

PART I

History and literature of the botanical investigation of extra-tropical Western Australia

CHAPTER 1 HISTORY

EARLY DISCOVERIES

The early voyages of exploration which first brought Western Australia to the attention of the western world were of little value insofar as the botany of the area was concerned. None of the many Dutch navigators of the seventeenth and eighteenth centuries who must surely have visited the west coast of Australia on many occasions seems to have shown any interest in the flora of the new country.

It was left to the British Captain Dampier to bring back the first information regarding the vegetation of Western Australia. Some of the 40 species which he collected came from the tropical regions of Western Australia, especially from the Archipelago which bears his name. The rest came from the Shark Bay area, which his expedition visited briefly in 1699. This collection was worked up by Woodward and some of the results published in the account of Dampier's travels and in Plukenet's *Amaltheum Botanicum* (1705). The collection is held in the herbarium of the University of Oxford today. Reference was made to it by Lawson during the British Association Meeting at Bradford in 1873.

The second collection of plants from Western Australia was made by Archibald Menzies, also British, who was the naturalist on Vancouver's expedition. Vancouver discovered King George Sound in 1791, and gave an excellent description of this impressive area. It was from here that Menzies collected a number of plants which unfortunately remained unknown to the scientific world for some years until Robert Brown's publication.

THE FRENCH

The unfortunate delay referred to above was responsible for the loss of priority to names of species in Menzies' collection. Only a year later (1792) Labillardière visited Western Australia. His botanical collections which were much more numerous than those of Menzies, were described between 1804 - 1806 in *Novae Hollandiae Plantarum Specimen* (2 volumes). This was the first important contribution to the botanical literature of Western Australia.

Labillardière was the naturalist with the expedition of D'Entrecasteaux, who sailed along the southern coasts of Western Australia towards the end of 1792 in the corvettes *La Recherche* and *L'Espérance*. He proceeded along the south coast without landing, until in early December the ships were forced by bad weather to run for shelter. They anchored in the neighbourhood of Esperance Bay¹ on 13 December and remained there until 20 December 1792. The scientists on board made good use of their time there. Labillardière gave a detailed account of his work in the area in the *Relation du Voyage*. At first he collected on a small island which was situated facing the bay. He noted the characteristic form of the granite and at the west end of the island, the occurrence of coastal limestone which he correctly considered to be a remnant of a former general deposit covering the island. One of the first plants he saw (*loc. cit.* p. 395) was "a *Leptospermum* which was remarkable for its silvery leaves and dazzling red flowers" (*Kunzea sericea* (Labill.) Turcz., Myrt.). Next collected were banksias, *Lobelia* and other less conspicuous plants. On page 401 there is a description of *Eucalyptus cornuta* and on page 403, *Chorizema ilicifolium* (Legum.) which "was found with many other plants in a marly soil". Finally, *Spinifex hirsutus* (Gramin.), *Anigozanthos rufus* (Amaryll.), *Banksia repens* (Prot.) *Dryandra nivea* (Prot.) and several myrtaceous species were discovered on the mainland.

The careful publication, clear descriptions and fine illustrations ensured the value of Labillardière's collection, although it only resulted from the work of a single week.

Labillardière was followed by Leschenault, who took part in the expedition of the

¹ Labillardière specifies the place accurately in his itinerary tables as Baie de Legrande, 33° 55' 16"S, 119° 32' 1

Géographe and *Naturaliste* under Baudin and Peron. This expedition holds a special place among the voyages of discovery to Western Australia. A chronicle of the voyage, *Voyage de découvertes aux Terres Australes*, was published by Freycinet in 1824. The mainland was sighted on 27 May 1801, and by 31 May botanical investigations were being made on the coast in the neighbourhood of Cape Naturaliste.

Melaleuca Preissiana (Myrt.) was reported as a striking tree on alluvial soils; the first description of it is given in Vol. 1, p. 181, of Freycinet. It was recorded with some surprise that this apparently nutrient-impooverished region exhibited a “variété prodigieuse des arbers et des arbrisseaux”. The most important species collected are listed in Leschenault’s summary (*loc. cit.* IV, pp. 338-339). These include *Salicornia* found on marshy ground - together with species of *Banksia*, *Calothamnus* (Myrt.), *Macrozamia* (Cycad.), *Anthocercis* (Scroph.) and *Lasiopetalum* (Stercul.) on sandy soil further inland.

