

## **The Singapore Botanic Gardens Herbarium – 125 Years of History**

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### **Introduction**

The Herbarium dates back to the establishment of the Botanic Gardens on its present site. By 1875, H. J. Murton already had a collection of dried specimens, which was temporarily housed in his office until the proposed herbarium building was erected, and from the start he established a library having ordered from England a 'good collection of standard botanical works' (*Annual Report for 1875*). He reported that by 1879 the herbarium comprised 3,000 named specimens (*Annual Report for 1879*). Most of his collections were made from Singapore, Perak, Selangor and Malacca but he acquired valuable old herbarium specimens, mostly of Indian and Nepalese plants, that had been in J. Collin's possession in Singapore but which had originally been part of Ward's herbarium held by the Linnaean Society in London. These included Wallich's specimens collected from Penang, Malacca and Singapore, as well as the oldest specimens in the Singapore herbarium, those collected by Moravian Missionaries in 1790 (*Annual Report for 1889*).

### **The First Phase**

When N. Cantley was in charge of the Gardens, a new Office and Herbarium was erected in 1882 at the cost of \$1,500. This Herbarium occupied 650 sq ft with a further 200 sq ft for a drying room (*Annual Report for 1882*). (Drying specimens was always a problem in the humid tropics until the advent of hot air drying ovens). In 1884, a herbarium keeper was employed to cure and mount specimens as well as to look after the library (*Annual Report for 1884*). From the efforts of Cantley and his collectors, such as M. V. Alvins who made an interesting collection of ethnobotanical specimens from the Malacca and Negri Sembilan region, the herbarium collection was fast expanding and filled 18 cabinets. In addition, a small stove had been acquired to 'keep away the damp from the books, as well as the herbarium specimens' (*Annual Report 1885*). Duplicates were already

being sent to Kew. Even at that early date, Cantley reported in 1885 that "The collecting of herbarium specimens, in order to afford material for scientific investigation... had not been forgotten" (*Annual Report for 1885*).

H. N. Ridley took over the Herbarium in 1888 but his efforts were hampered by the lack of a herbarium keeper (*Annual Report for 1888*). By then, the Herbarium was regularly receiving specimens from C. Curtis, Superintendent of the Botanic Garden in Penang; from G. King of the Calcutta Botanic Garden including in 1892 a valuable gift of 5,000 specimens of early collections from Peninsular Malaysia, such as those of Father B. Scortechini, Kunstler (often referred to on herbarium labels as 'King's Collector') and L. Wray; the British Museum, which in 1895 gave 1,503 specimens collected by Wallich and Hance; as well as from Kew (*Annual Report for 1889*).

Ridley's plans for the Herbarium were ambitious: "I am ... attempting to get specimens of every plant for each of the States [of the Malay Peninsula], and the similarity of the flora induces me to add those of Sumatra, Borneo and adjacent islands' (*Annual Report for 1889*). He therefore set about an ambitious collecting programme to many parts of the Peninsula, then very remote. Many collecting trips were made when he was on leave and could be free of his duties as Director. In addition, he collected in Sumatra, Borneo, Java, peninsular Thailand and Christmas Island (the last was at that time under the jurisdiction of Singapore). He collected literally thousands of specimens and is credited with discovering more than a thousand new species.

In addition to his own collections, he continued to receive duplicate specimens from the British Museum, Calcutta and Kew, as well as many collections made by Europeans living locally, who were attached to museums, the geological survey or were planters. He also regularly received specimens from G.D. Haviland and G. F. Hose in Sarawak. Indeed, it was extremely fortunate that Hose gave Singapore a duplicate set of his collections as, on returning from home leave, he discovered his personal collection had been totally consumed by termites (Steenis-Kruseman, 1950). Later Ridley regularly received specimens collected from the Philippines, Java and Sumatra.

In addition, Ridley built up a collection of wood, especially important in those days when the timber trees were not well known, as well as a collection of the less durable or more fragile specimens, which were preserved in spirit.

