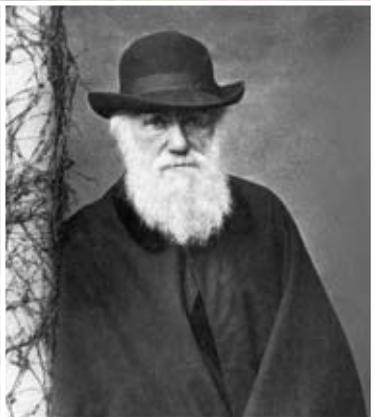
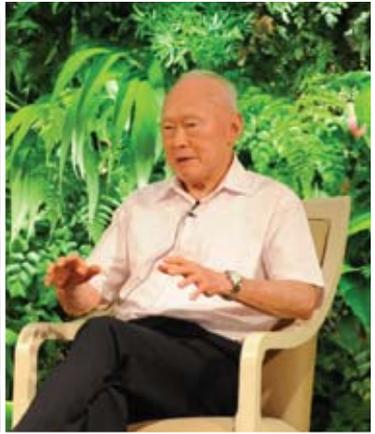
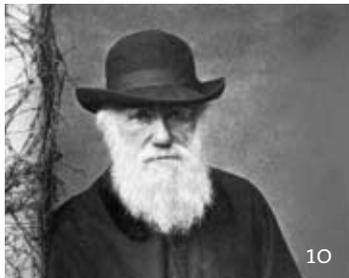


Gardenwise

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Lakka Palm
Photo by Benjamin Aw

Editors
Chin See Chung
Mark Hughes
Kho Soo Pei

Production Managers
Christina Soh
Mak Sin Chang

Design
Splash Productions Pte Ltd

Message from the director

Chin See Chung

ARTICLES

- 2 150th celebrations: Celebrating 150 magical years of the Gardens Terri Oh
- 4 150th celebrations: An open conversation with Minister Mentor Lee Kuan Yew:
The greening of a nation Terri Oh
- 6 150th celebrations: Jane Goodall and friends speak on
conservation and biodiversity loss Terri Oh
- 6 150th celebrations: A tribute to two Grand Dames
150th celebrations: Putting a stamp on history: the Gardens and SingPost Terri Oh
- 7 Gregarious flowering of some native orchids of Singapore Tim Yam Wing
- 10 Darwin and plant movement George Staples, Dina Gallick
- 14 Dragonflies of the Gardens Robin Ngiam
- 16 Flowering Giants in the Gardens Lua Hock Keong

REGULAR FEATURES

Around the Gardens

- 18 Greening things up Thereis Choo
- 19 The Gardens' logo: the history of the lakka palm Benjamin Aw
- 20 Strange encounters of the fourth kind Serena Lee, Nura Abdul Karim
- 20 Willi Henning Society XXVIII meeting Mark Hughes

Notes from the Economic Garden

- 21 All hail the queen! Marc S. Frank

What's Blooming

- 22 Corner's kapurs in Flower Lahiru S. Wijedasa, Derek Chan
- 23 *Crateva religiosa* Nura Abdul Karim

Ginger and its Allies

- 24 *Hedychium longicornutum* - a stunning epiphyte from Malaysia Jana Leong-Škorničková

From Education Outreach

- 26 A 'drama'-tic week in the Children's Garden Winnie Wong, Janice Yau
- 27 Community outreach through the JBCG Student-Guide Programme David Liew, Janice Yau

From Taxonomy Corner

- 28 Why plant names change – and what we can do about it George Staples

Book Review

- 29 Mr Roscoe's Garden by Jyll Bradley Jana Leong-Škorničková

From the Orchid Species Collection

- 30 The 'rat tail orchid' *Paraphalaenopsis labukensis* and its allies Hubert Kurzweil

Beyond the Gardens

- 32 ASEAN + Three Regional Meeting on "Global Taxonomic
Initiatives: Needs, Assessment and Networking" Benito C. Tan

Inside back cover

- Key visitors to the Gardens** Benjamin Aw, Serena Lee

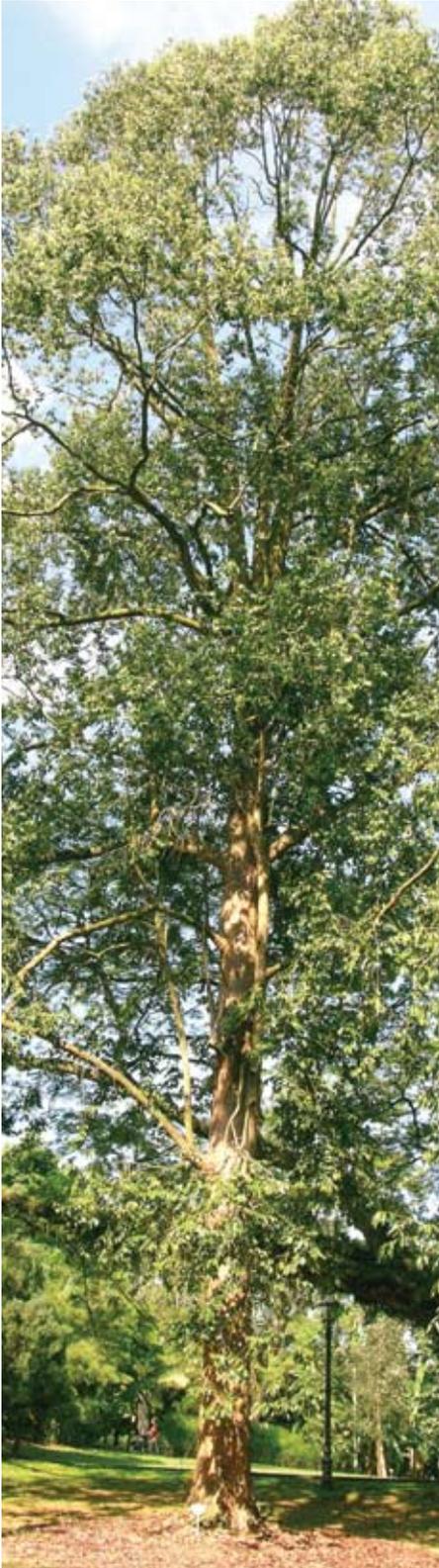
Back cover

- From the Archives**
The Malay Archipelago Christina Soh

Singapore Botanic Gardens, 1 Cluny Road, Singapore 259569
NATIONAL PARKS BOARD

nparks_sbg_visitor_services@nparks.gov.sg www.sbg.org.sg www.nparks.gov.sg

Message from the director



While we celebrate our 150th anniversary this year, we also reassessed our priorities and strategies. Various aspects of conservation will become more important areas of focus for the Gardens as the issues of tropical forest destruction, habitat loss, erosion of plant diversity and climate change become more urgent. We hope to expand our capacity to understand and document plant diversity through research; make greater contributions in education, promoting awareness about plant diversity and building capacity for its conservation; and expand our documented plant collections in *ex-situ* conservation.

To ensure optimal use of resources we will target selected groups for the expansion of our living plant collections; these will include wild relatives of fruit and nut tree species, bamboos, ferns, aroids, ginger, dipterocarps, medicinal plants and woody climbers. Other more established groups like orchids, palms and cycads will also be given attention. However, before embarking on new collections we will need to make sure that we have the space to grow them and the capacity to successfully maintain, record and track, and have the ability to make good use of them. We have made a good start in ensuring through partnerships, collaborations and exchanges, that the botanical collections we grow are documented and with legitimate origins.

This issue also reports the celebratory events marking our 150th anniversary, held in the first half of the year. The inaugural event, *A Tale of Two Gardens*, in acknowledgement of our special relationship with the Royal Botanic Gardens Kew, was a simultaneous tree planting ceremony linked via a live video conference. We planted two saplings of Brazilian rubber, *Hevea brasiliensis*, while in Kew two individuals of the Chusan palm, *Trachycarpus fortunei*, were planted. Our saplings are progeny of the second generation from the original rubber trees sent to the Gardens from Kew in 1877.

An exhibition, *The Seed that Changed the World*, told the story of the commercial rubber industry and the role played by the Gardens in spawning a business that changed the social and economic fabric of the region. Other events organized included a forum with Jane Goodall as the keynote speaker. She reminded the audience that humans have the power and ability to better manage the global environment and to share it with other life forms. We also launched a special stamp series with SingPost to commemorate our 150th anniversary. These stamps depict paintings that highlight memorable views and locations in the Gardens.

All our events are designed around plants and the environment and are programmed for optimal public participation and enjoyment. They help visitors remember their happy moments in the Gardens or remind them of the importance of plants and biodiversity and the need for conservation. It reminds them of the role of the Gardens and that they are also the custodians of this heritage institution and public space.

Planning, organizing and staging events and exhibitions to the highest levels of excellence have an unexpected benefit. The activities demand long hours, cooperation, collaboration and patience with everyone working and learning together. The end result is not only highly successful events, more confident and capable individuals but an even better Gardens' team. After each event there are interested visitors who ask for the contact of our 'event organiser' only to be surprised to find out that we did it all ourselves. Congratulations to all members of the Gardens team.

Chin See Chung

A handwritten signature in black ink, appearing to read 'Chin See Chung'.

Celebrating 150 magical years of The Gardens

The Minister for National Development, Mr Mah Bow Tan, officially launched a year-long line-up of activities to mark the 150th Anniversary of the Gardens on 3 April 2009. The inaugural event was entitled *A Tale of Two Gardens*, in recognition of the special relationship shared between Singapore Botanic Gardens and the Royal Botanic Gardens, Kew in England which is also celebrating an anniversary this year - its 250th.

Ties between the two gardens began in the 19th Century. In 1877, Kew Gardens gifted the Singapore Botanic Gardens with 22 rubber seedlings which was the catalyst for the rubber industry's explosion in Southeast Asia and an economic boom across the region. To honour both anniversaries and this most precious gift, a symbolic tree planting ceremony was held simultaneously in both gardens linked via a live video conference.

In Singapore, the planting was done by the British High Commissioner to Singapore, His Excellency Paul Madden and Mrs Christina Ong, Chairman, NParks. They each planted a *Hevea brasiliensis* (rubber tree). Over in London, Singapore's High Commissioner to the United Kingdom, His Excellency Michael Teo Eng Cheng and Chairman of the Board of Trustees of Kew Gardens, Lord Selborne, each planted a *Trachycarpus fortunei* (Chusan Palm).

At the same event, Minister Mah also launched an interactive public exhibition entitled *The Seed that Changed the World*. The exhibition was viewed by about 10,000 visitors and traced the birth of the commercial rubber industry and the Gardens' role in shaping the ensuing economic boom.

As part of the celebrations, Lady Yuen-Peng McNeice, a longstanding generous supporter of the Gardens, gifted the 150th anniversary commemorative book entitled 'Gardens of Perpetual Summer'. This beautifully produced book chronicles the history and development of the Gardens for the enjoyment of future generations to come.

No anniversary celebration is complete without a cake and so the school children from Nanyang Primary School came together in *A Gift of Love* to show their appreciation for the Gardens with a gift of 2,000 handmade birthday cupcakes. Corey Koh, a Primary One pupil from Nanyang Primary School, said: "I love coming to the Botanic Gardens because it is a different world altogether. My favourite spot at the Botanic Gardens is the Evolution Garden. I can walk around that garden many times and not get bored. I always discover something I missed before. I am glad that I am living in this world now with all the beautiful flowers and trees. We should all love our earth and plant more trees. I am so glad to be able to celebrate the Garden's 150th anniversary. My friends and I were so excited when we were told that we were to bake a birthday cake for this celebration. We really had lots of fun baking the cupcakes."



Terri Oh
Singapore Garden Festival

A Year of Celebrations

There are many more exciting and educational events on the calendar at the Gardens for this anniversary year. This series of informative exhibitions and events will appeal to those who want to learn more about the Gardens and discover the fascinating world of plants.

"*Two Minds, One Theory*" exhibition will shed light on how the theory of evolution that changed the scientific world was simultaneously developed by Charles Darwin and Alfred Russel Wallace.

In September the Gardens, in partnership with Singapore Press Holdings, will bring together some 150 couples to exchange vows in a mass wedding ceremony.

Launch of Singapore Botanic Gardens Calendar 2010. An eagerly anticipated annual event, this will be our 8th calendar produced in partnership with ExxonMobil Asia Pacific. This year's calendar will feature botanical illustrations from the Gardens' archives. All proceeds from the sale of the calendar will go towards the Singapore Botanic Gardens Exhibition Fund in support of its public exhibition programme.

International meeting on *Convolvulaceae* will bring to our shores top botanists in the plant family of *Convolvulaceae*. It will kick start a global project to establish the World Checklist of *Convolvulaceae*.

Trees of the World Light-up. An event involving embassies and schools, where the local and expatriate communities will be invited to participate in this light up by decorating trees for the festive season.

Rainforests - the Human Challenge. SBG, in a tripartite partnership with Kew Gardens and the Prince's Trust, will be hosting this worldwide touring photo exhibition of international rainforests sponsored by Sony.