In the latter half of June, the *Géographe* sailed northwards to Shark Bay where botanical investigations were begun, in particular on Bernier Island. In Vol. 1, p. 245, are mentioned a *Ficus*, 2 or 3 *Acacia* spp., “a small *Melaleuca*” and several species of *Atriplex* and *Triodia* (Gram.). A low-growing *Acacia* with horizontal branches and a *Cyperus* 2 – 3 ft. high with more-or-less-globular flowering heads the size of a man’s fist (probably *Spinifex longifolius* R. Br. (Gram.)), occurred on the dunes. In Vol. IV, p. 337, a more detailed list is given, although only genera are named. These collections were of particular interest, as Bernier Island has not been re-investigated botanically since, and no exact determinations of Leschenault’s specimens have yet been made. Leschenault deserves further credit for his observations on the effects of the prevailing winds on vegetation. This work also arose out of his study of the vegetation of Bernier Island (*loc. cit.* Vol. I, p. 248).

Incidentally, the coast of Shark Bay was visited once again by the French - by the expedition of the *L’Uranie* and *La Physicienne*, under Freycinet’s command. Gaudichaud, who was botanist to the expedition, collected a considerable number of specimens at Shark Bay but only a few new species were described (in “Voyage autour du Monde sur l’Uranie et la Physicienne” 1817-1820. Botany by C. Gaudichaud. Plates by A. Poiret. Paris 1826).

While botanists on the *Géographe* were working in the vicinity of Shark Bay, those on its sister ship, the *Naturaliste*, were exploring the Swan River district in June 1801. Rottneest Island was traversed (*loc. cit.* I, p. 365), followed by part of the Swan River. The coastal limestone of the river banks was noted and *Eucalyptus “resinifera”* (= *E. gomphocephalata*) reported as a particularly stately tree (see I, p. 353). The Darling Range was seen in the distance, but the party did not succeed in penetrating that far into the country.

Almost two years later, following the conclusion of their explorations in eastern Australia, the expedition returned to the shores of Western Australia. The boats remained anchored in King George Sound from 15 February to 1 March 1803. In these two weeks Guichenot and Leschenault made very large collections (*loc. cit.* IV. 340) of novel taxa whose genera fill several pages of the account of the expedition (*loc. cit.* IV 341-343).

Leschenault’s collection, however, was never thoroughly processed, and he only receives a mention in monographs as a botanical collector. Thus the returns for his labours were relatively small. However, it should be noted that he saw more of the Western Australian vegetation than any earlier investigator and even more than Robert Brown did. It is therefore particularly unfortunate that the passing on of his knowledge to his contemporaries was limited to a short summary in the last chapter of Freycinet’s work (*loc. cit.* IV 327 and on), under the title “Notice sur la végétation de la Nouvelle Hollande et de la Terre De Diémen”. He emphasised the xeromorphic character of the vegetation and suggested it was a reaction to the dryness of the climate. The poor development of cryptograms and the harshness of leaves of the indigenous Gramineae were also mentioned.

ROBERT BROWN AND HIS CONTEMPORARIES

At about the same time as the explorations under Baudin and Peron were proceeding, the expedition of the *Investigator* under Captain Flinders reached Australia. Among the scientists present was Robert Brown and it was through him that our knowledge of the Australian flora was greatly expanded. Also present were F. Bauer, a botanical artist, and the horticulturalist, P. Good, who acted as conservator.

Flinders followed the course of his predecessor, Vancouver, and approached the Australian coast from the south-west. On 8 December 1801 he landed in King George Sound. The stay here lasted until 30 December, and in these three weeks R. Brown laid the foundations of his huge Australian collection. The extraordinarily rich flora of this region is clearly represented in these collections even though they were made in mid-summer when only a limited number were in flower. R. Brown's explorations were evidently very thorough, for his herbarium contained species (e.g. *Thysanotus pauciflorus* R. Br. (Lil.)) which were only recollected during our expedition exactly one hundred years later.

After leaving King George Sound, Flinders sailed eastward and cast anchor at only one other spot on the West Australian coast where his scientific colleagues wished to collect. This was at Lucky Bay. Various islands in the Recherche Archipelago were also visited and collections were made on Goose and Middle Islands. The ship stayed in the area from 10 to 18 January 1802 and several field trips were organized. Robert Brown, for example, travelled westwards as far as Cape Le Grand. The collections he made provided very important material, some of which is still unique. Despite the fact that the adjoining region had been investigated by Labillardière in 1792, by Maxwell at a later date, and that we collected at Esperance Bay, there still remain some species which have not been collected since Robert Brown discovered them.