And so the Herbarium grew. In 1890, the large quantities of plants that Ridley was collecting required a specially constructed drying room where specimens were dried on a corrugated iron platform heated from beneath by *chatties* full of charcoal (*Annual Report for 1890*). In 1892 it

was necessary to spend \$500 to enlarge the Herbarium (*Annual Report for 1892*). In 1889 Tassim Daud was employed as herbarium keeper followed by Ahmad Kassim in 1895. With a herbarium keeper, the specimens could be sorted into folders and the Herbarium to be rearranged to Ridley's satisfaction following the system used in Hooker's *The Flora of British India* (which included the Malay Peninsula). In addition, Ridley was able to report that "the vermin which were very abundant have been destroyed" (*Annual Report for 1889*).

By 1900, Ridley was boasting that the Herbarium was "now without doubt the finest for the Malay Peninsula plants in the world and contains many types and cotypes of plants from the Peninsula, Borneo, Sumatra and Siam" (*Annual Report for 1900*). In 1910, the Herbarium was further strengthened with the addition of Curtis's collection when the Herbarium of the Penang Botanic Garden was transferred to Singapore (*Annual Report for 1910*).

In 1904 and 1905, the Herbarium moved to a new building (*Annual Report for 1905*), but Ridley noted that it was not satisfactory as 'the whole building was very leaky and damp for a great part of the year'. In 1907, the Herbarium was one night invaded by termites. Fortunately, their tunnels were discovered before they had got into the cabinets. In haste the whole collection was re-poisoned taking four men from the Public Works Department four months to complete (*Annual Report for 1907*).

In 1913, specimens collected from the Botanic Gardens of Penang and Singapore were removed from the general collection and kept separately (*Annual Report for 1913*). This 'Gardens Herbarium' was important for checking that the names of plants grown in the Gardens were correctly identified and could also be used as a basis for compiling a catalogue of plants grown in the Gardens. This was very important for, as Cantley had scathingly commented in the *Annual Report for 1882*: "A catalogue purporting to be a list of plants contained in the Gardens was published in 1879 and a supplement in 1880. But on my referring to the catalogue for the names of the trees they could not be found: I next sought for the plants contained in the list, and with the exception of a few was equally unsuccessful". However, although he began to catalogue the plants it was not until 1912 that the first reliable Gardens' catalogue was produced (Anderson, 1912). (The next catalogue, *The Checklist of Cultivated Plants of Singapore Botanic Gardens* by Tay *et al.*, 1995, appeared very much later).

Due to Ridley's efforts, the collection was sufficiently comprehensive to embark on taxonomic revisions for the "Materials for the Flora of the Malay Peninsula" project under King at Calcutta. For this purpose large quantities of specimens were sent as duplicates or on loan to specialists

who revised particular families. For example, in 1894 specimens were sent to O. Beccari in Naples who was revising the palms. Ridley himself undertook to revise the monocotyledons (Ridley, 1907). After Ridley retired, he continued to work indefatigably at Kew to produce the five-volume *Flora of the Malay Peninsula* (Ridley, 1922–1925).

## The Second Phase

Ridley was succeeded as Director by I. H. Burkill, best remembered for his two-volume *A Dictionary of the Economic Products of the Malay Peninsula* (I.H. Burkill, 1936), for which the herbarium collection with notes on local uses recorded on the herbarium label was an important source of information. In addition, Burkill laid a sound basis for the scientific investigation of the Malayan flora by creating the post of Curator of the Herbarium and employing several talented taxonomists. With Ridley's *Flora*, which covered seed plants, complete, Burkill shifted the emphasis onto the much neglected lower plants. In 1922, R.E. Holttum was appointed Assistant Director and began to work on ferns; in 1923, C.X. Furtado was appointed Assistant Botanist in charge of the naming of the living collection and cultivated plants; in 1924, M.R. Henderson filled the new post of Curator of the Herbarium (Table 1); and in 1929, E.H.J. Corner joined the staff as Assistant Director and worked on fungi.

After the hiatus of WWI, when paper for mounting specimens was not available, three women were employed to mount specimens (*Annual Report for 1922*) and by 1924 the backlog was cleared and under the direction of the new curator, the Herbarium was rearranged to follow Ridley's *Flora*, the folders following the *Flora*'s numbering of the families, genera and species. In the course of this work, species not recorded in the *Flora* came to Henderson's attention, which he published a series of papers (Henderson, 1927, 1929, 1930a,b). In 1926, the herbarium of the Federated Malay States Museum was handed over and incorporated into the Singapore collection (*Annual Report for 1926*).