Caption:

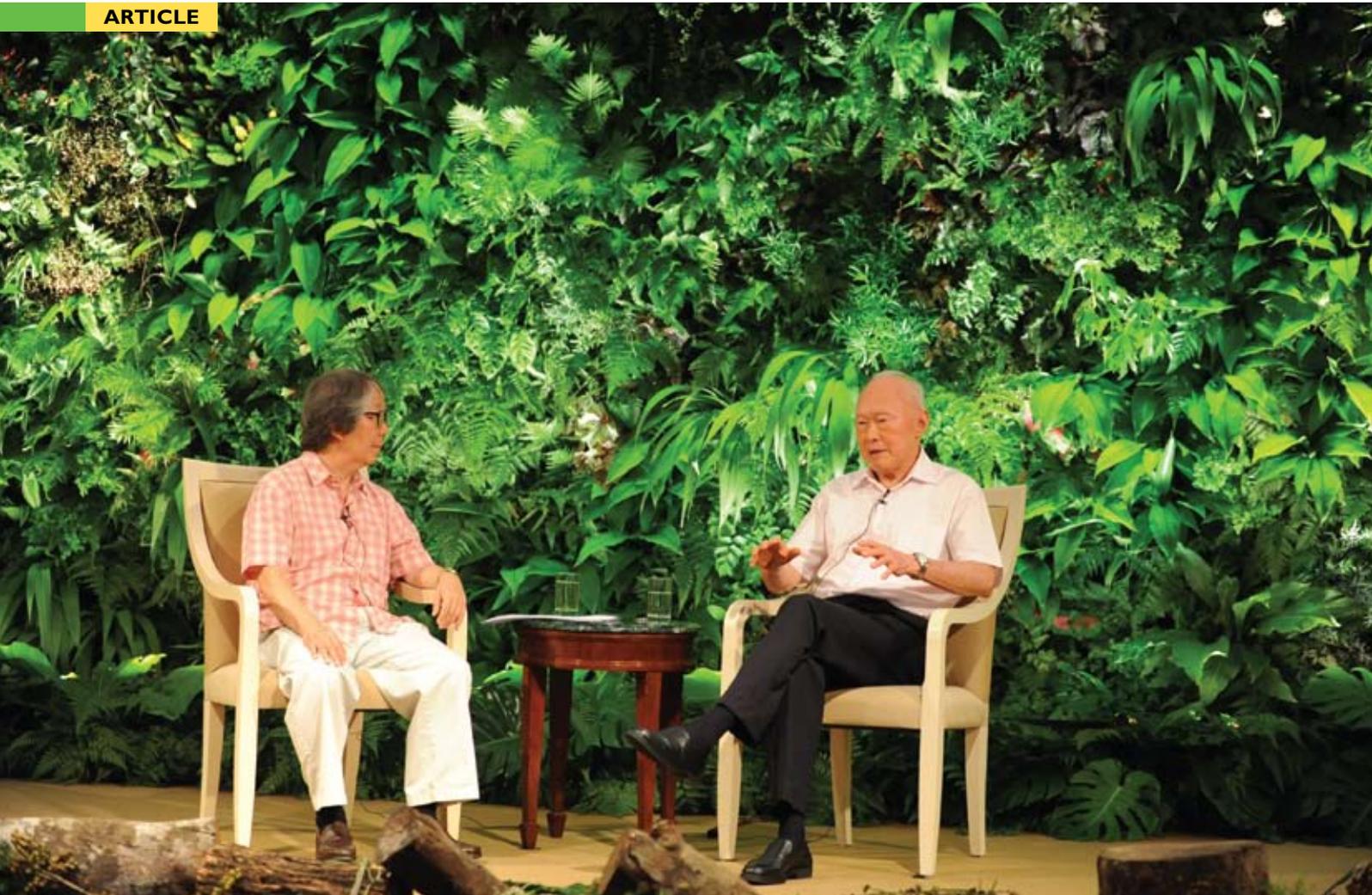


Top:
Minister Mah with students of Nanyang Primary School and their gift of 2,000 cupcakes.

Left:
His Excellency Paul Madden, British High Commissioner to Singapore, Dr Chin See Chung, Director of the Gardens and NParks Chairman Mrs Christina Ong, planting two *Hevea brasiliensis* saplings.

Bottom:
NParks CEO Mr Ng Lang, Ambassador-At-Large Professor Tommy Koh and Minister Mah viewing "The Seed that Changed the World" exhibition.





An open conversation with Minister Mentor Lee Kuan Yew: The greening of a nation

Minister Mentor Lee Kuan Yew (MM Lee) was the Guest of Honour at the Gardens' 150th Anniversary anchor event on 6 May, where he participated in an open conversation on the greening of Singapore with over 500 guests. During the session moderated by Professor Tommy Koh, Singapore's Ambassador-at-Large, MM Lee shared his insights on the inspiration and challenges in developing our Garden City, and our potential as Singapore advances into a City in a Garden.

MM Lee is the visionary and driving force behind Singapore's development as a Garden City, of which the Gardens played an important role by lending its expertise and resources towards the greening of the nation. MM Lee

is also the patron of the Garden City Fund which was launched in 2003 to encourage the community to be actively involved in our Garden City through conservation efforts, research, outreach and education.

Guests who attended the event included pioneers who championed the development of our Garden City, representatives from private sector corporations, non-government organizations, the landscape and horticulture industry, and individual supporters of the Garden City Fund. The proceeds from the event will go towards the Garden City Fund Scholarship Programme, which provides scholarships for Singapore's future

botanists and horticulturists. The event raised over \$800,000 for this cause, including a bequest of S\$250,000 by the late Mr Hunter Caldwell to the Gardens. Mr Caldwell was a British citizen who lived in Singapore and was a regular garden visitor. He enjoyed the Gardens tremendously and bequeathed this generous legacy on his passing.

Terri Oh
Singapore Garden Festival

Jane Goodall and friends speak on conservation and biodiversity loss

Human beings, with our creativity, intellect and inventiveness, have the ability to change the world we live in today. This was the key message from three prominent personalities in the field of conservation who spoke at the “Speak with Jane Goodall and Friends” open forum organised by the Gardens on June 4. The forum, featuring world renowned primatologist and conservationist, Dr Jane Goodall, was part of our year-long calendar of activities to commemorate the Gardens’ 150th Anniversary. As one of the world’s foremost tropical botanic gardens, we aim to play a larger and increasingly meaningful role in raising awareness of the need to conserve our natural heritage, as well as contributing to the global plant conservation initiative through research, education and capacity-building activities.

Dr Goodall, together with Professor Leo Tan, Director (Special Projects), Faculty of Science, National University of Singapore and Chairman of the Garden City Fund, and Mr Christian Courtin-Clarins, Chairman of Clarins, shared with over 180 invited guests their views on humanity’s response to biodiversity loss and the resulting conservation efforts that are currently being carried out.

Best known for her study of the chimpanzee’s social and family life, Dr Goodall is also the founder of the Jane Goodall Institute and initiator of the Tanganyika Catchment Reforestation and Education project (TACARE) in Tanzania. Speaking on her optimism about the future of the global environment for all living things, Dr Goodall’s message of hope was simple yet touching. Her many stories of the triumph of the human spirit were touching and awe-inspiring. Dr Goodall said, “My reason for hope is this extraordinary human brain. When you think of the technology that we’ve created and when our backs are to the wall, I think it’s when our brains start working overtime.” Dr Goodall also emphasised the important role that botanic gardens play in preserving plant diversity, as plants are the basis of everything on earth,



without which we will not be able to exist.

At the same forum, Professor Leo Tan, Director (Special Projects), Faculty of Science, National University of Singapore and Chairman of the Garden City Fund, also shared his insights on how Singapore, as a tiny island state, has responded to the challenges of environmental sustainability. Citing the Semakau Landfill as an example, Professor Tan illustrated how Singapore has managed to preserve the biodiversity around Pulau Semakau while reclaiming the land needed for the landfill.

French skincare brand Clarins is also no stranger to the delicate balance between commercial profitability and the need to be a socially responsible global citizen. Apart from switching to solely using plant extracts in their products from 1991, Mr Christian Courtin-Clarins, Chairman of Clarins also delisted the company in 2008 to alleviate the pressure on the bottomline as a result of being more environmentally friendly. Clarins, he said, has been actively involved in various initiatives that protect biodiversity and support responsible development.

The event was fully subscribed within a week of its announcement and was very well received. For many, the forum was a unique experience, bringing together three very different perspectives.

A tribute to two Grand Dames

A Green Generation Concert on the evening of 5 June at the Gardens’ Shaw Foundation Symphony Stage celebrated the birthdays of two grand dames – the Gardens’ 150th Anniversary and renowned conservationist Dr Jane Goodall’s 75th.

The concert brought together over a thousand youths who gathered to hear Dr Goodall, whose message of hope was inspirational and heartwarming. The highlight of the evening was a surprise cake-cutting ceremony featuring a four-tiered birthday cake specially decorated by Gardens’ staff.





Putting a stamp on history: the Gardens and SingPost celebrate the 150th anniversary with the launch of a stamp series

Six special "Friends of the Gardens" together with Mr Ng Lang, CEO, NParks and Mr Wilson Tan, Group CEO, SingPost, unveiled the Singapore Botanic Gardens' 150th Anniversary commemorative stamp series at a launch ceremony on 19 June 2009. The six "Friends of the Gardens" drawn from all walks of life included Madam Rashidah Zali, a long-serving landscape technician at the Gardens; Mr Keith Hillier, a volunteer pioneer of the Gardens; Mr Tan Jiew Hoe, President, Singapore Gardening Society; Dr John Elliot, President, Orchid Society of Southeast Asia and Ang Cheng Hui, a Primary 6 student from Nanyang Primary School who has participated in floral art competitions organised by the Gardens and Nanyang Primary School.

The set of four commemorative stamps and a miniature sheet depict some of the Gardens' best-loved icons and was specially drawn by acclaimed Singapore designer and artist Mr Eng Siak Loy. His works have earned him many accolades, including Asia's Most Beautiful Stamps award and second place in the Most Beautiful Stamp in the World award in 2003. He is also a winner of the Singapore President's Award Design

(Designer of the Year) in 2007, in recognition of his artistic achievements.

Speaking at the launch, Dr Chin See Chung, Director of the Gardens said, "It is fantastic that in the year of such a historic milestone for the Gardens, some of the Gardens' most-recognised spots can be captured so beautifully in this stamp series. By having the icons of the Gardens featured in this commemorative stamp series, members of the general public will also be able to own a piece of the Gardens, and to reflect on some of their fond memories at each of these iconic spots."

Terri Oh
Singapore Garden Festival

Flora And Fauna - a quilt exhibition

The Gardens' Library of Botany and Horticulture provided a perfect setting for a quilt exhibition of flora and fauna inspired quilts from 12 to 21 June 2009. More than 30 quilts were on display in the Gardens, some of which were inspired by the greenery and the iconic locations in the Botanic Gardens itself and specially created to commemorate the Gardens' 150th anniversary. Ranging from 0.6 m x 0.9 m to 2.5 m x 2.5 m in size, these exquisite quilts were lovingly crafted by quilt specialist Ira Joseph and friends. Visitors were also treated to daily demonstrations on quilt making during the exhibition.





Gregarious flowering of some native orchids of Singapore

Bulbophyllum vaginatum flowered profusely on 5 May 2009.



On 5 May 2009, we observed one of the most spectacular flowerings of two native orchid species in Singapore, *Dendrobium crumenatum*, the pigeon orchid, and *Bulbophyllum vaginatum*, when plants of both species flowered at the same time all over Singapore.

The ephemeral flowers of *Dendrobium crumenatum* stay open for only one day, whilst those of *Bulbophyllum vaginatum* last for 3-4 days. Botanists call this type of flowering behaviour “massed gregarious” or “gregarious.” In the Asian tropics it is believed that 650 to 700 orchid species exhibit such a flowering pattern. Most of these species produce large numbers of flowers on each plant when they are in bloom.

Approximately 250 *Dendrobium* species exhibit gregarious flowering. Some produce flowers that only last for four to five hours, whereas others have flowers that last for as long as two days.

Native species that flower gregariously

Bulbophyllum vaginatum, a species distributed in Thailand, Peninsular Malaysia, Singapore, Borneo and Indonesia is often seen growing in masses on the branches of rain trees and *Syzygium grande*. They are a spectacle when in full bloom. The flowers are creamy-yellow with about 15 arranged in a fan-shaped whorl at the top of a stalk. The lateral sepals are 7 cm long, which is many times longer than the upper sepal. This orchid is classified as an endangered species in Singapore.

Another native orchid, *Dendrobium crumenatum*, the pigeon orchid, is the most common epiphyte in the region



Bromheadia finlaysonianana. The inflorescence produces one flower at a time, each of which lasts only a few hours.



The flower of *Taeniophyllum obtusum* resembles the figure of a ghost, hence it is also known as the 'ghost orchid'.



Flickingeria comata, one of our native species which has unfortunately become extinct in Singapore. The flowers only last for one day.



The flowers of *Thrixspermum amplexicaule* are very attractive, pale lilac in colour and about 3 cm across. Unfortunately, they only last for a day.



Thrixspermum amplexicaule plant at Pulau Ubin.

and can be seen on many roadside trees in Singapore. It flowers 9 days after a heavy rainstorm. It is a delight to see and smell them in bloom as the flowers, which resemble white pigeons, are sweetly scented. This simultaneous flowering, which seems to ensure pollination, has interested investigators for more than a hundred years.

Flickingeria is a close relative of *Dendrobium* and comprises about 60 species. They are distributed from India to New Caledonia, and all species flower gregariously. An example is *F. comata*, a native species that unfortunately is no longer found in the wild in Singapore. Flowers of this peculiar-looking species are borne on the internodes of the pseudobulbs. The petals and sepals are creamy-yellow with purple spots. The most interesting part of the flower is the lip which has deep irregular clefts.

There are 12 species in the genus *Bromheadia*, and one of them, *B. finlaysonianana*, can be found in Singapore. Like *Dendrobium crumenatum*, it flowers gregariously a few days after rain. The attractive flowers are white, with a yellow patch on the lip, and are faintly scented although unfortunately they only last a few hours.

Thrixspermum belongs to the Vanda tribe and consists of 100 to 150 species which are distributed from India across Asia to the Pacific Islands. They have ephemeral flowers appearing one at a time from a flattened inflorescence. One local example is *Thrixspermum amplexicaule* which can still be found at Pulau Ubin. This widespread species is a semi-aquatic orchid and grows with the lower half of the plant submerged in

water. The flowers are very attractive, pale lilac in colour and about 3 cm across.

