A BRIEF HISTORY OF BOTANICAL EXPLORATION OF PAPUA AND NEW GUINEA

By J. S. Womersley, B.Sc.*

NEW GUINEA, one of the largest islands in the world is, together with Borneo, probably the least known country botanically. Situated as it is between Australia and the Philippines and between Indonesia and Polynesia, the flora shows distinct affinities with that of these neighbours. The study of such affinities and dissimilarity between the flora of different countries is known as phytogeography. Various authors have included New Guinea in the phytogeographic unit known as Malaysia. This unit includes Indonesia, Borneo, the Philippines and New Guinea, but not the Bismark Archipelago.

The study of the flora of Malaysia goes back to the dawn of history with the records of the Indian and Chinese authors of thirty centuries ago. These early references were essentially superficial and related almost entirely to religious or utilitarian values of the plants described. The Chinese seafaring traders from time immemorial carried cloves, areca nuts, sandal-wood and other vegetable products from Malaysia to China and in commenting on their discoveries composed the earliest descriptions but confined their writings primarily to the medical virtues of plants. The *Ayurvedas,* the most important Sanskrit botanico-medico work, is of uncertain age but contains 600 to 700 plant names.

The early Greeks brought the first factual information about Malaysian plants to Europe. The scientific advisers with Alexander's armies which penetrated the Punjab and Indus regions in 330 B.C. had a keen eye for botany. They came across the Banyan Fig Tree, *Ficus benghalensis* and by their notes enabled Theophrastus, who, incidentally is really the father of plant geography, to accurately describe the peculiar habits of these trees. They observed that from the horizontal branches aerial roots descend, enter the ground, thicken and take on the form of secondary trunks. It is interesting to note how these accurate early Greek writings have been overlooked and misunderstood by later authors. Meister, a European gardener who worked for several years in Java during the 17th century, wrote of a tree, the roots of which rise vertically from the ground till merging into branches. Among 18th century writers the same tale appears in a modified version when they describe downwardly growing branches which reach the ground and take root. A recently published American book by N. S. Knaggs caps all previous diversions from the truth with an account of the tree which sinks its branches into the soil, these emerge again to sink and emerge growing on each emergence into a full sized tree, so the tree marches through the forest.

This serves as an example of the errors of fanciful explorers and the merit of accurate data obtained by sober unbiased observers. It is not alone even among modern writings. Theophrastus also accurately described *Cycas* and the mangrove communities which, by their uniformity, are remarkable among the plant communities of the world.

For 1500 years from the time of the Greeks there was a particularly sterile period for phytogeography. Practically no botanical writings from this period have been discovered.

The voyages of the Portuguese, Spanish and Italian explorers into Asia during the middle of the 13th century, have left records of numerous botanical discoveries. The narrative of the travels of Marco Polo, published in 1296 mentions that he found rice growing in northern Sumatra. He has also mentioned in his notes

* Forest Botanist, Department of Forests, Lae, Territory of New Guinea.

Arenga, the sugar palm, *Cocos*, the coconut and *Dryobalanops aromatica*, a tree of the family *Dipterocarpaceae* which produces a valuable timber, a crystalline camphor and resin.

Various other travellers from the southern European countries wandered through India, Ceylon, Borneo and the nearby islands. About the beginning of the 16th century, the Portugese penetrated to the east while in Europe, but somewhat later, Brunfels and Fuchs set new standards for the illustration by painting of plants, Cordus for description by writing and Caesalpinus for critical taxonomy. With this development scientific botany was firmly established.

Not later than 1526 the Portugese reached the shores of New Guinea. From 1580, when Portugal came under the banner of Spain, the latter nation remained in power in Malaysia until the 17th century. Their botanical writings are, however, few and far between.

Early in the 17th century, the botanists in Europe were realising how rich was the flora of the east. Van Linschoten, the first of the Dutch to arrive at Goa, includes amongst his writings descriptions of the pineapple, jack fruit, mango, cashew nut, citrus, coconut, banana, etc. The spices and condiments were singled out for special treatment. 1600 saw the foundation of the Dutch East India Company. Variously referred to as a conspiracy of robbers and heartless oppressors, it is an historical fact that toward science the company behaved honourably, encouraging the collection of natural history specimens. It is interesting to read an instruction issued during this period to apothecaries and surgeons of the fleet. It is titled, " Recommendations for Apothecaries and Surgeons sailing on the Fleet in the year of 1602 for the East Indies." They shall bring back, laid between paper, branches carrying leaves and fruits and flowers, whenever possible, of nutmegs, both species male and species female, black pepper, white pepper, long pepper betle, cubebas, mangoes, mangosteens and similar beans of a kind of cotton growing in Bantam with branchlets and leaves and enquire after their local names. Similarly branchlets of all other kind of trees that seem strange and grow there with flowers, leaves and fruit, when possible the habit of the tree to be designed, whether they are large or small, whether they are green in winter or not. Their names in the vernacular, and to what end they are used.