In 1922, an active collecting programme started and continued up to the Japanese Occupation. Burkill made extensive collections from both Taiping Hills and Fraser's Hill, Corner collected all over the Peninsula for his book on *Wayside Trees* (Corner, 1940) as even many of the village fruit trees were still improperly known (*Annual Reports for 1936*), Furtado specialised in and made collections of aroids and palms (Johnson and Tay, 1999), Henderson concentrated on the limestone flora and visited many hills, mountains and islands to collect, Holttum made collections notably from Mount Kinabalu and several mountains in the Peninsula. In all these

expeditions, the plant collectors employed in the Herbarium played an important part. Corner started a dried collection of macrofungi having successfully experimented with methods to keep them permanently free of mould and beetle attack (*Annual Report for 1931*). Corner is also famous for using *beruk* monkeys (pig-tailed macaques) to collect botanical specimens (Corner, 1992).

C.E. Carr, a planter by profession, built up an excellent collection of orchids, not only from the Peninsula but also 800 specimens from Mount Kinabalu. After his early death in New Guinea, the Botanic Gardens bought in 1936 his personal herbarium of over 3,000 orchid specimens, which included nearly all his locally collected material, as well as many flowers in spirit, besides a set of the 7,000 orchid specimens from New Guinea that the Singapore Herbarium was given in return for processing them. This is an invaluable resource for the study of Malesian orchid taxonomy.

Thousands of specimens were collected each year and large quantities of duplicates were sent to regional and European herbaria; similar quantities were received in exchange, such as H.H. Bartlett's Sumatran specimens, a set of Ledermann's New Guinea specimens, and quantities of specimens from the Forest Department, British North Borneo (Sabah). (The latter's herbarium was later to burn down).

By January 1930, the new herbarium was completed with two floors. The upper with a gallery housed the herbarium of cultivated plants, museum specimens and the spirit collection, while the ground floor was occupied by the office and the general collection housed in seven double ranks of 12 two-unit teak cases (*Annual Report for 1930*).

The herbarium and library and their collections survived undamaged even though the line of fire during the invasion by Japanese forces came within half a mile of the Gardens' boundary. (Some specimens, however, on loan to German institutions did not survive). In 1948, the Hongkong Herbarium collection arrived from Penang, where it had been sent for safe keeping in 1940. (This was indeed fortunate as the building where it was housed in Hongkong was destroyed during the war). After the war, the collection was returned intact to Hongkong.

The Japanese Occupation brought an end to active collecting and exchange of specimens. Both Corner and Holttum were interned in the Gardens and, freed from administrative duties, devoted their time to research, which turned out to be an extraordinarily productive time resulting in taxonomic revisions and even a new theory of tropical botany – Corner's Durian Theory (Corner, 1949).

After the war, a notable addition to the herbarium was the acquisition through repatriation of 5,000 specimens from the personal collection of Z. Teruya, a Japanese planter once resident near Kota Tinggi, Johore. As

Secretary to the Japanese Planters Association, he had the opportunity to travel all over the Peninsula. His collection was, however, only incorporated in to the main collection in the 1960s (H.M. Burkill, *pers. comm.*).

### The Third Phase

Furtado, Henderson and Holttum resumed work in the Gardens after the Japanese Occupation ended. Furtado continued to work as Assistant Botanist until he retired in 1952, when he was reappointed as Botanist. (Even after this second retirement he continued to work in the Herbarium). After Holttum left, Henderson became Director and, in 1948, J. Sinclair was employed as Curator of the Herbarium (Table 1). By a curious twist of fate, in 1954 exactly thirty years after Henderson had found his post in Kuala Lumpur threatened and I.H. Burkill had created the post of Curator for him, H.M. Burkill (I.H. Burkill's son) found himself in the same situation when funding for his post as botanist at the Rubber Research Institute in Kuala Lumpur dried up. The posts of Assistant Director and the Botanist both being vacant at that time, Henderson was able to offer H.M. Burkill a secure post (H.M. Burkill, *pers. comm.*). H.M. Burkill immediately found a niche in taking up the study of seaweeds, at that time a much neglected field and one of economic importance.

With the setting up of the new university in Singapore, local botany graduates came onto the job market. The first to be employed was Chew Wee Lek in 1956, followed by Chang Kiaw Lan in 1959, by Hardial Singh in 1963, and by Geh Siew Yin in 1970.