Taeniophyllum is another Asian genus belonging to the *Vanda* tribe. They are unusual orchids as all 150 species are leafless epiphytes, with most of them having ephemeral flowers that open one to a few at a time. Some are night blooming and seem to flower at random and rely on strong fragrances to attract pollinators. A few of the day-bloomers flower gregariously, such as *Taeniophyllum obtusum* which is still found in Singapore. It has greatly reduced stems covered by scale-like leaves. Each flower is 5 mm across, with orange-yellow petals and sepals, and the white lip is fleshy and concave. The flower, which resembles the figure of a ghost, is also known as the 'ghost orchid'.

The mechanism

Most of the gregarious flowering orchids produce flowers that last for only one day. Therefore, to ensure cross pollination, all plants in an area must flower together. In *Dendrobium crumenatum*, the pigeon orchid, all plants in an area flower at the same time 9 days after a heavy rain storm. Professor Eric Holttum, former director of the Gardens suggested that the flower buds develop until all parts are formed and the anther is almost fully grown. Development then ceases and the buds become dormant. Further development is initiated only by a drop in temperature of about 5°C. As all buds grow at the same rate, all the flowers open a fixed number of days after the rainfall. In Malaya, Singapore and Indonesia sudden temperature drops usually occur following rainstorms. Exactly nine days after the cooling, just before dawn the white flowers open and start emitting a

very pleasant aroma. Pollinating bees are attracted by the colour and fragrance of such a large number of flowers and arrive shortly after dawn. Although it is known that a drop in temperature promotes development of the flower buds, the control mechanism itself is still unknown.

Although both *Dendrobium crumenatum* and *Bulbophyllum vaginatum* flower gregariously, the two species do not necessarily flower together. For example, the pigeon orchid tends to flower more often than *B. vaginatum*. And when *B. vaginatum* blooms, the pigeon orchid may not do so and vice versa. It is believed that each species requires a different temperature reduction or stimulus to trigger the development of its flower buds. Since the buds of different species develop at different rates, the flowering time differs from one species to the next.

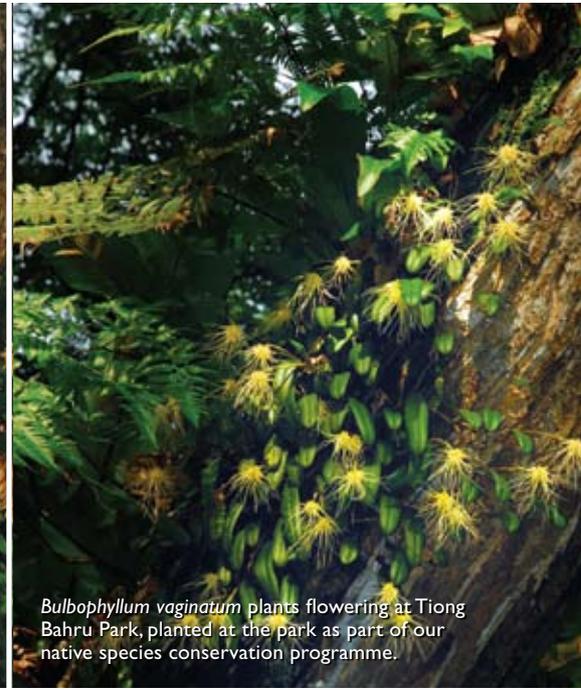
Efficient and effective reproduction

Gregarious flowering is a very successful strategy to ensure cross pollination using minimal resources. Inside the tropical rainforest, most orchid species grow far apart from one another and pollinators need to travel long distances between plants. Therefore, the chance of getting pollinated is slim. If all the plants flower simultaneously in one area, pollinators do not need to travel far and can move from flower to flower quickly within a few hours while collecting nectar (and pollinating the flowers). Gregarious flowering is a win-win situation, as the pollinators get food easily and the orchids are efficiently pollinated.

Yam Tim Wing
*Orchid Breeding and
Micropropagation*



Bulbophyllum vaginatum alongside a tiger orchid, Tiong Bahru Park



Bulbophyllum vaginatum plants flowering at Tiong Bahru Park, planted at the park as part of our native species conservation programme.



Bulbophyllum vaginatum flowering in Tiong Bahru Park



Dendrobium crumenatum, the pigeon orchid flowering in Tiong Bahru Park.



Dendrobium crumenatum flowering in the National Orchid Garden on 5 May 2009.

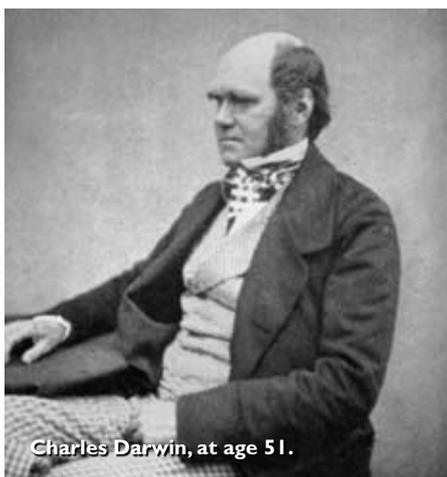


The flowers of the pigeon orchid last only one day.

Darwin and plant movement

The year 2009 marks the 150th anniversary of the publication of Charles Darwin's *Origin of Species*, and celebrations are being held around the world to commemorate this remarkable work that forever changed our view of life on earth. While Darwin is certainly best known for his evolutionary studies, it is seldom realized that he did not confine his studies to animals and geology, but also worked with plants. Yet surprisingly little has been written about Darwin's botanical studies and his books about plants do not enjoy the popularity of his works on animals, humans and natural selection. A recent visit to Kinokuniya (a leading bookshop in Singapore) revealed a shelf about 1 metre long filled with books by, and about, Charles Darwin, but almost none of his botanical works were represented there.

Among Darwin's books dealing with plants are titles such as *On the various contrivances by which British and foreign orchids are fertilised by insects* (1862, 1904), *Carnivorous Plants* (1875), *The effects of cross- and self-fertilisation in the vegetable kingdom* (1878), and *On the movements and habits of climbing plants* (1875). In Darwin's lifetime these were all popular works, especially his study of orchid pollination. What is seldom acknowledged is that the botanical research behind them were undertaken as a result of ill health, and this research occupied Darwin's mind at a time when he withdrew from the world and became a virtual recluse.



Charles Darwin, at age 51.

The Beagle voyage

Darwin found his true calling in life during the five years (1831–1836) it took for HMS *Beagle* to circumnavigate the globe, making hydrographic charts for the Royal Navy. Having studied medicine and the ministry, and finding both unsuitable as careers, he paid his own passage aboard the *Beagle* in order to have the freedom to study what really interested him: the natural world. Darwin had considerable opportunity to leave the ship when it was near land to pursue his passion for natural history. He often made long travels alone while ashore, collecting specimens and recording observations everywhere he went. At this time Darwin was in his mid-20s and physically fit — at 6 feet tall he was athletic and strong. Aside from regular bouts of seasickness, he was seldom ill during the voyage and it appears to have been a time of good health for him, despite having a long history of physical ailments which tended to intensify when he was under stress. His biographers suggest that these conditions began with the death of Darwin's mother when he was eight, and they plagued him throughout his long life. The ailments soon recurred following his return to England, suggesting life in London must have been much more stressful for Darwin than his life aboard the *Beagle*. This is remarkable because the *Beagle* was a small ship (only 27 meters) with 74 people aboard; conditions were certainly crowded and the voyage lasted five years.

Darwin's life at Down House

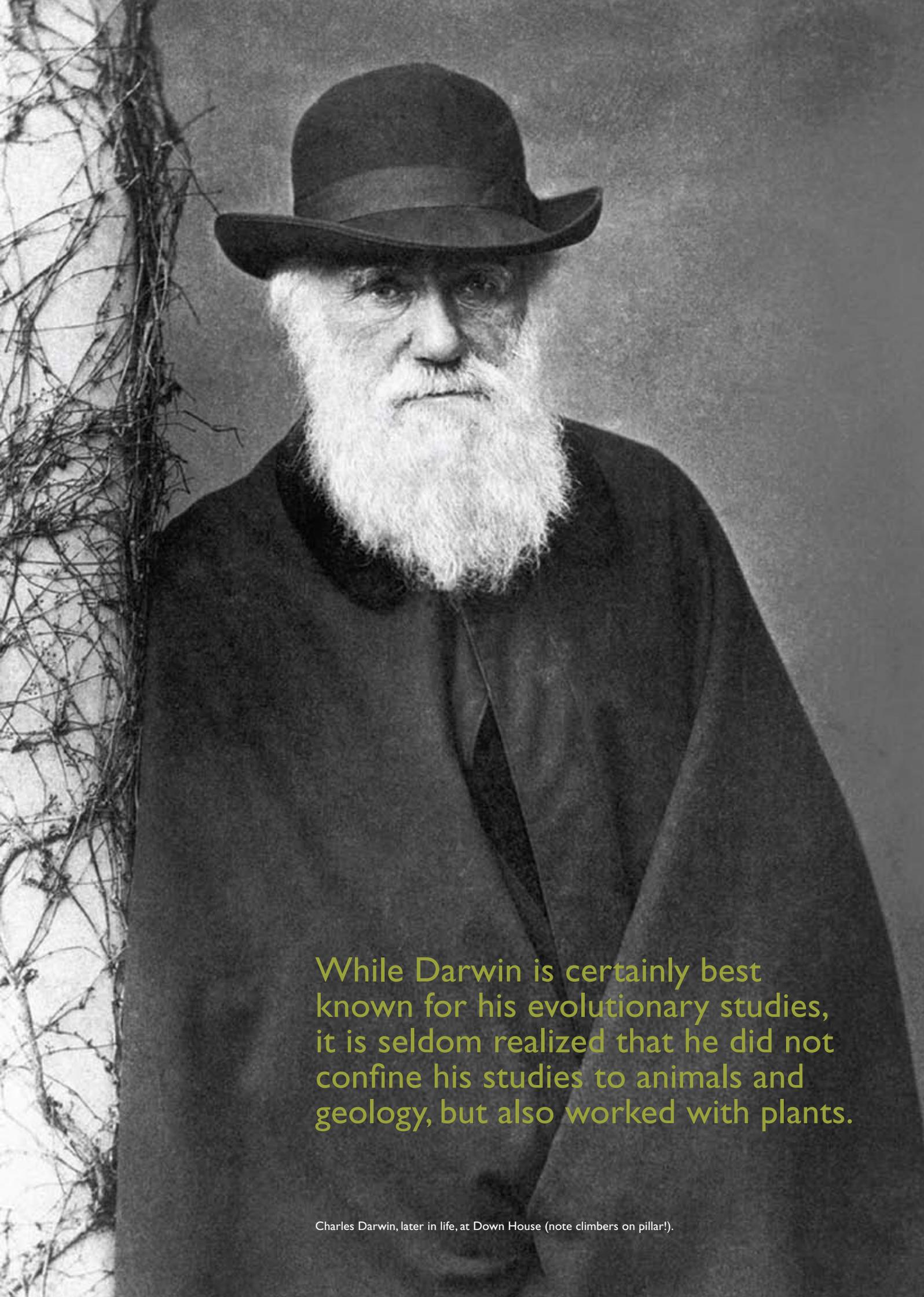
In 1839 Darwin married his cousin, Emma Wedgwood, and the couple took up residence in London. There were already several marriages between the Darwin and the Wedgwood families; Darwin's mother was a Wedgwood. His decision to marry his first cousin worried Darwin: would such close marriages affect the children it produced? Whether these questions had begun to prey on Darwin's mind or not, he soon felt the strain of city life and he and Emma decided to move to the country. In 1842 they relocated to Down House, a country estate near Bromley

in Kent. He was never to travel abroad again and seldom left Down House for the rest of his life. Darwin experienced periodic bouts of illness and became a near recluse for long periods of time. At Down House he found the quiet and the privacy he needed to develop his ideas and work out his theories of natural selection. He also found investigations into plants to be enormously satisfying and in the gardens and glasshouses that he built Darwin conducted a range of experiments and observations on all manner of botanical subjects. When he was ill his children often assisted him, bringing plants into his study or sick room and helping him conduct the experiments and record observations.

One of the subjects that fascinated Darwin was plant movement. In the classical view of nature prevailing at the time, animals were capable of moving but plants were not. Yet during his travels in the tropics, Darwin observed first-hand that plants were capable of movement and he wanted to know how this was possible. He began to assemble plants for study and he recorded many observations on temperate plants such as hops (*Humulus lupulus*, used for brewing beer) and bindweed (*Calystegia* sp.), among others. But what he really wanted was to compare these temperate climate plants with those from the tropics, and so he decided to build a "stove", the term then used for a heated glasshouse in which tropical plants could be grown.

