus *Phaius*, named x *Phaiocalanthe.*

Hubert Kurzweil
Paul Leong
Herbarium

H. Kurzweil

Calanthe cf. argenteostriata

H. Kurzweil

Calanthe cf. engleriana

Paul Leong

Calanthe sylvatica, a species that is very widespread in Africa and Asia

Singapore Garden Festival
– First International Show to Gather World's Top Award-winning Designers Under One Roof

Singapore, the Garden City of the Tropics, will host the first international garden and flower show on the equator from the 16th to the 25th of December 2006.

The inaugural **Singapore Garden Festival** is unique as it is the first in the world to showcase creations by international award-winning landscape & garden designers specially invited to the Festival to work alongside local horticultural talents. It promises a floral fiesta of beauty with exciting events to please the eyes and delight the senses. Occupying 2.3 ha of indoor, air-conditioned area at the Singapore International Convention and Exhibition Centre in Suntec City, the Festival's exciting offerings include:

- **Best of Show Designer Gardens** featuring creations by local designers and top award-winning garden designers from renowned garden shows around the world. More than 20 designers from United Kingdom, United States of America, France, Holland, Australia, Japan, China, Singapore and Southeast Asian countries are participating. They include:
  - UK's Julian Dowle, one the world's most experienced and respected garden designer with 26 award-winning entries at the internationally renowned Chelsea Flower Show including a record of 11 gold medals;
  - Australia's Jim Fogarty, a multiple award-winner including two Best of Show Awards, two Design Excellence Awards and four Gold Medals at the Melbourne International Flower & Garden Show;

Kho Soo Pei

SBG Archives

SBG Archives

- USA's Michael Bruce, who won two consecutive Best in Show (or Best of Show) (Floral Design) awards at the Philadelphia Flower Show in 2005 and 2006; as well as
- Winners from the 5th Singapore Institute of Landscape Architects (SILA) Design Award Competition and the Landscape Industry Association (Singapore) (LIAS) Awards of Excellence 2005.

- **Floral Windows to the World** featuring colourful and vibrant cut-flower displays and floral masterpieces with stunning set design and lighting by floral designers from home and abroad.
- **Singapore Orchid Show** glorifying this most diversified botanical family and the most important plant group in the international floriculture industry and showcasing Asia's rich and diverse heritage of orchids.
- **Garden Fiesta & Marketplace** offering educational, recreational & entertainment activities catering to the public, the serious gardeners as well as the hobbyists. The Festival Marketplace will offer a wide array of plants, gardening & landscape products and services and arts & craft.

Singapore welcomes the world to the Garden City of the Tropics! Join us at the **Singapore Garden Festival** 16th-25th December, 2006!

Kho Soo Pei
Special Projects

(For more information on ticketing and the Festival, visit the website www.singaporegardenfestival.com)

New Staff at Visitor Services

The Visitor Services of the Gardens recently went through a glorious period of growth to take in new activities. We heartily welcome all new staff aboard and we look forward to service with a lot of care and smiles.

Tall and slim, Audrey Wong joined the Gardens in April 2006 as Assistant Director Visitor Management & Education. Her forte is in Business and Hospitality & Tourism Management. She is also a Certified Hotel Administrator (CHA), which she obtained from USA. She hopes to see the Gardens prospers – and she meant not just the trees or plants. Audrey enjoys hiking, water rafting, cooking and reading.

Yap Siow Hong joined us as Manager, Visitor Services, in March 2006. She was working in the Development & Outreach Unit, Yong Loo Lin School of Medicine at the National University of Singapore. Siow Hong is no stranger to everyone here as she was previously a staff of Visitor Services and later the Marketing & Commercial Units of the Gardens. She is happy to be back among old trees, colleagues and friends and went straight into the thick of things looking after the needs of our visitors.

Andrew Liu Yong Teck used to work for a telecommunication company prior to joining the Gardens. He is currently pursuing a part-time degree in Mass Communication, which he expects to complete in 2008. He joined the Gardens in February 2006 and describes the work at Visitor Services as hectic at times but enjoyable, especially with wonderful colleagues in the team. During his free time, he reads books on history or current affairs and tries to find time for swimming or tennis at least once a week.