When H.M. Burkill became Director in 1957, he found the administrative inflexibility of moving staff between the posts of Assistant Director, Keeper of the Herbarium and Botanist made them difficult to fill (H.M. Burkill, *pers. comm.*). He therefore arranged for them to be re-graded as three botanists posts, so when Chang took over the curation duties of the herbarium after Chew left, her post was designated Botanist (Keeper).

After WWII, collecting in Peninsular Malaysia was severely restricted by The Emergency. Sinclair continued to collect in Singapore and Johore. Soon regular collecting trips were made to Sarawak, first by the Director, J.W. Pursglove, then by Sinclair, Chew Wee Lek, Chang Kiaw Lan and Geh Siew Yin. Chew was an active member of both Royal Society Expeditions to Gunung Kinabalu. Burkill built up a collection of seaweeds.

After Independence, the Forest Departments of Peninsular Malaysia, Sabah and Sarawak began to build up their own herbaria and regularly send duplicates to the Herbarium. In contrast, the collecting activities by

**Table 1. Curators/Keepers of the Herbarium****1924—1946 Murray Ross Henderson**

The post of Curator of the Herbarium was created by I. H. Burkill in 1924 for M.R. Henderson whose post in Kuala Lumpur had been abolished in a government reorganisation. Henderson held the post (except during the war years when he was in South Africa) until 1946, when he became Director of the Botanic Gardens.

**1948—1965 James Sinclair**

In 1948, J. Sinclair was appointed Curator, a post he held until his retirement in 1963. He was then re-employed until 1965 to cover the duties of local staff overseas for higher studies, continuing in an honorary capacity until 1967. It was during his time in 1955 that, according to the Annual Reports, there was a change in name from Curator to Keeper of the Herbarium but the reason for this was not stated.

In 1959, the posts of Assistant Director, Keeper of the Herbarium, and Botanist were all re-graded as Botanist, so that in 1960 the post became Botanist (Keeper of the Herbarium).

**1965—1970 Chew Wee Lek**

In 1956, Chew Wee Lek was the first local graduate to be appointed as Botanist, and, in 1965 on his return with a PhD from Cambridge, he took on the duties of Keeper.

**1970—1987 Chang Kiaw Lan**

Chang Kiaw Lan, the second local graduate to work in the Herbarium, was appointed as botanist in 1959 to take charge of the collection of fungal specimens. In 1970, when Chew became Director, she took over his duties as Botanist (Keeper).

**1987—1993 Mrs Ng Siew Yin (née Geh)**

When Chang retired in 1987, there were no taxonomists employed in the Herbarium and the Keeper's post effectively became defunct. Mrs Ng then took on the duties of Keeper in addition to her own as Assistant Commissioner of the Botanic Gardens.

**1993—1996 Chin See Chung**

Under the aegis of NParks, the post of Keeper of Herbarium and Library was revived and held by Chin See Chung from 1993 until 1996 when he became Director of the Gardens.

**1997—present Ruth Kiew**

In 1997, R. Kiew was appointed.

staff in Singapore declined and the SFN (Singapore Field Numbers) series, which was started in 1924 and used by all staff to number their collections, was discontinued at the end of 1958.

By 1949, the herbarium was already reported as “filled to overflowing” in spite of 11 new units of herbarium cases being purchased. It was clear an extension was urgently required (*Annual Report for 1949*). At that time, the Herbarium ranked in size second in Asia and tenth in the world.

By the late 1960s, the herbarium building had become derelict. In H.M. Burkill’s own words:

“The Singapore herbarium gave me endless anxiety. When the second floor was added, iron girders (?cast iron, not steel) were bricked on to the outside of the lower floor to carry its weight. I suspect, but without means of knowing for sure, that the contractor used seashore sand not washed free of salt for cement and mortar, resulting in serious corrosion of the metal. There must have been settling of the upper floor on to the brickwork of the lower. There was bulging and glass fillets cemented on were constantly cracking. Year by year estimate proposals for a new building were rejected by the Treasury. When the UNESCO Visiting Committee for Tropical Herbaria came to Singapore I reported this most serious situation, and in a courtesy call on high authority, they must have touched a receptive button for soon after I received an urgent communication from the Director of Public Works Department (PWD) to the effect that he would ‘repair’ the building provided that I accept the repaired building standing on the same outline footings of the old. The PWD would remove the roof and demolish the rest down to the ground and build again up from there replacing the old roof on top. This was the crux for retaining the original floor dimensions. Into the bargain a third floor would be built in thus meeting my need for more storage space. The work would be carried out on the PWD’s Upkeep of Buildings vote, whereas any change in the ground dimensions would have required a new OCSE (Other Charges Special Expenditure) vote from the Treasury, application for which had been regularly rejected. In effect the PWD gave me a new and extended building on a ‘repair’ vote! Anyhow the situation was serious and I was given three weeks notice to clear the building. No storage space was offered. Hamish Gilliland, Professor of Botany, University of Singapore, came to my rescue with the loan of a vacant Nissen hut in the University grounds. The ensuing massive and complete clearout had some rewards. Many skeletons, put aside and long since forgotten came to light, and were duly dealt with. Perhaps any organisation with an accumulation of materials ought to have an upheaval like this every few years!”

(H.M. Burkill, *pers. comm.*)



So through H.M. Burkill's energies, a new three-floor herbarium building was completed in 1964, to which was added in 1968 a new wing, which also housed the library. In 1972, a third storey was added to the wing, but what the herbarium gained from occupying the new floor on the wing, it lost as the ground floor of the main herbarium building was given over to administration. The Herbarium has remained little changed since then, apart from experiencing an ever-increasing shortage of space as more specimens are added to the collection.

In 1967, with the launching of the Garden City Campaign, the botanists attached to the Herbarium were directed to apply their research to more practical ends. On several occasions, H.M. Burkill deplored this change, which was based on the misconception that a botanic garden could function to international standards without the backing of a strong botanical research programme (H.M. Burkill, 1993). He pointed out that the applied fields of economic botany, education and conservation all need a strong botanical base.

In 1973, the Botanic Gardens came under the administration of the Parks and Recreation Branch of the Public Works Department. The stated aims for botanical work included maintenance of the Herbarium and library, collection of plants for the Herbarium, identification, botanical publication and the preservation and maintenance of Nature Reserves in Singapore (Tinsley, 1989). With the botanists' posts transferred away, the Herbarium was just able to tick over. In 1973, Mrs Ng moved to the Parks and Recreation Branch as Assistant Commissioner, followed in 1975 by Hardial Singh, leaving only Chang in the Herbarium. After 1970, for twenty years no new taxonomists were recruited.

### **The Fourth Phase**

The formation of the National Parks Board (NParks) in 1990 as a statutory board under Tan Wee Kiat, Executive Director of NParks and Director of the Botanic Gardens (the first for 18 years!) brought a wind of change as Tan sought to restore a proper balance between research, education, conservation and recreation and to revive systematic botany. Three new posts for taxonomists (the Keeper of the Herbarium and Library being one) were created. From 1990 to 1996, Tay Eng Pin held one post. In 1993, Chin See Chung was appointed as Keeper to be followed in 1997 by the seventh Keeper, Ruth Kiew (Table 1). She presented a set of about 2000 specimens, mostly forest herbs and plants collected from limestone and mountains in Malaysia. In 1998, the second post went to I.M Turner (Assistant Director, Horticulture) and the third is reserved for an orchid taxonomist.

A new building for research, which included a spacious new Herbarium, was planned. The last was overtaken by events when NParks was enlarged with the merger with the Parks and Recreation Division, and the research building was transformed into Gateway, the new headquarters for NParks.

So it is that at present the Herbarium still occupies the old buildings, although some improvements have been made in air-conditioning the library, office and type collection. The Herbarium holds at least 600,000 specimens of which more than 4,000 are types and specimens are constantly added through staff collections and by exchange. Space increasingly is a constraint as the sturdy cupboards, many of solid teak from the days before plywood, are filled to bursting, the overflow being accommodated in Leiden-type boxes that double as cupboard space. Computerisation of the collection is proceeding slowly using BRAHMS (Botanical Research and Herbarium Management System) for databasing, label generation and bar-coding. Concurrently plans are afoot for a new building that will take the Herbarium into the new millennium, so with modern facilities, adequate staffing and funding, the Herbarium aims to recapture its former reputation as a centre of excellence in tropical taxonomy.

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