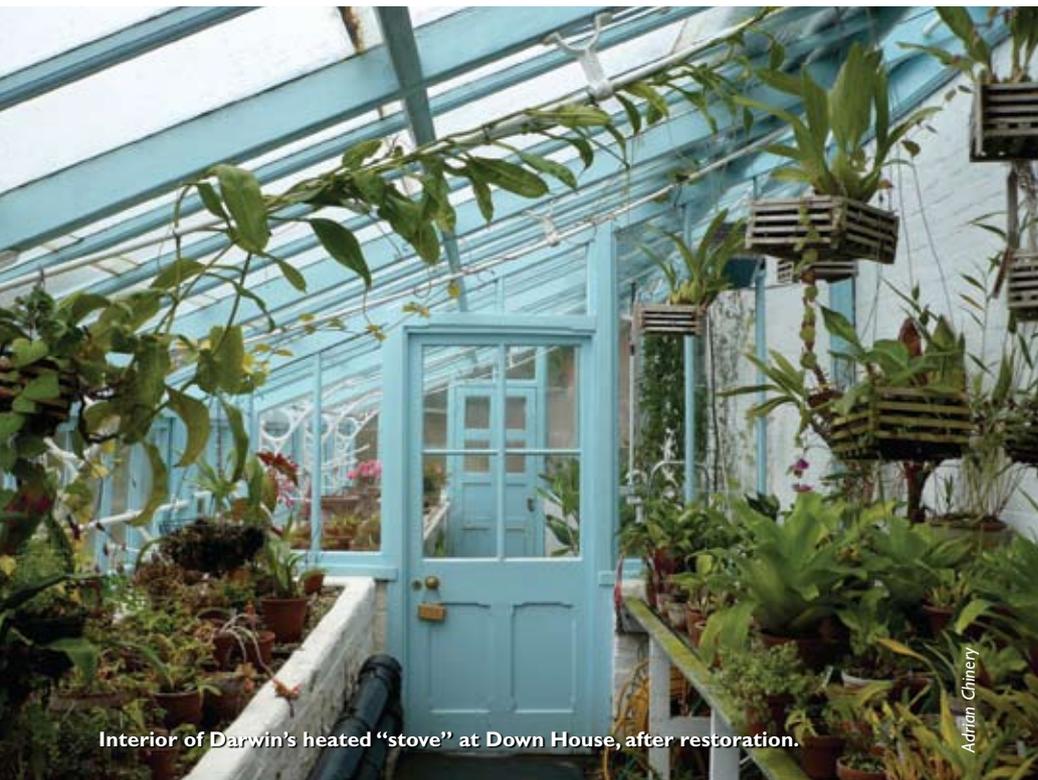
Darwin's Stove and studies on plant movement

In 1862 Darwin began construction of a heated glasshouse on the property at Down House. Before it was completed he was already longing to fill it up with all manner of exotic plants. In correspondence with his friend Joseph Hooker, then deputy director of Kew Gardens, Darwin wrote about his desire to study orchids and tropical climbers. Hooker responded by asking for a list of the plants Darwin was interested in acquiring. In January 1863 Darwin travelled to Kew with his list of desiderata in hand and a short time later several



While Darwin is certainly best known for his evolutionary studies, it is seldom realized that he did not confine his studies to animals and geology, but also worked with plants.

Charles Darwin, later in life, at Down House (note climbers on pillar!).



Interior of Darwin's heated "stove" at Down House, after restoration.

Adrian Chinery



A tendril climber, *Lagenaria siceraria*, with new tendrils and some already coiled tightly on a fence.

Dino Gallick

packing cases arrived at Down House, filled with Hooker's largesse. This caused Darwin to write to his friend delightedly and to joke that perhaps Hooker would end up before the courts for having so liberally shared Kew's resources. One wonders if Hooker could be faulted for making so many tropical plants—which were, after all, government property—available to his friend, in light of the good use he made of them and the many studies he published based on that gift.

Among the tropical plants Darwin now possessed were a number of climbers, and he proceeded to study the ways in which climbing plants are able to ascend vertically. Darwin recorded precise observations on how long it took for a young shoot tip to make a full circle, and at what stage of development that stem became rigid and stopped its movement. He reported that some species always twine in a clockwise direction, while others twine anti-clockwise. A few species had individuals that twined one way or the other, just as people are left- or right-handed, and oddly enough, some plants reverse direction as they grow! He noticed that a tendril would move around a very slender thread, yet was not affected by rain drops that were much heavier, nor by wind blowing on the tendril.

Somehow the plant could detect anything on which it might possibly twine, yet it did not react to other physical stimuli.

Darwin wrote up all this information, combining his own observations with a thorough survey of the literature on plant movement. Initially published in 1865 as an article in the *Journal of the Linnean Society of London*, Darwin later expanded and updated in the article into a book, first published in 1875 and reprinted several times. Early in the text, describing the twining motion of hops stems, he mentions "To ascertain more precisely what amount of movement each internode underwent, I kept a potted plant, during the night and the day, in a well-warmed room to which I was confined by illness." It is the only acknowledgment Darwin makes in the book that his study of climbers was motivated, at least in part, by his own ill health. He categorized climbers into four groups: *stem twiners*, which climb by means of the stem wrapping around a support; *leaf climbers*, which climb by means of *leaf petioles*, midribs, or inflorescence stalks; *tendril bearers*, which possess specialised tendrils on the stems, leaves, or inflorescences that wrap themselves around a support and finally, *hook and root climbers*, that either scramble over other plants by means

of hooked structures that do not wrap themselves around the support, or by forming adventitious roots along the stem that allows the plant to cling onto a support.

Although Darwin recorded in detail what he observed, he did not have a mechanism to understand how a plant was able to move. That explanation came only many years later; after plant physiologists and experts in biomechanics investigated the nature of the mechanisms that enable a plant to move.

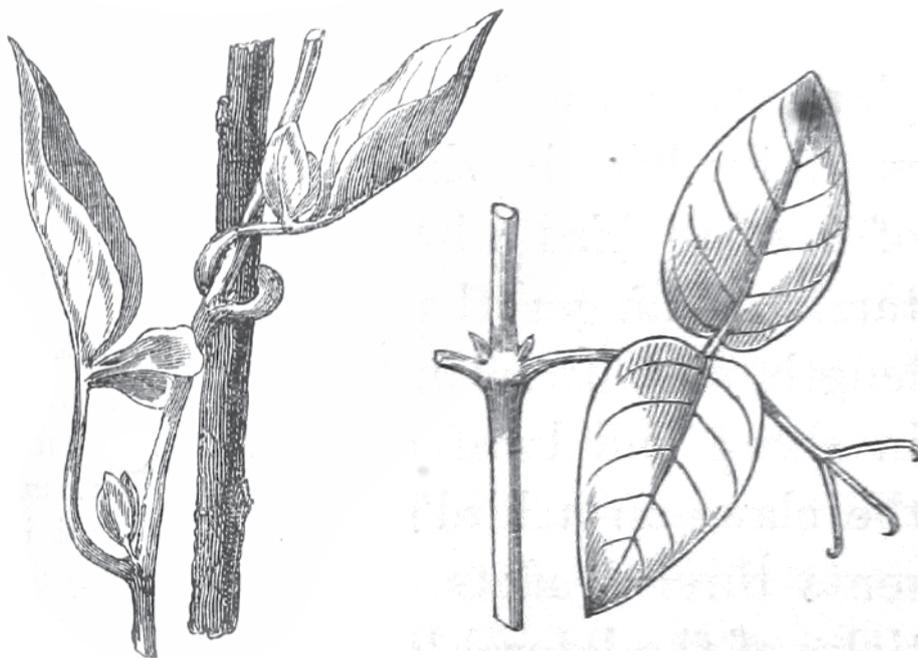
How do plants move?

Thigmotropism, from the Greek *thigma*, meaning 'touch', describes the movement of climbing plants when tendrils (modified leaves or stems) wrap themselves around a solid object. They can do this very quickly; as Darwin recorded, a tendril can wrap around a support one or more times in less than one hour. The climbing plant is responding to touch — it can somehow detect the presence of a solid object on which it might climb, but it does not react to wind blowing on the tendril or a raindrop falling on it. How does this work? In order to understand how plants move, we must examine what happens in the cells inside the tendril. When touched, plant cells produce ethylene, a plant hormone that stimulates

growth in cell width rather than an increase in cell length. Consequently, the cells of the tendril touching a solid object shorten and the cells on the opposite side elongate, allowing the tendril to curve around the support. So the plant hormone ethylene is responsible for one kind of plant movement.

In Darwin's time plant hormones had not yet been discovered; that came about more than 60 years later, in 1926, when Frits Went isolated a substance from the seedling leaves of wheat that made the tips turn toward the light; he named this chemical substance *auxin*. Yet here again, Darwin led the way in making observations that set the stage for others to explain how things worked. Darwin and his son, Francis, recorded the first observations on seedlings of oats (*Avena sativa*) and canary grass (*Phalaris canariensis*), which bend towards light as they elongate. Darwin concluded that, in response to light, some 'influence' causing bending is transmitted from the tip of the seedling leaf to the area below the tip where bending normally occurs. This sort of plant movement towards (or away from) light is called phototropism. How does it work? In response to light, the hormone auxin 'moves' from the light side to the dark side of a plant's growing tip, stimulating the elongation of cells on the shaded side. This sounds simple enough but the biochemistry involved in the redistribution of auxin in response to light is very complex. This intercellular transfer is mediated by a *photoreceptor*, a pigment-containing protein that absorbs light energy and converts it into a biochemical response.

The movements of the stems of climbing plants which so fascinated Darwin can now be explained in terms of the interaction between these two hormones, auxin and ethylene. First, the elongating stem makes a rhythmic sweeping motion in a circle, toward and away from the light source (phototropism); this is due to the production of auxin at the stem tip, which regulates the elongation of cells on the side away from the light. Then, once the sweeping young stem touches something solid thigmotropism takes over: the cells on the side of the stem that touches a solid surface produce ethylene, which cause them to widen rather than elongate, and curve toward



A leaf twiner; *Solanum jasminoides*, with its petiole wrapped around a stick.
Drawn by George H. Darwin and reproduced from *Journal of the Linnean Society* 9: 42 (1865).

"*Bignonia* from Kew" one of the plants sent down by Hooker to Down House.
Drawn by George H. Darwin (Charles's son). Reproduced from *Journal of the Linnean Society* 9: 49 (1865).

and around the object. And so the stem wraps around the support. Simple!

On a cellular level, plant movement can be very simply explained as a response to internal chemical signals, e.g. hormones. In fact hormone comes from the Greek word *horman* meaning 'to set in motion.' Hormones are small organic molecules that function as highly specific chemical signals between cells. A single hormone molecule can trigger changes in the concentration of many other molecules that in turn produce other changes within cells. It has often been said that humans are at the mercy of their hormones, and the same is definitely true for plants: these molecules govern everything that happens inside a plant and also how they respond to their external environment. While Charles Darwin didn't understand how hormones worked in plants, he carefully described their outward effects. His botanical investigations, though often overlooked and unremarked today, set the stage for later researchers in the plant sciences to make significant contributions to what we know about how plants work.

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George Staples
Herbarium
Dina Gallick
Living Collections

Photos by Anon unless otherwise stated

*Urothemis signata**Rhyothemis phyllis**Pseudagrion microcephalum*

Dragonflies of the Gardens

*Ceriagrion cerinorubellum**Ictinogomphus decoratus*

The Singapore Botanic Gardens is well known for its flora. The resident birdlife and butterflies are also blessed with many human admirers. However, another group of beautiful insects exist in the Gardens and is often over-looked by visitors. These colorful and vibrant Gardens inhabitants are the dragonflies.

According to the scientific classification of insects, dragonflies belong to the order Odonata which means 'toothed ones'. The order is further divided into two suborders: Anisoptera ('dissimilar wings') and Zygoptera ('similar wings'). In layman's terms, Anisoptera are the dragonflies and Zygoptera are the damselflies. Thus both dragonflies and damselflies are closely related and the generic term 'dragonflies' is often used when referring to both insect groups. It is easy to differentiate between a dragonfly and damselfly. A dragonfly is generally larger, fast flying and they rest with wings opened. On the other hand, damselflies are smaller, weaker fliers and most of them rest with wings closed above their body. Dragonflies are fierce predators targeting any prey they can catch and handle. These include small

Dragonflies are fierce predators targeting any prey they can catch and handle. These include small flies, butterflies, and other small insects including mosquitoes.

flies, butterflies, and other small insects including pests such as mosquitoes. Males of most common species are more colourful than females so they are the ones most often seen at a typical pond defending a small territory.

The life of dragonflies is inevitably linked to water. After mating, females lay their eggs in aquatic habitats, which depending on the species, can be ponds, lakes or streams. The eggs develop into aquatic larvae that are like their parents: fierce predators, this time hunting small water insects or fish. A large part of a dragonfly's lifecycle is spent as an aquatic larva. On average, it takes about a year for larvae to develop, longer for temperate species that suspend development during the winter. Eventually, the larvae will develop fully and leave their hidden underwater

existence to emerge into the colourful adults we are more familiar with.

In Singapore, we have 117 recorded dragonfly species with about seven or eight species believed to be locally extinct due to habitat loss. The Gardens has many ecologically different water bodies. There are large ponds like Symphony Lake and Eco-Lake, and small ponds like the one in the Children's Garden and a marshy pond near Swan Lake. There are also artificial ponds like those at Sundial Garden and Plant House. All these habitats support different dragonfly communities. This is why the Gardens is a great place to appreciate dragonflies as most of Singapore's common pond species can be seen. All together, ten different dragonfly habitats have been identified in the Gardens. Surveys of these

habitats by Gardens' staff are ongoing to obtain baseline data on the dragonfly population. So far a total of 25 species has been recorded, giving the Gardens a respectable proportion of the 117 known from the whole of Singapore.

Most species are extremely attractive. For example, mature males of the common *Neurothemis fluctuans* found throughout the Gardens have dark red wings. Other reddish dragonflies like *Crocothemis servilia* and *Rhodothermis rufa* can also be found. Blue is also a common colour, such as for the species *Brachydiplax chalybea* and *Acisoma panorpoides*. *Rhyothemis phyllis* is a species whose wing pattern reminds one of a bee while other species also have prominent and beautiful wing patterns, including *Hydrobasileus croceus*. The large, impressive *Ictinogomphus decoratus* is one of the fiercest insect predators around. Some species are very active fliers that seldom perch. *Pantala flavescens* and *Pseudothemis jorina* are two examples.

Damselflies, being smaller, require a keen eye to spot but are just as colourful. The very common *Pseudagrion microcephalum* is entirely blue while *Ceriagrion cerinorubellum* is blue and red with a dash of green on the thorax. *Agriocnemis femina* is one of the smallest species in Singapore with a hindwing of only 10mm long. This is not easy to spot but can be identified by the white thorax of the mature male or the reddish young female.

Dragonflies add colour to the ponds scattered within the Gardens. Hopefully, further surveys can uncover more species especially those that are active at dusk and perhaps even rare species taking refuge among the Gardens' greenery. Although situated in the heart of a bustling city, the Gardens support a very healthy dragonfly population thanks to the general good health of the ponds. The Gardens plays a vital role in the conservation of Singapore dragonflies. So next time you take a

walk in the Gardens, pause for a while at a pond. Perhaps you can spot the red *Rhodothermis rufa* or the beautiful blue *Brachydiplax chalybea* as they make a fly-past in the sunshine.