Before joining us, Christopher Foo Meng Wei was with Prudential Assurance as an Advisor in financial planning, insurance and investment plans. Now as a Visitor Services Officer since January 2006, he enjoys his work as "... it provides a really good learning experience for me.", he says. When possible, he jogs, catches a movie or just spends quality time with family and friends.

Editors

Photos by Hassan Ibrahim

(From top left in clockwise direction)
Siow Hong, Andrew Liu and Audrey Wong

Chris Foo

KEY VISITORS TO THE GARDENS (JANUARY TO JUNE 2006)

Name	From
Dr Bob Harwood	Darwin Herbarium, Australia
Mrs Carmen Gloria Cortes	Wife of Chilean Ambassador to Singapore
Mdm Cecilia Echenique	Wife of Chilean Foreign Minister, Chile
HE Daniel Woker	Ambassador, Embassy of Switzerland in Singapore
Dr E. Roshini Nayar	National Bureau of Plant Genetic Resources, India
Mdm Fatimah Mohamed	Universiti Kebangsaan Malaysia, Malaysia
Dr Harry Simmons IV	Bamboo Ranch, Thailand
HM Husni Thamrin	Permanent Secretary of the Regency, Kutai Kartanegara, East Kalimantan, Indonesia
HE Professor Dr Iajuddin Ahmed & HE Professor Dr Anwara Begum	President & First Lady of Bangladesh
HE Joao Antonio da Silveira de lima Pimental	Ambassador of the Republic of Portugal to Singapore
HE Jorge Fernando Branco de Sampaio & First Lady Maria Jose Ritta	President (& First Lady) of the Republic of Portugal
Dr Judy Chen	University of Florida, USA
Mrs Kamal Idris	Wife of HE Dr Kamal Idris, Director-General of World Intellectual Property Organisation
Dr Kongkanda Chayamarit	Director, Office of Hebarium, National Park, Wildlife And Plant Conservation Department, Thailand
Mr Lau Si Lo	Chairman, Civic & Municipal Affairs Bureau of the Special Administrative Region of Macao, People's Republic of China
Mr Lee Byungman	Chief of Executive Office, Gyeonggi Green Foundation, South Korea
Dr Leong Yueh Kwong	Penang Botanic Gardens, Malaysia
Mr Lim Boon Tiong	Curator, Penang Botanic Gardens, Malaysia
Lord & Lady Levene of Portsoken	England

Name	From
Mr Liu Jiangang	Deputy Chief of Tianjin Development and Reform Commission, People's Republic of China
Mr Ma Yingjiu	Mayor of Taipei City, Taiwan
Mr Nairul Anawar Abdul Lahai	Chairman of Municipal Board, Bandar Seri Begawan, Brunei Darussalam
Dr Phanit Laosirirat	Executive Director, Thailand Productivity Institute, Thailand
HM Preah Bat Samdech Preah Boromneath Norodom Sihamoni	King of Cambodia
Dr Rhett D. Harrison	Research Institute for Humanity and Nature, Japan
Ms Sam Yen Yen	Forest Research Institute of Malaysia, Malaysia
HM Dr Semane Bonolo Molotlegi	Queen Mother, Royal Bafokeng Administration of South Africa
Ms Susan Kilmas	University of Coloroda, USA
Mr Takeo Hiranuma	Member of the House of Representatives and Liberal Democratic Party, Japan
Ms Tanya Rehse	Duke University, USA
YB Teng Chang Yeow	State Secretary, Penang, Malaysia
Mr Tomas Fer	Charles University, Czech Republic
HM Tuanku Syed Sirajuddin Al-Marhum Tuanku Syed Putra Jamalullail & HM Tuanku Fauziah Binti Al-Marhum Tengku Abdul Rashid	The Yang Di-Pertuan Agong XII & Raja Ibni Permaisuri Agong, Malaysia
HE Valdas Adamkus & Mrs Alma Adamkiene	President (and Wife) of Republic Of Lithuania
Dr Wong Khoon Meng	University of Malaya, Malaysia
Dr Yvonne Su	University of Hong Kong, China
Mr Zhang Jian	Manager, Shanghai Incineration Plant, People's Republic of China
Mr Zhou Qun Xin	Vice Mayor of Zhangjiagang City, Jiangsu Province, People's Republic of China