You will notice that apart from the interests of commerce in the peppers, nutmegs and spices there was expressed the interests of science in calling for branchlets of all other kinds of trees. Apart from the collection of dried herbarium specimens the introduction of living plants into hot houses came into vogue. During the seventeenth century the botanists of the Netherlands came to possess the finest collections, both living and dried, of Malaysian plants in Europe. Their eminent position was achieved through the benevolence of the Dutch East India Company.

In 1753 all botanical work was revolutionized by the publication by Linnaeus of his Species Plantarum. In this now famous work Linnaeus proposed the binomial system of nomenclature which is now universally adopted in the biological sciences.

The pre-Linnaean period of Malaysian botany is one of superficiality until the Dutch, together with the Spanish and Portugese, revealed the east as a rich garden of plants. Linnaeus himself was little acquainted with the Malaysian species and, on the other hand, the botanists who were in close contact with the Malaysian flora had little contact with the Linnaean school. This combination of circumstances was unfortunate for subsequent Malaysian phytography. The Malaysian phytographers were under the impression that the species propounded by Linnaeus in the Species Plantarum included all the plants existing throughout the world. Consequently species completely unknown to Linnaeus were fitted in to sometimes not even closely related species described in the Species Plantarum.

A broadening of the species limits originally proposed by Linnaeus was the outcome. This has created many mis-interpretations of Malaysian species which were described during the latter part of the 18th century.

Linnaeus' work was most conducive to clearer phytography and constructive taxonomical research, but this new light focused on South Africa, Europe and America rather than Malaysia.

In the early part of the post-Linnaean period the tempo of exploration which started to rise during the period of Portugese domination in Malaysia, accelerated. The East India Companies of other nations followed the Dutch example by instructing captains and crews to bring back specimens of the natural flora of the islands visited.

Several English travellers followed Cook into the waters of Malaysia and Forrest explored parts of the Molluccas and New Guinea, searching for nutmeg seedlings.

Solander, travelling with Cook in the *Endeavour,* visited the south-west parts of New Guinea during 1770. The collections made by Solander, while few in number, are the first which may be reliably accepted as of New Guinea origin.

During the latter part of the 18th century, scientific journals, especially in England, became established. *Curtis Botanical Magazine* began publication in 1787. This journal continues to-day as a magnificent series of coloured plates and descriptions. Numerous Malaysian plants have been figured and described herein.

The *Annals of Botany,* the *Transactions of the Linnean Society* of London commenced publication about the same time. Both these journals have accommodated papers on Malaysian botany.

The explorations of the French in the East and Pacific brought to light little of botanical interest.

There is not space to pursue the history of the plant exploration in Malaysia as a whole from the end of the 18th century up to the present time. It will suffice to say that the Dutch have been quite the most outstanding as a nation in furthering the botanical knowledge of the East Indies.

I have already mentioned Solander's brief contact with New Guinea. This was followed in 1824 by a visit to Dorei on the Vogelkop Peninsula of the French ship *Coquille.* R. P. Lesson made quite large collections at Dorei while the *Coquille* was there. A year or so before the better known French botanist Gaudichaud collected on Rawak Island just off the coast of the Vogelkop Peninsula.

In 1828 Zipelius, a botanist to whom due recognition of his work has not been given, visited the south-west coast of what is now Dutch New Guinea. Considerable collections were made at Etna Bay and Triton Bay. Zipelius was more than a collector and his manuscript contained descriptions of many New Guinea plants. These were never published under his own name but it would seem that many of Blume's species should rightly have been credited to Zipelius.