Robin Ngiam
National Biodiversity Centre

Photos by Robin Ngiam



Dragonfly Larva



Acisoma panorpoides



Agrioptera insignis



Agriocnemis femina (immature female)



Brachydiplax chalybea



Crocothemis servilia



Pantala flavescens



Ischnura senegalensis

Dryobalanops aromatica

Flowering giants in the Gardens

Over the past few months beginning in March, a family of trees has been quietly blooming in the midst of the lush greenery and floral displays of the Gardens. Attracting little attention with their usually small inflorescences, it was only when trees of a more expressive family member, the Kapur (*Dryobalanops aromatica*), laid their entire crowns with showy blossoms that confirmed the arrival of an uncommon event: The flowering of the dipterocarps!

The Dipterocarpaceae, commonly known as dipterocarps, is a family of pantropical trees that occur in tropical forests at altitudes up to 1800m above sea level (Ashton, 1982). The highest species diversity occurs in Tropical Asia, with 10 genera and 386 species found in the Malaysian region, including Singapore.

The curious might ask what is special about this family of trees. To find out the answer, one needs to stand among the trunks of these towering giants. They form the dominant component

It is believed that mass flowering occurrences are triggered by environmental cues, namely a period of unusually dry weather and increased daily sunlight hours between January and March.

of the forest in our region, accounting for up to 30% of the total number of trees and 55% by wood volume (Symington, 2004). Dipterocarps are typically emergent forest trees, sometimes growing up to 70m in height, with a cylindrical trunk rising straight up before branching at heights of 20 to 40 metres. The better known, include Chengal (*Neobalanocarpus*), Keruing (*Dipterocarpus*) and Seraya (*Shorea*). The largest recorded Chengal is found in the forests of Terengganu in Peninsular Malaysia. It measures 16.75m in diameter at its base and is estimated to be about

1300 years old. The tallest dipterocarp recorded in a *Shorea faguetiana* in Sabah that reaches over 80 m.

Dipterocarps typically flower once every 4 to 8 years. The intensity varies from a few mature individuals flowering to a mass flowering of almost all dipterocarp trees and other tree families throughout the Malesia region (Corlett, 1990). It is believed that mass flowering occurrences are triggered by environmental cues, namely a period of unusually dry weather and increased daily sunlight hours between

*Shorea leprosula*

Paul Leong

*Shorea sumatrana*

Serena Lee

*Dipterocarpus zeylanicus**Shorea leprosula**Shorea macroptera* ssp. *macroptera**Hopea odorata**Shorea pauciflora**Dipterocarpus kunstleri*

January and March. Some exceptions are *Dipterocarpus grandiflorus* (Central Catchment Nature Reserve), *Hopea mengarawan* (Gardens Rain Forest), *Shorea roxburghii* and *Dipterocarpus zeylanicus* (Garden grounds) which flower and fruit almost every year.

There are 72 species of dipterocarp trees from 6 genera in the Gardens, of which 18 species are known to have flowered in recent years. Some of the more notable mature dipterocarps in the Gardens are listed in the table below:

<i>Anisoptera megistocarpa</i>	(Native)	Gardens Rain Forest
<i>Dipterocarpus zeylanicus</i>	(Sri Lanka)	Between NParks HQ and the National Biodiversity Centre (NBC) Office
<i>Dipterocarpus oblongifolius</i>	(Malesia)	Tanglin Entrance, besides gate
<i>Dryabalanops aromatica</i>	(Malesia)	Several locations in the Gardens
<i>Hopea mengarawan</i>	(Native)	Gardens Rain Forest
<i>Hopea nutans</i>	(Malesia)	Beside Symphony Stage
<i>Hopea odorata</i>	(Northern Malaysia to Thailand)	Near NParks HQ and beside Swan Lake
<i>Shorea bracteolata</i>	(Native)	Between NParks HQ and NBC Office
<i>Shorea gratissima</i>	(Native)	Gardens Rain Forest
<i>Shorea leprosula</i>	(Native)	Gardens Rain Forest and near Tanglin Gate
<i>Shorea macroptera</i>	(Native)	Gardens Rain Forest
<i>Shorea ovalis</i>	(Native)	Gardens Rain Forest
<i>Shorea palembanica</i>	(Malesia)	Near Swan Lake
<i>Shorea pauciflora</i>	(Native)	Gardens Rain Forest
<i>Shorea robusta</i>	(India)	Within the Orchid Nursery
<i>Shorea roxburghii</i>	(Malesia)	Between Swan Lake and Tanglin Gate
<i>Shorea sumatrana</i>	(Malesia)	Beside Symphony Stage
<i>Vatica maingayi</i>	(Native)	Gardens Rain Forest
<i>Vatica rassak</i>	(Malesia)	Behind Holttum Hall

A period of relatively dry weather beginning in late December last year which ended with rainy spells in mid-February this year, hinted at a possibility of a mass flowering season. It did not take long before the trees began to respond, with *Shorea sumatrana* throwing out the first blooms towards the end of February, although the Gardens Rainforest Hopea mengarawan may have flowered even earlier. Others soon followed except for *Shorea gratissima* and *S. roxburghii*. The dipterocarp trees of Bukit Timah Nature Reserve, Central Catchment Nature Reserve and the two trees in Changi (part of the original coastal forest) also began to flower.

In Singapore, the Gardens and our nature reserves are the remaining refuges of these majestic trees. Most dipterocarps have either Vulnerable or Critically Endangered conservation status in Singapore (Davison, 2008). The authors hope that significant quantities of viable seed will be produced in 1 to 2 months from now. This would ensure a growing seedling stock that can be used to enhance the populations of these great trees in our forested areas, as well as enrich the diversity of native trees for planting in our parks and along our streets.

Lua Hock Keong
National Biodiversity Centre

Lahiru S. Wijedasa
Living Collections

All photographs by Lua Hock Keong unless otherwise stated.

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Reliving kampong days. Our Landscape Technician, Ismail, shows how a net should be cast.



Greening things up



An *Ensete ventricosum* getting its fertilizer dosage. Pieces of tilapia are buried in three shallow holes around the plant.

Everybody recognizes the Gardens for its lush, verdant landscapes, but perhaps less obvious is that even the behind-the-scenes gardening action is going green. Thanks to the combined efforts of the Horticulture team, maintaining the Gardens is becoming a more and more environmentally friendly affair. Here are just some examples of interesting green practices in the Gardens.

Making full use of all available resources

Dried leaves that fall to the floor are some of nature's natural fertilizers and soil conditioners. They release nutrients back into the ground when they decompose, and the added organic matter improves overall soil quality. All dried leaves from the Gardens stay in the gardens – and are either swept under trees to form a leaf-mulch, or collected and shredded into smaller pieces that are later mixed back into the soil or used as mulch.

Another bona-fide Gardens' organic fertilizer is a lot more 'fishy'. One of the much loved activities for visitors at Swan Lake and Symphony Lake is to feed the fish, and as a result, these ponds are positively teeming with life (albeit 99% tilapias). However, after a nasty *Oodinium* (a fungus) infestation almost wiped out the entire fish population in Swan Lake early last year, we quickly learnt from the AVA (Agri-Food and Veterinary Authority of Singapore) that the total number of fish had to be kept in check in order to keep them healthy. Once the fish population

All dried leaves from the Gardens stay in the gardens – and are either swept under trees to form a leaf-mulch, or collected and shredded into smaller pieces that are later mixed back into the soil or used as mulch.

becomes too large and exceeds the pond's oxygen capacity, the fish become sickly and highly susceptible to disease.

Maintaining this balance calls for the regular culling of fish from these ponds. As tilapias are the most prolific and constitute most of the fish population, they are the only kind of fish that are routinely caught. But what is bad news for at least some of the tilapias is excellent news for the plants. The 150-300 kg worth of tilapia fish collected from the ponds every couple of months is chopped up and buried among the plants as a nutrient-rich organic fertilizer.

Treating pests the biological way

In the Gardens, we tolerate insect pests to a degree because generic chemical sprays not only wipe out pestilent insects, but also the much-loved insect life such as butterflies and dragonflies. Chemicals can also disrupt whatever ecological balances between predators and prey that might exist. But once insect damage becomes too severe and human intervention becomes necessary, we try to go for targeted and more biological control measures. For instance, biological

pesticides that contain neem extracts have been found to be effective at controlling some insects. A good example would be the cycads in Evolution Garden, as the regular application of neem products on their new leaves drastically reduces the damage wrecked by caterpillars.

Another biologically friendly approach is to try and physically trap whatever pest that is causing you grief. In the cool house in the National Orchid Garden, problematic slugs are baited and caught using irresistible gastronomic treats such as cucumber slices soaked in beer. The palm collections around the Gardens are also protected with traps, these ones laced with pheromones that entice the damaging rhinoceros beetles and red-palm weevils with promises of soul mates.

But in many cases, pest problems can be controlled simply by giving the plants a health booster. Regular applications of organic fertilizer make many plants stronger, healthier and much less susceptible to pests and disease. Perhaps a buried fish will do.

Thereis Choo
Living Collections



The Gardens' logo: the history of the lakka palm

The upright leaves of this palm that line our paths sway gracefully in the breeze. Affectionately greeted as the 'sealing wax palm', 'lipstick palm' or 'pinang rajah', *Cyrtostachys renda* is an attractive plant no matter which name you choose.

Found abundantly in the fresh water swamps of South East Asia, including Singapore, it thrives on fertile soil in gardens and can soar as high as 15 metres, flamboyantly displaying its attractive red crown-shaft and firm green leaves. Exquisite rows of this palm in the Gardens are credited to the vision and deft touch of Dr Tan Wee Kiat, a previous Director of the Gardens.

Dr Tan was first captivated and inspired by *Cyrtostachys renda* from an old

lithograph featuring the palms in a swamp. He knew this was the one for the logo of Singapore's historical Botanic Gardens. This stunning palm was worked on by award winning artist Mr Eng Siak Loy and the rest is history. He set about featuring this icon in various forms, each time bringing to life its luster and beauty. It is now also featured in the stained glass in the foyer of the Visitor Centre, as well forming the motif of the Clock Tower there. As the logo of the Gardens, it sits on the shirt of each staff and volunteer. Who would have thought that a palm from a swamp could receive such reknown.

Benjamin Aw
Visitor Management

Photos by Benjamin Aw



Cross section of the stem



Cross section of the stem

Lush leaves, *Cyrtostachys renda*

Strange encounters of the fourth kind

On 11th March, one of our Gardens Research Fellowship recipients, Dr Wayne Rosing from Middle Tennessee State University, gave an exclusive workshop entitled 'Collection, Specimen Preparation, and Classification of Plasmodial Slime Molds' to 16 enthusiastic staff of the National Parks Board. All were eager to learn more about this strange group of little-known organisms that move and feed on food particles like amoebas and yet, reproduce by spores. These organisms are all around us though we have often brushed them off as minute fungi or moulds, not warranting a detailed study.

These organisms moved like amoebas when in their feeding state, and you could clearly observe cytoplasmic streaming under a 10× objective lens of a compound microscope. When the streaming slows down, the mature plasmodium prepares to fruit. This eventually gives rise to fruiting bodies containing spores. These fruiting bodies, ca. 3–8 mm long, came in numerous varied forms ranging from ice-cream cone look-a-likes and little popsicles to miniature toilet plungers. Some of the fruiting bodies were iridescent under light and shimmered like tiny fairy lamp-posts. We could all not help but gawk with amazement and wonder, exclaiming spontaneously with ooohs and ahhs.



Diachea leucopodia



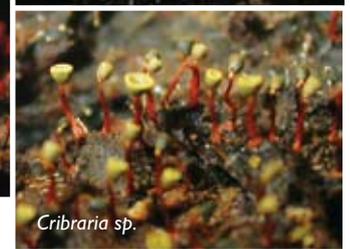
Hemitrichia calyculata



Arcyria denudata



Arcyria magna



Cribraria sp.



Physarella oblonga

Serena Lee
Herbarium
Nura Abdul Karim
Living Collections

Pictures by Serena Lee
Identifications by Wayne Rosing

Willi Henning Society XXVIII meeting

The Gardens was host to the 28th meeting of the Willi Hennig Society from the 22-26 June. Willi Hennig is regarded as the father of modern phylogenetic systematics, which is the investigation of the evolutionary relationships between species. Organised jointly by the National University of Singapore and the Gardens, the meeting brought together about 80 scientists from every continent, representing sixteen countries. The meeting attracts research scientists from the fields of zoology, botany, systematics, ecology, molecular biology, virology and the philosophy of biology, and this mix can often lead to extended and occasionally heated debates. The meeting also provided the opportunity for some student speakers to earn their stripes, including a number from NUS. In all there were four days of presentations, including topics as diverse as the bizarre mating behaviour of Sepsid flies to a week-by-week reconstruction of the molecular evolution



of the H1N1 virus as it transverses the globe. As well as a reputation for cutting-edge science and philosophy, Henning meetings also have a reputation for providing a good party. This one proved to be no exception, as a 10-course tasting menu of the best of Singapore makan ('food') was dished up at a great Marina Bay venue. I am sure all participants wish

to join me in thanking the organizing committee for providing such a stimulating and enjoyable conference.

Mark Hughes
Research Associate

All hail the queen!

Dark-purple ripe mangosteens

Garcinia mangostana, commonly referred to as mangosteen in English, *mangis* in Malay, *dao nian zi* in Mandarin pinyin, and *mangkustan* in Tamil, is certainly the most esteemed species of its genus. It is widely regarded as the 'queen of tropical fruits', yet it is virtually unknown outside of Southeast Asia. Requiring a rich, acidic soil and humid equatorial climate with plentiful year-round rainfall, the mangosteen has proven difficult to establish outside of its native range. Young trees are notoriously slow to establish and take ten to fifteen years before bearing fruit; even then the yield may be low and uncertain. Thought to be a natural polyploid hybrid between *Garcinia malaccensis* and *Garcinia hombroniana*, the mangosteen is now known only as a cultivated plant. All species of *Garcinia* are dioecious, with separate male and female trees. However in the mangosteen male plants are unknown, and female trees produce fruit without fertilization by pollen.