Spathoglottis Syed Sirajuddin is named after HM, the Yang Di-Pertuan Agong XII of Malaysia (far right) on his visit to the Gardens on 25 January 2006. Presenting him with the birth certificate of the orchid is Dr Tan Wee Kiat, then CEO and now Advisor to NParks

The orchid naming ceremony of *Dendrobium* Norodom Sihamoni held on 30 March 2006, in honour of the King of Cambodia (second from left). On his right is the King's sister HRH Samdech Reach Botrei Preah Anoch Norodom Arunrasmy. Included in the picture are (from far right) Chairman of NParks, Prof Leo Tan, and Dr Balaji Sadasivan, Acting Minister For Information, Communications and The Arts

Photos from SBG Archives

The Oriental Indian Art and Pleasure Gardener

Amongst the rare volumes found in the Gardens' Library is a book entitled ***Der orientalisch-indianische Kunst- und Lust-Gärtner,*** which translated into English means "**The Oriental Indian Art and Pleasure Gardener**". This book, written by George Meister in 1692, comes with superb prints and is one of the oldest books in our collection.

Von der Frucht oder Baume Duryoens, auf Malacca und Batavia, which described the fruit of the Durian tree from Malacca and Batavia (Java)

George Meister (1653-1713) from Dresden, Germany, was employed by Andreas Cleyer as his gardener. The latter was the Chief of the Dutch Trading Post. Meister, being a gardener by profession, was the first European garden specialist to report on gardening in the Far East. This book written in German is an account of his travels, with descriptions of the plants of the Asiatic mainland, Japan, the East Indies and the Cape of Good Hope. Meister was the first European to describe bonsais, Camellia (*Camellia japonica*), and Japanese garden techniques.

Meister visited Japan twice with his employer Cleyer. His admiration for an aspect of Japanese gardening is found in this translation in Wybe Kuiter, *Nagasaki Gardens and Georg Meister (1653 - 1713)*. In, *Genesis* **3**: 94-102, Kyoto 1997.

Von Pisang oder Indianischen Feigen-Baum. A description of the Banana, which in 1692 was already known as the *Pisang* (Malay for Banana), but was then also considered as an Indian Fig Tree

"…Here I add with justice how the Japanese and the Chinese build their gardens and decorate them, not with beautiful sculpture, but with rocks. These people cannot imagine a greater delight than to have large rocks in their gardens, which were not placed there by Nature but were found by them and then moved…. It is done in such a way that even a thousand European who haven't seen it before, would think that it was God and Nature and not the hand of man that created it."

Christina Soh
Library

Photos by Hassan Ibrahim

Der Orientalisch-Indianische
Kunst-
und
Lust-Gärtner/
Das ist:
Eine aufrichtige Beschreibung
Derer meisten Indianischen/als auf Java Major, Malacca und Jappon, wachsenden Gewürtz-Frucht- und Blumen-Bäume/wie auch anderer raren Blumen/ Kräuter- und Stauden-Gewächse/ sampt ihren Saamen/nebst umbständigen Bericht derselben Indianischen Nahmen/ so wol ihrer in der Medicin als Oeconomie und gemeinem Leben mit sich führendem Gebrauch und Nutzen;
Wie auch
Noch andere denckwürdige Anmerckungen/ was bey des Autoris zweymahliger Reise nach Jappan, von Java Major, oder Batavia, längst derer Cüsten Sina, Siam, und rückwerts über Malacca, daselbsten gesehen und fleißig observiret worden;
Auch
Vermittelst unterschiedlicher schöner ins Kupffer gebrachter Indianischer Figuren/ von Bäumen/ Gewächsen/ Kräutern/ Blumen und Nationen entworffen und fürgestellet durch
George Meistern/
Dieser Zeit Churfl. Sächl. bestallten Indianischen Kunst- und Lust-Gärtner,
Mit Churfl. Sächs. Durchl. gnädigstem PRIVILEGIO
DRESDEN/ In Verlegung des AUTORIS, druckts Johann Riedel/ Anno 1692.