After Zipelius there was another long gap in the botanical exploration of New Guinea. Teysmann in 1870 visited Dorei, where Lesson had collected on the Vogelkop Peninsula, d'Albertis and Beccari collected at Hatam also in the Vogelkop Peninsula and in 1875 Naumann visited the Territory of New Guinea in the German ship *Gazelle.* Naumann was fortunate that the *Gazelle,* which was on a voyage of discovery, called at several points on New Hanover, New Ireland and New Britain, also on Bougainville at Kaiserin Augusta Bay. Naumann's collections are the first of the prolific German herbaria which were to follow. In the same year, 1875, Sir William Macleay visited the islands of Torres Strait and the south coast of Papua, Macfarlane collected on the Fly River and d'Albertis visited Yule Island and Mekeo, after which he spent two years amassing a

considerable herbarium on the Fly River. d'Albertis travelled upstream some considerable distance. Sir William MacGregor, writing in the Annual Report of British New Guinea, 1889-90, states that the map of the Fly River as prepared by d'Albertis was tolerably accurate up to the junction of the Fly River with the Alice River, but beyond this point d'Albertis' map bore no resemblance to the actual course of the river. It was, therefore, impossible for him, *i.e.* MacGregor, to determine the furthest point reached by d'Albertis.

Most of the plants collected by d'Albertis were identified by Beccari, although Mueller, at the Melbourne herbarium, received at least some material. Beccari's *Malesia* deals with many of the d'Albertis plants.

In 1889 and 1890 Otto Warburg and Burke collected near Manoekwari and Hatam respectively in the Vogelkop Peninsula. Burke's collection consisted almost entirely of orchids.

In the Territory of New Guinea Hollrung was busy from 1886 to 1888 in the vicinity of Finschhafen. Karnbach also collected in this locality about the same time. Hellwig and Burke explored the Sattleberg and Cromwell Mountains making considerable plant collections during 1889.

Warburg also visited Finschhafen during 1889-1890 and collected in that locality. He also collected on New Britain (Blanche Bay) and on New Hanover.

During the period 1890-1900 the prolific collectors, Schelchter and Lauterbach, were at work. Carl Lauterbach during the ten year period collected in the vicinity of Finschhafen, the Sattelberg Mountains, the Huon Gulf, Salamaua, Astrolobe Bay, the Ramu Valley and adjacent mountains, the Bismark Mountains, Blanche Bay and coastal districts of the Gazelle Peninsula and Nusa Bay on New Ireland.

Schlechter came to New Guinea in search of trees producing a latex having the properties of guttapercha. He explored and collected widely in the vicinity of Finschhafen, the Ramu Valley, the Gazelle Peninsula and the Bismark Mountains. Schlechter has the distinction of describing more than 1,000 species of orchids in addition to numerous species of other families.

In 1912-1914 the Swiss botanist Ledermann made extensive collections in the Sepik River and nearby foothills and mountains.

The 1914-1918 war terminated the activities of the German botanists in the field. They pursued their herbarius work with vigour, publishing many papers on the botany of New Guinea.

Only sporadic collections were made in the Territory of New Guinea between the two world wars, the most important of which are those of Lane-Poole, who collected during an inspection of the forests of New Guinea. Father Peekel, in New Britain and New Ireland, made considerable collections which were sent to Berlin and Mrs. Clemens spent some time at Mission Stations in the Salawaket Mountains, Markham Valley and at Morobe. Most of the specimens were sent to Berlin or America.

In Papua there were a number of collectors, mostly missionaries, in the latter part of the 19th century. Chalmers and Goldie travelled widely in the coastal and near coastal districts. Their collections were sent to Baron von Mueller in Melbourne. Mueller published a series of papers on these specimens under the title of "Descriptive Notes on Papuan Plants." The material which Mueller had at his disposal was primarily coastal, so it is not surprising that only a relatively few new species were described by him, most of the plants collected being already known from the north Australian or Malayan coastal belts. He is none the less a noteworthy contribution to Papuasian phytography.

Forbes made quite a large collection in the region of Sogeri. Many new species have been based on his material.

Prior to his tour of New Guinea of which I have written, Lane-Poole made an inspecion of the Papuan forests and collected a series of specimens. Carr, a Malayan orchidologist, visited Papua in the early 1930's collecting for the British Museum. An incomplete set of his plants is now housed in the C.S.I.R.O. Division of Plant Industry Herbarium, Canberra. This set was originally the property of the Papuan Administration but, due to financial difficulties, was sold to the Commonwealth Forestry School at Canberra and from there was passed to the C.S.I.R.O. Herbarium. Only eight sets of his plants appear to be in existence.