The mangosteen is a relatively slow-growing, evergreen tree (rarely exceeding 20 m in height) with a straight trunk and a dense, rounded to conical canopy. All parts of the plant contain yellow latex. The showy but short-lived flowers measure 4-6 cm wide, and are borne singly or in pairs at the branch tips, having four pinkish petals and four cup-like sepals. The broad, 4-8 lobed stigma sits directly atop a round white ovary. Short staminodes (sterile stamens) surround the ovary. The familiar fruit takes 5-6 months to mature

and has a thick, brownish-purple pericarp (rind) surrounding 4 to 8 white, juicy segments. The stigmatic lobes indicate the number of segments inside the fruit, and usually only one or two segments contain seeds. Consequently, when shopping for mangosteens remember that fruit with a greater number of stigmatic lobes will contain more seedless segments.

While the rind tastes astringent and bitter, the flesh is delicate and aromatic, with a flavor that is both sweet and slightly acidic. Sir Emerson Tennent, colonial secretary of Ceylon in the mid 19th century, compared the flavor of mangosteen to perfumed snow! This is an apt simile, since in traditional Chinese medicine the mangosteen is regarded as cooling (yin), and thus a perfect antidote to the "heaty" (yang) durian. Mangosteen fruit are mostly consumed fresh. The pulp is canned, frozen and processed into juice, preserves, and candy, but the delicate flavor does not hold up well to processing. Yet another reason to enjoy them while they are in season! Thailand, Indonesia, Malaysia, and the Philippines lead in global mangosteen production, but commercial production is low compared to other tropical fruits. The thick rind means fresh mangosteens hold up well to shipping; but even under refrigeration they remain edible for only 2-3 weeks, which is a deterrent to long-distance distribution.

Although the vitamin and mineral content of mangosteen flesh is relatively low, it



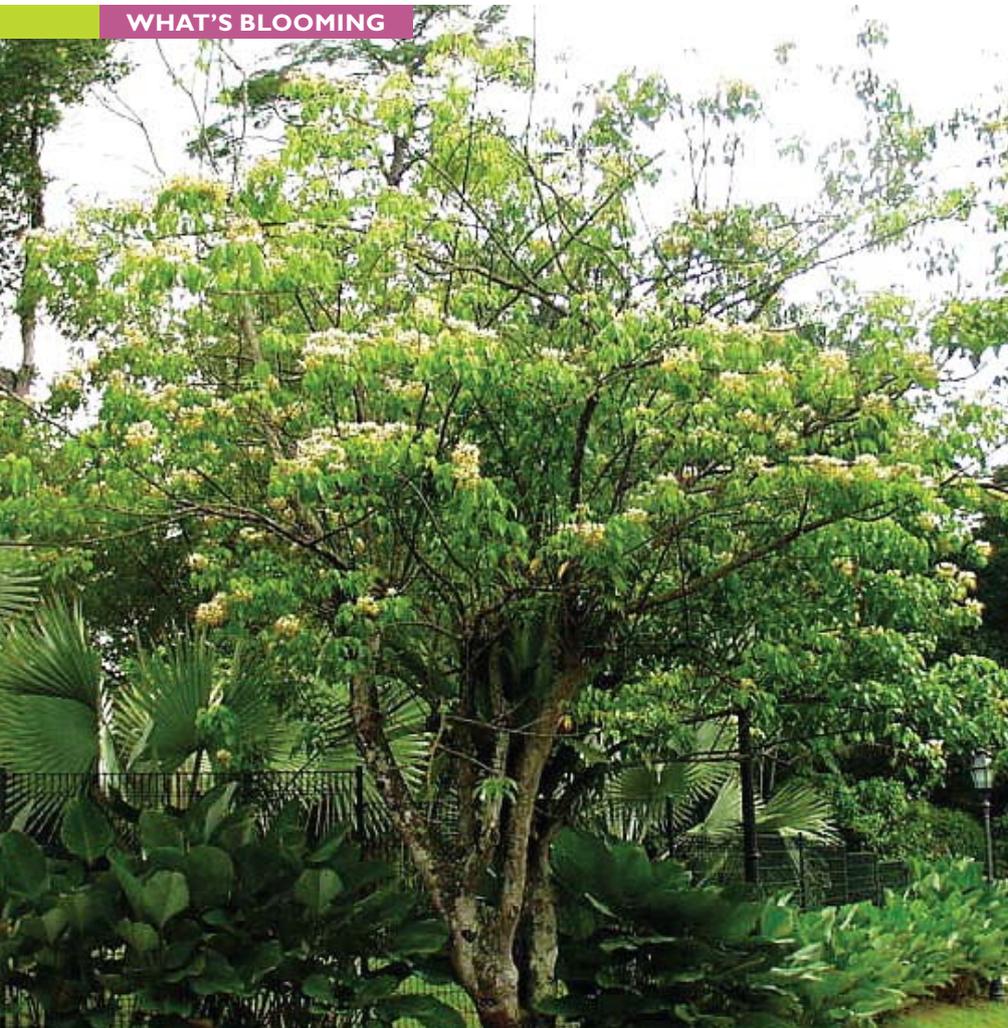
A peeled mangosteen showing the delicious white segments

has recently been touted as a "superfood" as it contains high concentrations of antioxidant compounds called xanthones. These are reputed to have anticancer, antimicrobial, anti-inflammatory, anti-aging, and immune-enhancing properties, but there is little clinical research to substantiate these claims. In traditional folk medicine, mangosteen bark, roots, leaves, and pericarp are used to treat diarrhea, dysentery, fever, menstrual problems, mouth sores, skin infections, thrush, wounds, and urinary disorders. The fruit rind, which has a high tannin content, is used to tan leather and as a source of black dye. It is also used as an ingredient in soaps and hair care products. The seeds are sometimes consumed after boiling or roasting, and oil extracted from the seeds is used in cooking as a substitute for ghee. The heartwood of mangosteen trees is dense and very strong. Trees that do not bear fruit provide timber for furniture, carpentry, cabinetry, and tools.

In the Gardens, mangosteen trees may be viewed on Lawn XJ adjacent to the Garage, in the fruit crops section of the Economic Garden, and at the Jacob Ballas Children's Garden. Approximately 20 other species of *Garcinia* are also planted in the Gardens landscape. Next time you visit be sure to stop by to see the Queen!

Marc S. Frank
Living Collections

Photos by Marc S. Frank



Crateva religiosa

Crateva religiosa, commonly known as the sacred garlic pear or temple tree, flowered recently in the Gardens. Our handsome old specimen can be found growing along the path near Symphony Lake. This species can be found growing wild or cultivated in India, throughout Southeast Asia right down to Micronesia and Polynesia. Both its botanical and vernacular names allude to its religious significance. The species is often cultivated around Buddhist temples and tombs in Asia and Pacific Islands.

Crateva religiosa is a small, slow-growing tree with a much-branched crown. The sacred garlic pear belongs to Caparidaceae or caper family, and so is related to the capers that we consume. This plant has glossy trifoliate leaves with long petioles. The blooms are large and typical of the caper family, having four petals with long, whiskery, violet to purple stamens. The long stamens make the flowers look like spiders, giving

rise to another common name for the species: spider tree. The petals are a rich cream colour that deepens with age and have a garlic scent. The leathery ovoid-shaped fruit is a pale tawny colour, and dangles on a long stalk and is about the size of a tennis ball. The pulp is fleshy, pinkish, garlicky and said to be poisonous.

This plant has medicinal value in both India and Southeast Asia. In India, the pulp of the fruit was mixed with mortar to make cement, or used as a mordant in dyeing, while the foliage was used as fodder. The smooth, closed-grained wood has been used to make drums and artifacts.

So on days when there are concerts near Symphony Lake, why not explore and see if you can find this sacred tree.

Top left:
A blooming *Crateva religiosa* tree growing near the Symphony Lake.

Top right:
Close-up of the spider-like flowers of *Crateva religiosa*.

Bottom right:
The garlic-smelling and toxic fruit of *Crateva religiosa*.

Nura Abdul Karim
Living Collections

All photos by Nura A. Karim unless otherwise stated.

Corner's kapurs in flower

In early April this year a spectacular flowering phenomenon associated with *Dryobalanops aromatica* (more usually known as kapur or Borneo camphor) was initiated, forming carpets of small, white flowers in four locations in the Gardens. If you were to stand in the midst of the fallen blooms at the foot of these large kapurs, you will not fail to miss their accompanying fragrance. What we experience today is due to the pioneering work of Professor E.J.H. Corner (Assistant Director of the Gardens at the time) who planted what are now our largest specimens in 1940 and 1942.

The kapur is one of the loftiest trees of the Dipterocarpaceae family, an emergent in the forest, and it exhibits a very statuesque form indeed: its balanced crown is normally denser than the fairly open ones of *Dipterocarpus*. Corner wrote in the 3rd edition of his book, *Wayside Trees of Malaya* (1988), "In parts of the East Coast States the kapur formed almost pure forests, and it was at once distinguished by its beautiful, open, fine-leafed crown. It was one of the tallest trees in the Indo-Malayan tropics, frequently attaining more than 200 feet (60m) in height. *Kapur*-forests have been logged so extensively that they are hardly to be seen".

While normally used as a timber tree, it has also been exploited as a source of camphor and an oleo-resin. Borneo camphor has been an item of trade for almost two millennia and was the first kind of camphor brought to Europe. You can crush its drip-tipped leaves and immediately smell the familiar resinous fragrance.

This tree has already been planted in our streetscapes (there are some along Mandai Road at about 5m height) and it is only a matter of time before we see more of these beautiful and fragrant blooms along our roads. As the stand-alone trees within the Gardens already exhibit such a beautiful sight and smell, the gregarious blooming of these trees in Singapore's streets will be spectacular.

Lahiru S Wijedasa
Living Collection

Derek Chan
Streetscape Division

Photos by Chin S. L. Koh



Top & middle:
Dryobalanops aromatica near Sundial Garden.

Bottom:
Close up of one of the scented blooms.

Hedychium longicornutum – a stunning epiphyte from Malaysia

If there was a beauty contest among gingers, *Hedychium longicornutum* would surely qualify to the semi-finals. The inflorescence is both weird and beautiful.

Its orange-red flowers are of an intricate architecture. Long and slender red corolla lobes hang downwards, while the long staminodes and deeply split labellum are curled and usually bright orange. The flowers open for 48 hours, a long duration compared to many other gingers, where flowers typically last just few hours to one day. Flowers emit a slight and pleasant scent wooing butterflies and perhaps also moths with long probosces to have a taste of its sweet nectar deposited deep at the bottom of the long

corolla tube. In return, the plant expects the insects to transfer some of the pollen from the long exerted anther onto the stigma.

This species flowered regularly for past few years in the Ginger Garden, but only twice did we see the formation of fruits. As in other *Hedychium* species, the fruit is a septifragal capsule with three leathery valves. These open when the fruit is ripe and are bright orange inside with orange-red seeds embedded in bright red aril – a colour combination highly attractive to birds that ensure seed dispersal. As we have currently only single plant in Ginger Garden, we can assume that this species is capable of self-pollinating.

If there was a beauty contest among gingers, *Hedychium longicornutum* would surely qualify to the semi-finals. The inflorescence is both weird and beautiful.



Detail of the inflorescence.



Hedychium longicornutum perched on rocks in the Ginger Garden.

This species is native to Peninsular Malaysia and is rather widespread in lowland and midrange forests. It has been recorded and collected many times from various parts of the Malay Peninsula, but unfortunately has never been found in Singapore in the wild. It grows perched on trees or in rock crevices and for that purpose it is well adapted by having swollen roots. These roots not only help to store some extra water, enough to sustain the plant for couple of days without rain, but also provide a firm grip to increase the stability of the plant.

The name *H. longicornutum* was first mentioned by Griffith, an English botanist working for the East India Company, in one of his unpublished manuscripts. It was properly described only in 1892 in J.G. Baker's account of Scitamineae (old name for the plants of the ginger order - Zingiberales) he prepared for the Flora of British India. Interestingly, Baker described in the same work and on the very same page 228 yet another epiphytic *Hedychium* species from the Malay Peninsula - *H. crassifolium*. We know however, that Baker

based at Kew herbarium worked mainly from dried plant specimens and drawings, and had no chance to see the true variability of gingers in the wild. He himself admitted that it was a great limitation for the study of this family. It was H.N. Ridley, director of the Gardens between 1888-1912, who carried out extensive fieldwork in the region and observed this species in the wild in several places. He concluded that both names proposed by Baker represented only one species, and chose the name *H. longicornutum* to be used for this taxon. R.E. Holttum, who also spent over 30 years in this region, further studied gingers in the Malay Peninsula and supported Ridley's treatment. He noted that the difference in leaf shape and size can be considerable and the colour of the labellum and staminodes varies a lot from yellow to orange to reddish.



Fully matured fruit.

A 'drama'-tic week in the Children's Garden



A bee, a bear and a chicken... these are some of the funny yet endearing mascots which attracted hundreds of children, their parents and their friends to attend the new drama performances at the Jacob Ballas Children's Garden (JBCG) during the one-week March 2009 school holidays.

In the afternoon of 15 March 2009, performers from the Arts Theatre of Singapore Ltd. dressed up as colourful insect characters which blended into the JBCG garden setting perfectly. The Arts Theatre had put together a full-of laughs, yet full-of-education, performance about Buzzy Bee Larry and his (Mandarin) language lesson. Our young audience (4 to 12 years of age) were introduced to Mandarin words and phrases describing nature through the use of conversational Mandarin in a fun, light-hearted way. Larry and his friends also led sing-along songs and captivated their audience with their favourite Mandarin nursery rhymes. Throughout the 20 minute performance, even parents were not shy to join in.

On 22 March 2009 the play "Bear and Chicken Go Camping" by the Singapore Repertory Theatre was held at the Party Place. During the 30 minute

performance, the mascots acted out their camping adventure in the great outdoors, amusing and entertaining young and old alike. Bear and Chicken inspired in our young visitors a sense of awe for nature and the wonders of the great outdoors. Children also brought back with them an understanding of the value and importance of friendship.

Catering to young visitors who preferred more personalized lessons, drama facilitators from Debblinks led a total of 10 sessions of "Nature & Me" and "Stories About Nature" drama workshops in JBCG's Living Classroom. Since January 2009, a total of 158 participants have joined us for these workshops. Through stories and the use of props, young participants have had an enjoyable time expressing their creativity and developing new-found feelings of respect towards nature. Participants also brought home with them some very important messages on caring for the environment, being eco-friendly and going green.

For those who did not get the chance to catch the drama performances and workshops since January 2009, repeats were held during the June 2009 school

holidays. For more details on fun-filled, educational programmes, check out the Education webpages on the Gardens website at www.sbg.org.sg

Clockwise from top left:

Through role-playing, using puppets and props, our young participants put together a plot about an oil spill incident in the vast ocean.

A group photo with the main characters, 'Buzzy' Bee, Butterfly and Spider at the end of the performance.

"Give me FIVE!!!" The Party Place was filled with laughter while performers interacted with our young audience.

Bear and Chicken entertaining the audience at the Party Place of the Jacob Ballas Children's Garden.

A group of brave little audience members showcasing their singing talents during the 'Buzzy' Bee performance.

Young participants starting off a "Nature & Me" drama workshop with warm-up exercises with drama facilitator, Debbie Woodford.

**Winnie Wong
Janice Yau
Education**

Community outreach through the JBCG Student-Guide Programme



Methodist Girls School students having fun at the Photosynthesis Exhibit and exploring JBCG as part of their 6-hours training.

"All Life On Earth Depends On Plants" is the theme central to the Jacob Ballas Children's Garden (JBCG). It was for the dissemination of this very message that the Education Branch of the Gardens rolled out the JBCG Student-Guide Programme.

The challenge to take up the pilot run of this programme was answered by the Methodist Girls School (MGS). Through this collaboration, the Gardens provided an opportunity for students of MGS to help them build up their confidence through giving guided tours to the community at large. For MGS, this programme was added to the pool offered to their students for the fulfillment of their Community Involvement Programme (CIP) hours. CIP, an initiative of the Ministry of Education, has the objective of nurturing students to become socially responsible and develop their sense of belonging and commitment to their country. Through participating in community work, students also learn the value of service and develop lasting friendships with one another.

These Student Guides play an important

role in spreading the important message of environmental conservation and nature appreciation by giving JBCG's young visitors their initial outdoor lessons in natural and life sciences through the guided tours. A love of nature and a passion for educating and sharing information are the two key pre-requisites in becoming a Student Guide. This passion will transcend into the delivery of 'care-for-nature' messages that goes hand-in-hand with the attractions found in JBCG.

Our Student Guides were given an intensive 6 hours of training that began in late March 2009. The training sessions included a briefing on the volunteer programme, a comprehensive introduction to JBCG complete with familiarization tours, shadowing experienced guides to observe and learn how to conduct guided tours, eventually ending with trials and assessment. Having met the requirement of the training and assessment, thirty-three Secondary 2 MGS students qualified in early April as Student Guides under this programme. Each pair of Student Guides leads groups of up to ten young visitors (Kindergarten to upper Primary

School children) and their parents each time, at no charge. These tours are offered 4 times per weekend, for the period of 18 April to 21 June 2009.

The Students-Guides were finally put to the test when the first batch of guides began their duty on 18 April 2009. Visitors to JBCG had these to say :

"It's a very good start for kids to like and appreciate nature, and learn about the functions and contributions of plants to human life," says Ivan Song, a parent who joined the tour conducted by MGS student-guides, Bao Rong and Alyssa.

"I think the guides were well-prepared for the tour. They were helpful and patient with the children," says N. Bowling, a tourist from the United Kingdom who was with her children on the guided tour.

In the first 5 weeks since the programme was offered to the community, JBCG has had 30 programme runs which reached out to 155 young visitors and their parents. The Gardens is proud of its first 33 Student Guides who have contributed towards making this pilot collaboration with MGS a success.



Above: Methodist Girls School student-guides sharing the green message with visitors to JBCG.

David Liew
Janice Yau
Education

Photos by Paul Chin

Why plant names change — and what we can do about it

One of the most annoying aspects of scientific plant names is how often they can change. In some cases a botanical name that has been stable for many years and is widely used for a plant familiar to gardeners, scientists, teachers and others will abruptly change. While this is a necessary consequence of advances in botanical knowledge, it never fails to irritate the people who are accustomed to using that name – now we have to learn a new name for the same plant! Particularly as we get older, changing botanical names seem more and more inconvenient and humbug.

Beginning in 1994, the International Code of Botanical Nomenclature (ICBN), the rule book that governs how scientific plant names are created, applied, and eliminated, had a new provision in it to improve the stability of names so that they don't have to change under certain circumstances. The ICBN has always operated on the Principle of Priority: the oldest name for a plant that meets all the technical requirements of the ICBN is the name that has to be used. Thus, when an older name for the same species was discovered, it had to displace the name in use, even when that name was well known and widely familiar. Rules are rules, after all. But in response to many complaints about seemingly arbitrary changes of botanical name for technical reasons beyond the grasp of most of the people who use those names, new provisions were made in the ICBN to allow those familiar names to stand, even when older names are discovered. Here are the two options now available for a taxonomist to propose stabilising a name that is in widespread use.

Rejection of names: when an older name that has been overlooked or forgotten is discovered, and that older name will displace a familiar and widely used name, it is now possible for a case to be constructed for rejecting this older name. There are several ways this might be done, but the case has to be made

that taking up this older name (and thereby replacing a familiar and well-known name) would be a disadvantage for people who use the familiar and well-known name. A proposal for rejection has to be published, voted on by a committee of nomenclatural experts, and then finally put forward for a vote before the next Botanical Congress (held every six years). If the proposal passes, then the rejection of the name takes effect.

Conservation of names: it is now possible to propose that a familiar and well-known botanical name can be conserved against older name(s) that threaten to displace it. A case must be constructed, rather like a legal brief, which summarises the advantages gained by keeping the established name, and simultaneously predicting the disadvantages that would happen if the name were to be replaced with an older one. The case must be clearly made, and evidence provided, that displacing the familiar and well-known name would be a disadvantage for people who use the name. A proposal for conservation has to pass the same three steps as a rejection proposal before it takes effect.

Here is a practical example drawn from the Convolvulaceae, the morning glory family. *Bonamia menziesii* A. Gray is one of the rarest morning glories in the world; it is native to the Hawaiian Islands, where it is found today on six of the largest islands. Due to the species rarity and threats to its remaining habitat, *B. menziesii* is protected under the US Endangered Species Act. In 2005 it was discovered that there is a problem with the type specimen chosen for the name *B. menziesii* – due to an unfortunate mixup, the type specimen is actually a different species! This means that the name, *Bonamia menziesii*, would, if the ICBN is rigidly adhered to, disappear into synonymy under an older name already in use for a different species. And a new name would have to be chosen for this rare and endangered species.

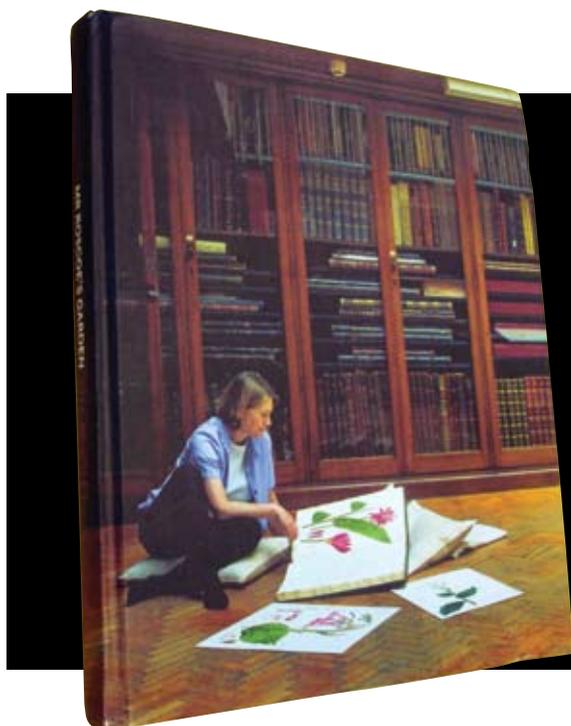


Bonamia menziesii, an endangered Hawaiian morning glory.

As you might imagine, such a name change would be most disadvantageous for people who know this plant and it would cast ambiguity onto the legal status of the plant, which is only afforded legal protection by Endangered Species Act under the name, *Bonamia menziesii*. What to do? Rejection or conservation? Which option offers the best chance for stability—so this familiar name, in use since 1862 when it was first published, need not change?

In this situation, under the new provisions of the ICBN, it is possible to propose conservation of the name *Bonamia menziesii* with a new type specimen. This has already been done and, if the proposal is successful, will ensure that this name will remain in place. While these new provisions of the ICBN won't entirely do away with annoying name changes, they can certainly be used in some cases to make the botanical names we use more stable.

George Staples
Herbarium



Mr Roscoe's Garden

by Jyll Bradley

Published in September 2008 by *Liverpool University Press*.
160 pp, 170 colour and 30 b/w illustrations.
Price GBP 24.95 (approx. S\$55)

For one who is always drawn to pictures when opening a book for the first time, it was with great delight that I found the first three quarters of this 160 page book *Mr. Roscoe's Garden* by Jyll Bradley filled with nothing but pictures. Landscapes, portraits, newspaper cuttings, botanical drawings, old and not so old, wonderful pictures all. Where were these places? Who were these people? Adding to the mystery was the complete absence of captions, so I soon found myself skimming through a good part of this section, wanting to delve immediately into the text behind these images. The essay reveals the story of the Liverpool Botanic Gardens and the man who built them, a very successful local-boy-made-good solicitor, fierce opponent of slavery and religious discrimination, and lover of art, literature and plants. His name was William Roscoe.

The story begins more than 200 years ago with the life of Roscoe and how using his good standing in polite society garnered support for the creation of a new botanical garden. It was the golden age of an ever-expanding British Empire, and Liverpool was a conduit through which the riches of Empire flowed. The garden, along with the city, flourished. Jyll Bradley, after two years of poring through archives and meeting numerous people connected in one way or another to the Liverpool garden, has pieced together a fascinating story. A story of a long line of strong-minded

individuals whose vision, passion and sheer doggedness put the Liverpool Botanic Gardens on a par with the likes of Edinburgh and even Kew. However, it is a story with a sad ending. The gardens existence was threatened first from pollution and urban development, and then from devastation inflicted by the carpet-bombing of 20th-century style warfare. In the end, national politics and industrial upheavals during the tumultuous Thatcher years dealt it the final blow. The Liverpool Botanic Gardens was demolished. It's hard for me to imagine an institution that first opened its doors before the founding of modern Singapore, achieving all that it has in both the scientific and horticultural worlds, could in our time simply disappear. Yet it is also a hopeful story, for many plants were stashed away before the bulldozers arrived. Gingers, orchids, palms, bromeliads and much more are after over 30 years amazingly still in Liverpool, waiting and clinging to the hope of a new home. I will be but one of many to celebrate the day when a new Liverpool Botanic Gardens will open, rekindling the dream and spirit of William Roscoe and those that followed.

There are some minor errors in the book, such as misspellings of plant names (*Nepanthes* vs. *Nepenthes*; *Phaleonopsis* vs. *Phalaenopsis*, *Epidednron* vs. *Epidendrum*) and one misidentification of pandan for bamboo in the index of picture captions, which could have

been avoided with more careful proof reading. This, however, does not affect the enjoyment of this book, and *Mr. Roscoe's Garden* does justice to the man and his legacy, and Jyll Bradley should be congratulated for this creatively presented, beautifully illustrated and engagingly artful book.

Jana Leong-Škorničková
Herbarium

The 'rat tail orchid' *Paraphalaenopsis labukensis* and its allies

Paraphalaenopsis is a small orchid genus of only four species and one reputed natural hybrid, all of which are endemic to the island of Borneo. They are reminiscent of the genus *Phalaenopsis* but differ by having hanging terete (= fleshy, cylindrical and pencil-like) leaves. These bluish green leaves, usually three to six in number; can extend to almost 1.6 m in length and have earned the plants the common name 'rat tail orchids' as they resemble the tails of rats!

A specimen of *Paraphalaenopsis labukensis* recently flowered in the Orchidarium here in the Gardens where its showy and scented flowers arranged in loose clusters of 10 to 20 astounded many a visitor. As in the other species of this genus the characteristic features of the large wax-like flowers are the undulating edges of their pointed petals and sepals and the remarkable 3-lobed lips. In *P. labukensis* the sepals and petals are dark brown and have white or greenish-yellow edges and tips, and the 3-lobed lip is cream-white with brown markings. An interesting detail is that the side lobes of the lip have very pronounced hooks at their tips. It is hard to imagine that this beautiful and large-flowered species was only described as recently as 1981 due to the remoteness of its habitat in Sabah and the rarity of the plant.