Quite the most notable recent collections have been those made by L. J. Brass. Brass accompanied the expeditions organised by Richard Archbold. These were primarily ornithological expeditions but Brass was attached as botanist. The first of these was the 1933-34 expedition from Hall Sound to Mount Albert Edward. In 1936-37 the second expedition penetrated to the central range at the headwaters of the Fly River and also collected in the lowlands near the Wassi Kussa River. The party therefore covered a great deal of the ground which d'Albertis covered. Among the collections are many plants not recorded between the time of d'Albertis and the present day. The whole of the botanical material from these and the third Archbold Expedition, which will be discussed later, was sent to the Arnold Arboretum in America. The staff, led by Dr. Merrill and Miss Perry, have worked up the collections and distributed duplicates. A number of the duplicates have been donated in exchange to the Department of Forests Herbarium at Lae.

Numerous papers have been published in the *Journal of the Arnold Arboretum* on the plants from these collections. Merrill and Perry with the series *Plantae Archboldianae* and A. C. Smith with his series *Plantae Papuanae* have been the most prolific authors. Many new species have been described.

In Dutch New Guinea a number of small collections were made during the years following 1900. Kock collected on the south coast near Merauke, Versteeg on the southern side of Mount Wilhelmina, Branderhorst generally along the south coast from Merauke westwards. In 1911 Boden Kloss made some important collections when he ascended Mount Carstenz in the Nassau Range from the southern side. Boden Kloss was botanist with the British Ornithological expedition led by Wollaston. Entering New Guinea at the mouth of the Utakwa River the party crossed the coastal plain and the ranges immediately inland. A river valley was then followed leading to the permanent snow line on Mount Carstenz. The botanical collections of Kloss have been worked up by Ridley, whose published report under the title "Botanical Results of the Wollaston Expedition" appeared in the *Transactions of the Linnean Society of London.*

In the northern part of Dutch New Guinea there were a number of expeditions to the central range from the coast. Those of Doorman to the Doormantop and Lam in the same region are notable. The Vogelkop Peninsula continued to receive considerable attention from visitors entering through Manoekwari. Miss Gibbs collected much material in the Arfak Mountains. This was worked up by the collector and the results published in a book entitled *The Phytogeography of the Arfak Mountains.*

The third Archbold Expedition was made to Mount Wilhelmina from the northern coast. Again led by Richard Archbold, the expedition was formed with the co-operation of the Government of the Netherlands East Indies and styled "The Indisch-Amerikaansche Expeditie". A technical staff of six included an entomologist, 2 foresters, ornithologist, mammalologist and botanist. The flying boat *Guba* was used to establish a base on Lake Habbema from the coastal base at Hollandia. Lake Habbema, with its large water surface, provided a very satisfactory base close to the slopes of Mount Wilhelmina. The botanical collections comprised over 6,000 numbers with numerous duplicates. Most of the

collections were made between 3,500 feet and 10,000 feet, although a few specimens were collected from the summit of Mount Wilhelmina itself.

There have been many other small collections, some quite unrecorded, which have been made in various parts of New Guinea. I have, with these exceptions, considered the most important collections made up to 1940.

Published work on the phytogeography of New Guinea has appeared in numerous journals. The German authors published the *Flora of New Pommern, Flora von Kaiser Wilhelmsland, Flora Deutschen Schutzgebiete in der Sudsee* and the *Flora of Micronesia.* This latter work, which appeared in the *Botanische Jahrebucher,* does not embrace specimens actually collected in New Guinea, but many of the species which are described in the *Flora of Micronesia* undoubtedly do occur in New Guinea.

More recent German work has been the fine series of papers under the general heading *Flora Papuasien* in Engler's *Botanische Jahrebucher.* The series was under the general editorship of Lauterbach but is now entrusted to Deils. 150 parts were issued up to the outbreak of war. Papuasia, for the purpose of this study by the German botanists, has varied in extent from the former German Colony alone to the whole terrain from the Vogelkop Peninsula to the Solomons. Many families have been virtually monographed, others merit a very sketchy treatment.

The Dutch botanists at the Rijks Herbarium in Leiden and the Herbarium at Bogor (Buitenzorg) in Indonesia have published numerous papers on New Guinea botany, including some excellent monographs on families occurring in Malaysia.

The outstanding Dutch publication is without doubt *Nova Guinea.* This publication, which has appeared at irregular intervals, embraces volumes I-XVIII and volumes I-IV, the last appearing during 1940, of the New Series. *Nova Guinea* is sponsored by the Netherlands Government. The publication was intended to receive work of ethnography, geography, geology, botany and zoology of Dutch New Guinea. As a botanical publication, *Nova Guinea* is indispensable to any one working on the flora of New Guinea. With one exception, keys have not been included in this work. The *Flora Papuasien,* in contrast, is full of keys and consequently the more useful work. In the main the botanical papers included in *Nova Guinea* are an assemblage of descriptions of new species or notes on little-known ones.