The other species of this interesting genus are equally attractive. *Paraphalaenopsis denevei* was actually the first species to be discovered, in 1925 by the keeper of the herbarium in Buitenzorg (now Bogor, West Java, Indonesia) Johannes Jacobus Smith, based on a plant collected in Kalimantan. This species has yellowish-green to light brown sepals and petals with greenish-yellow edges; the lip throat is white or yellow with crimson spots and the three lip lobes are crimson altogether. The flowers of the third species *P. laycockii*

It is hard to imagine that this beautiful and large-flowered species was only described as recently as 1981 due to the remoteness of its habitat in Sabah and the rarity of the plant.

measure 7–8 cm across and are the largest in the genus; whereas the flowers of the fourth species *P. serpentilingua* are the smallest being only 3–4 cm across. In *P. laycockii* the sepals and petals are usually pale rose and the lip cream with red or brown markings. *P. serpentilingua* has white sepals and petals and a red and yellow lip. Interestingly, the name of the last species describes the remarkable lip shape which resembles the forked tongue of a snake (Latin *serpens* = snake; *lingua* = tongue). Also, there is a reputed natural hybrid in the genus, *P. × thorntonii* which has been interpreted as a hybrid between *P. denevei* and *P. serpentilingua* as its flowers are intermediate between these two species. Described by Eric Holttum in 1966, this suspected hybrid is only known in Kalimantan.

The most obvious character that differentiates *Paraphalaenopsis* from *Phalaenopsis*, namely the terete leaves, is rather unusual in the orchid family, but such cylindrical and pencil-like leaves are not entirely unknown in other genera. Similar, though shorter, terete leaves are also found in a number of other orchids,

for example in the genera *Holcoglossum* and *Luisia* as well as in some species of *Vanda* and *Oncidium*.

Species of the genus *Paraphalaenopsis* are rather favourite plants in horticulture because of the showy and long-lasting flowers (they last up to four weeks). *Paraphalaenopsis* species require warm growing conditions and excellent drainage. Plants are best grown in small slotted pots or baskets and will also do well mounted on bark or on tree-ferns. They do not like to be wet and must be protected if winters are cold. *Paraphalaenopsis* prefer more exposure to the sun than *Phalaenopsis*. Though attractive by themselves, the species of *Paraphalaenopsis* have been much used as parents of showy hybrids which have often won awards by Orchid Societies.

Hubert Kurzweil
Herbarium

Chang Yoon Ching
Orchid Society of South East Asia

Photos by Hubert Kurzweil



Paraphalaenopsis labukensis in the Orchidarium (National Orchid Garden).



Paraphalaenopsis denevei, seen at last year's Singapore Garden Festival.

The Orchid Society of South East Asia
Singapore Orchid Show
Entry No: 1666 Section: 4 Class: 20
Plant: *Paraphalaenopsis denevei*

ASEAN + Three Regional Meeting on “Global Taxonomic Initiatives: Needs, Assessment and Networking”

A special ASEAN meeting of taxonomists, government policy implementors and biodiversity conservationists from the region, plus representatives from three North Asian countries, namely China, Japan and Korea, and in addition to French botanists, was held from 18 to 22 of May at the Office of SEARCA located at College, Laguna Province, the Philippines. The gathering formed part of the Global Taxonomic Initiatives programme.

The meeting was organized by the Office of ASEAN Centre of Biodiversity (ACB) in the Philippines with the aims of identifying common problems encountered by ASEAN researchers in taxonomy and biodiversity conservation, and proposing possible solutions. Since several of the ASEAN membered countries constitute one of the mega biodiversity centers of the world, the meeting has gained the funding attention of EU and found additional financial supports from French and Japanese governments who suggested to expand the regional meeting to include the botanists and plant protection workers from the three North Asian countries, hence, the name of “ASEAN plus Three Regional Meeting.”

The four days meeting was attended by about 60 participants from various Asian countries and France. The importance of the occasion was highlighted by the presence of ambassadors of Kampuchea, Laos and France in the Philippines, and the representatives from EU organization, at the opening and closing sessions of the meeting. The Singapore delegation at this meeting was headed by Dr. B. C. Tan from the Singapore Botanic Gardens, and included Prof. Shawn Lum (also representing Nature Society of Singapore) and Prof. Jean Yong Wan Hong, both from Nanyang Technological



University, and Dr. Tan Heok Hui from Raffles Museum of Biodiversity Research at National University of Singapore.

The meeting saw active exchanges of opinions between and among delegates of various ASEAN countries and their counterparts from Japan, China, Korea and France. The lack of access to old and original taxonomic publications and references, the often unavailability of type specimens of Asiatic plant species needed for an examination, a declining regional work force in taxonomy, and insufficient supports given by the ASEAN governments to the taxonomic workers in their respective countries, were identified as the main obstacles hindering the conduction and progress of taxonomic study and biodiversity conservation in the region. It was decided that another ASEAN plus Three Regional Meeting be organized and held in Singapore in October to continue this meaningful and timely dialogue.

Benito C. Tan
Herbarium

Key visitors to the Gardens (January to June 2009)

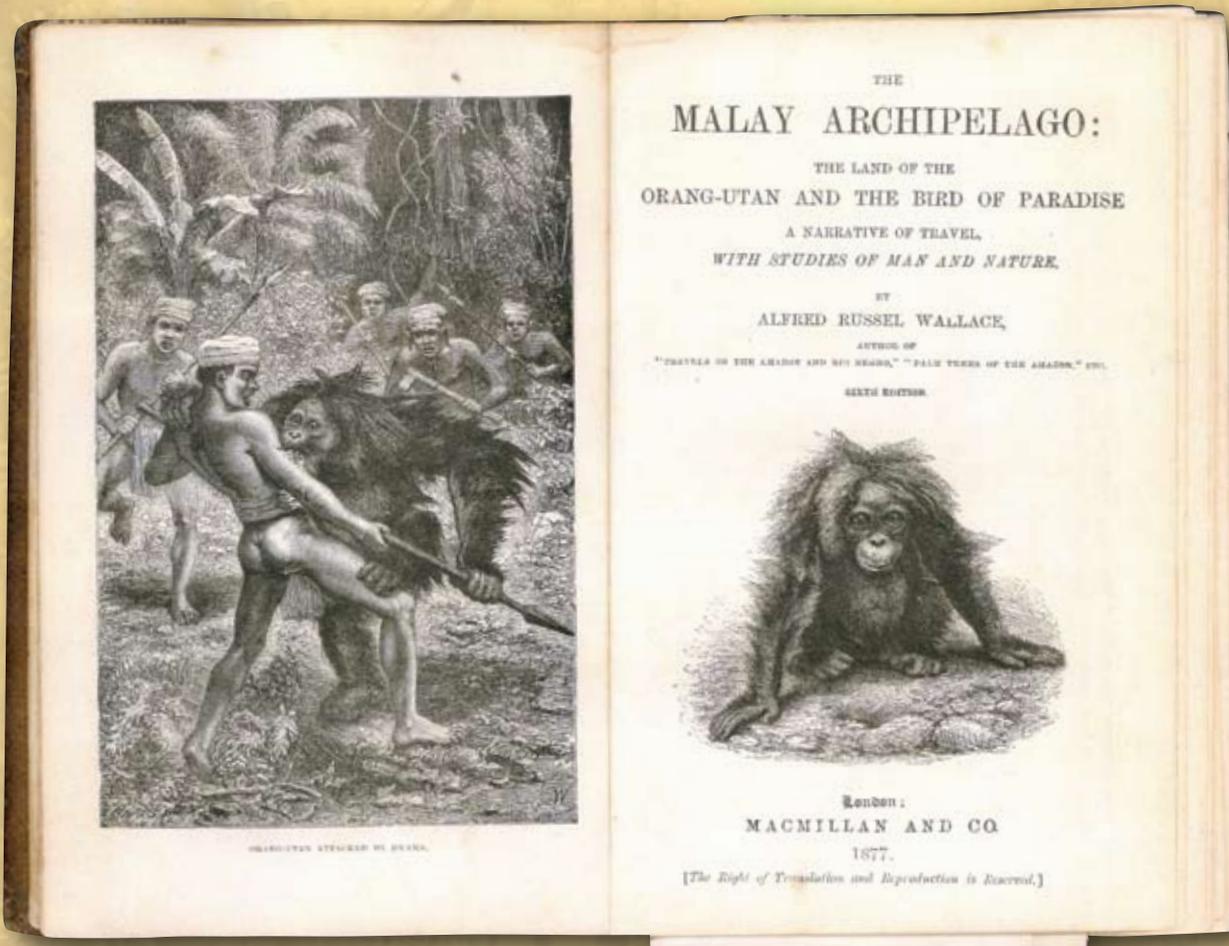
Name	From
Ms Angela Chew and delegation	Training Specialist, Institute of Healthcare, Singapore
Dr Bochkin Vasily	Main Botanical Garden, Russian Academy of Sciences, Russia
Mrs Candace Williams	Spouse of Shell's Global Downstream Director, Singapore
HE Chbor Thanath and delegation	Deputy General Director of APSARA Authority, Cambodia
Ms Chew Ming Yee	Forest Reseach Institute Malaysia
Dr Chiou-Rong Sheue	National Chiayi University, Taiwan
Dr Dahlia Shabuddin	University of Malaya, Malaysia
Ms Eugenia Lo	Yale University, USA
Y.Bhg Dato' Dr Ewon Ebin	Minister of Industrial Development, Sabah, Malaysia
Mrs Frederic Jon Service	Internal Medicine and Endocrinology, Mayo Clinic, Minnesota, USA
Prof Geoffrey B. Thompson	Consultant, Division of Gastroenterologic and General Sugery, Mayo Clinic, Minnesota, USA
Mr & Mrs George Shultz	Former US Secretary of State, USA
Mr Ha Hai Thanh	Deputy Director of Construction Development, Vietnam
Mr Ian Little	Chairman of the Botanic Gardens, Adelaide, Australia
Y.Bhg Dato' Ismail Abdullah	Permanent Secretary, Ministry of Industrial Development, Sabah, Malaysia
Ms Janet Gagul	University of Papua New Guinea, Papua New Guinea
Mr Khoo Min Sheng	National Institute of Education, Singapore
Mr Khoo Teng Chye	CEO, Public Utilities Board, Singapore
Ms Kwek Mei Jiun	Universiti Kebangsaan Malaysia
Mr Low Yee Wen	University of Malaya, Malaysia
HRH Princess Maha Chakri Sirindhorn	Thailand
Mr Marc Restellini	CEO and Founder of La Pinacothèque Museum, Paris, France
Dr Mark Hughes	Royal Botanic Garden Edinburgh
Hon Maurice Kagimu Kiwanuka	Minister of State of Uganda
Ms Melba Ruffo di Calabria	Former Italian Princess, Italy
Dr Mike Pole	Queensland Herbarium, Australia
HE Milo Djukanovic	Prime Minister, Montenegro
Dr Miyako Koizumi	Research Institute for Humanity and Nature, Kyoto, Japan
HE Dato' Sri Mohd Najib Bin Tun Haji Abdul Razak and Datin Sri Rosmah Binti Mansor	Prime Minister and spouse, Malaysia
HRH Moulay Rachid	Prince of Morroco
Ms Nadiyah Idris	Forest Reseach Institute Malaysia
Mr Paulo Alberto Soares	Ambassador, Brazil
Dr Piyakaset Suksathan	Queen Sirikit Botanic Garden, Chiang Mai, Thailand
Dr Pramote Triboun	Department of Agriculture, Thailand
Dr Razali Jaman	Universiti Kebangsaan Malaysia
Dr Rusyan Jill Coburn	ASEAN Centre for Biodiversity, Philippines
Dr Ruth Kiew	Forest Reseach Institute Malaysia
Her Highness Sheikha Mozah Bint Nasser Al-Missned	Consort of the Amir, Qatar
Dr Simon J. Owens	Royal Botanic Gardens Kew, UK
Ms Tan Hui Sin	Forest Reseach Institute Malaysia
Dato' Tiong Thai King	Chairman, Sibü Municipal Council, Sarawak, Malaysia
Mr Tran Hun Dang	Vietnam National University
Mrs Veronica Lee	Spouse of Shell's Country Chairman, Singapore
Dr Wayne C. Rosing	Middle Tennessee State University, USA
Dr Wong Khoon Ming	University of Malaya, Malaysia
Ms Zinnirah Shabdin	University of Malaya, Malaysia



HE Dato' Sri Mohd Najib Bin Tun Haji Abdul Razak and Datin Sri Rosmah Binti Mansor



Her Highness Sheikha Mozah Bint Nasser Al-Missned



The Malay Archipelago

This is the sixth edition (1877) of Alfred Russell Wallace's epic travel book **The Malay Archipelago: The Land of the Orang-utan and the Bird of Paradise; a Narrative of Travel, with Studies of Man and Nature** of which the Library of Botany and Horticulture is fortunate to own a copy. This book describes Wallace's travels in the East in the years 1854 to 1862 and was his most successful work, literarily and commercially. First published in 1869, it provides some of the initial evidence for the modern theory of evolution. This book went through fifteen editions during Wallace's own life alone, and has been translated into every major language, and a number of minor ones. It is clearly one of the greatest scientific travel books ever written, containing well-constructed

descriptive surveys of the region which are of considerable scientific value to the naturalist.

His observations in the Malay Archipelago (Malaysia, Singapore, Indonesia, the Philippines and New Guinea) led him to propose an imaginary line running between the regions islands. This later became known as "Wallace's Line" which divides what is now Indonesia roughly in half, running between Sulawesi and Borneo and south through the Lombok Strait between Bali and Lombok. Wallace noticed that the islands in the western part of the archipelago had animal life similar to that found in continental Asia, while the islands in the eastern part of the chain had species resembling those found in Australia. A quotation from a passage

from this book defines Wallace's observation of Singapore "The greater part of the inhabitants of Singapore are Chinese, many of whom are very rich, and all the villages about are almost entirely of Chinese, who cultivate pepper and gambir. Some of the English merchants here have splendid country houses. I dined with one to whom I brought an introduction. His house was most elegant, and full of magnificent Chinese and Japanese furniture. We are now at the Mission of Bukit Timah. The missionary speaks English, Malay and Chinese, as well as French, and is a very pleasant man. He has built a very pretty church here, and has about 300 Chinese converts. Having only been here four days, I cannot tell much about my collections yet. Insects, however, are plentiful..."

Christina Soh
Library

Photos by Jassy Phua