Notable publications in English have been Ridley's papers on the Botany of the Wollaston Expedition to which I have already referred, Miss Gibbs' *Phytography of the Arfak Mountains* and further papers by Ridley on the Forbes collections from Sogeri.

Australian botanists have been rather overshadowed by their European colleagues. Mueller published his *Papuan Plants* during the years 1875 to 1890. This work was based on the collections of MacGregor, Chalmers, Goldie and other Missionaries. Bailey, then White and Francis, published a number of short papers in the *Queensland Agricultural Journal* and *The Proceedings of the Royal Society of Queensland.* Recently Blake and Smith, also working in Queensland have published papers on New Guinea plants.

Mr. C. T. White, until his death, Government Botanist in Queensland possessed an excellent working knowledge of the New Guinea Flora, having made several visits to the island. His most important papers relating to New Guinea botany are several in the *Journal of the Arnold Arboretum.*

During the years that White was Government Botanist in Brisbane, he built up the Herbarium of New Guinea plants to the stage where it is easily

the most representative in Australia, though perhaps the most poorly housed. Other valuable collections of New Guinea plants are in the National Herbarium of Victoria where the specimens handled by Mueller are kept and at the Herbarium of the C.S.I.R.O. Division of Plant Industry in Canberra. A set of the Carr collections are housed there.

American interest in New Guinea phytography was stimulated by the botanical collections of Archbold-Rand expeditions. Primarily ornithological these expeditions were first to Hall Sound and Mount Albert Edward, the second to the headwaters of the Fly and the third to Lake Habbema and Mount Wilhelmina in Dutch New Guinea. The entire botanical gatherings of these expeditions were entrusted to the Arnold Arboretum in America. Dr. E. Merrill and Lily M. Perry together with A. C. Smith have systematically worked through the collections and published a series of papers in the *Journal of the Arnold Arboretum* dealing with the collections.

The writings of Merill, Perry and A. C. Smith are quite the most valuable of the recent publications.

The recent war necessitated the production of considerable quantities of timber for local use within the Territory. Army Forestry companies provided this timber. Our present Director of Forests, Mr. J. B. McAdam was able to have Mr. Lindsay Smith from the staff of the Brisbane Herbarium attached to the companies as Botanist. Under Smith's direction about 2,000 numbers, each consisting of 8-10 duplicate sheets were collected of ligneous plants. Most of this material was sent to Brisbane for distribution but a nucleus has been left at Lae and provided the basis for our Herbarium when I took over in 1946. Smith has worked up certain families from these collections but the overall position regarding the systematic study of this material is not very satisfactory.

In Europe the war was responsible for the destruction of most of the collections kept in the Berlin Herbarium. The German botanists preferred to retain the whole of the collection from New Guinea under their immediate care so that practically no duplicates had been distributed. Innumerable type speciments have been lost and the only available information for now and all time for the species based on these type specimens will be the published descriptions. New Guinea botany will suffer for many years from the loss of the material in Berlin. It is fortunate that even a few of the Lauterbach duplicates have been located in Breslau, and a very few are interspersed in the Herbarium at Brisbane.

We are now in a position to consider the present position of systematic Botany in New Guinea.

Since 1948 a new publication *Flora Malesiana* has been produced on an international basis for the promotion of botanical science and the cultural advancement of the people of the South-Eastern Asia to South-West Pacific Region. This publication will ultimately cover the entire history of botany in the Malaysian region and systematically revise the plant families found therein. Much of the historical information used in this article is taken from *Flora Malesiana,* Series 1, Vol. 4, Part 2, *Short History of the Phytography of Malaysian Vascular Plants,* for which the author is indeed grateful.

Botanical work in Papua and New Guinea is centred on the Herbarium of the Department of Forests at Lae. The present collections exceed 5,000 sheets and are growing actively. With the appointment of Mr. A. Floyd as Ecologist—Assistant Botanist, it will be possible to accelerate the rate of collection and acquisition of material into the Herbarium. The Resource Survey Section in conjunction with Officers of the Papua and New Guinea Administration is adding considerably to our knowledge of the New Guinea Flora.

From time to time the Herbarium receives collections of plants for indentification from residents of the Territories. If these specimens are adequate they are incorporated in the Herbarium. Some hints to collectors of botanical materail are given in the adjoining article.* Specimens from residents throughout the Territories will always be welcome and the staff of the Herbarium will undertake their indentification as speedily as possible.

---

* See *Notes on the Collection of Botanical Specimens*, Page 62 of this issue.