Allan Cunningham also botanised in Western Australia. The visits of this enterprising and successful explorer of Australia, particularly with regard to the rich flora of the southwest, were however only very short. As a member of an expedition under Captain King, he collected on two occasions, from 21 January to 1 February 1819, and from 24 December 1821 to 8 January 1822. He made quite extensive collections at King George Sound. At the end of January he also spent two to three hours on Dirk Hartog Island. Although he was never involved in investigating any new territory, his descriptions of his excursions are so clear that his collecting notes are of considerable value. They are recorded in his paper "A few general remarks on the vegetation of certain coasts of Terra Australis, and more especially of its north-western shores". This appeared as an appendix to the report of Capt. King "Narrative of a Survey of the Inter-tropical and Western Coasts of Australia." More information is given in the biography of R. Heward in Hookers Journ. of Bot. IV (London 1842) 231 and on.

The region around King George Sound was also the base for the explorations of W. Baxter, who collected for Henschman between the years 1823 and 1825, as well as later in 1829. From King George Sound, Baxter appears to have traveled as far as the foothills of the Stirling Range to the north, and as far east as Lucky Bay and Cape Arid. These trips do not seem to have produced much that was new to science. I have no detailed knowledge of his fieldwork in this area.

We have much more information about the explorations of Capt. J. Stirling which took place in 1827 in the region of the Swan River. The naturalist on the expedition was Ch. Fraser, the colonial botanist of New South Wales. He was the first, since Leschenault's brief visits, to study in some detail the flora of the Swan River and to bring back pressed specimens. His observations have been set out in "Remarks on the Botany of the Banks of the Swan River, Isle of Bauche, Baie Geographe, and Cape Naturaliste" (in Hookers Botan. Micellany I (1830) 221-236). From this account it appears that the expedition, after overcoming many difficulties (which had defeated the French explorers in 1801), followed the Swan River to the foothills of the Darling Range which forms the edge of the plateau. Fraser apparently ascended the extreme western slopes of the scarp. His report, which had very important effects politically, is also interesting from the point of view of

the history of botanical investigations in Western Australia. It contains vivid descriptions of the coastal limestone zone, mentions *Agonis flexuosa* (Myrt.), emphasises the importance of *Xanthorrhoea Preissiana* (Lil.) and *Macrozamia* (Cycad.) in the landscape, and lists the most common species of *Eucalyptus*. The value of these observations was unfortunately somewhat reduced by misdeterminations arising out of confusion with related New South Wales species. His account finished with notes on the vegetation of Garden Island (Isle of Bauche) and in the region of Geographe Bay. Fraser's paper also examined the possibilities for settlement around the Swan River, and he reported so favourably that it no doubt led to the annexation of the region by the British Crown. The descriptions of the vegetation of the Swan River as tropical in character, stand in striking contrast to the rather depressing account of the same region in Freycinet's work. However, in the latter case, it should be noted that the author was a Frenchman unfamiliar with Australia, while Fraser was at home on Australian soil. Fraser's visit took place in March at the end of summer when few flowers were in bloom and consequently a most unfavourable time for floristic studies. This is responsible for the fact that his collection contains relatively few species which could be identified. His travels therefore did not greatly expand our knowledge of the flora of the region. The same applies to the travels made by Collie, who, in 1832, botanised in the coastal districts of the south-west.

Finally we may mention that the collections of Fraser proved of some historical value in that they formed the subject of a small article by Robert Brown published in 1832, entitled "General View of the Botany of the Swan River" (Journ. Roy. Geogr. Soc. London I. 17-21). In this paper the relationship between the flora of the south coast (from King George Sound to Lucky Bay) and that of the Swan River country is considered, and a further advance was made in our knowledge of the extent of the Southwest Province.

BARON VON HÜGEL

Following the visits of Leschenault and Robert Brown, very little progress was made in knowledge of the Western Australian flora during the first thirty years of the nineteenth century. A more rapid advance was made possible by the declaration of the Swan River area as a British Colony in 1829 and the beginning of land settlement.

Because of the interest of the British in plants and flowers, the beautiful wildflowers of their new home created a keen interest among the settlers. Specimens and seeds of the most striking plants began to be sent back. As a result, there was a large increase in cultivation of the novel species from the Swan River. They began to take their place in conservatories together with those already grown from New South Wales.

Western Australian species began to be mentioned more often in horticultural journals, and here and there new species were described. However, before reports on the above material sent to England appeared, the records of a voyage made by Karl Baron von Hügel to Western Australia at the end of 1833 were published. He landed at the mouth of the Swan River on 17 November 1833 and studied the islands near the entrance to the river, collected in the neighbourhood of Perth and managed to penetrate inland as far as Darlington on the Darling scarp. He remained in the Swan River area until 19 December and then continued by sea to King George Sound, where he remained from 1-12 January 1833. His excursions there were not confined to the immediate vicinity of the Sound but covered the general Albany area, including the lower reaches of the King and Kalgan Rivers. G. Bentham, E. Fenzl, H. Schott and, in particular, St. Endlicher participated in processing the collections, and the results were published in 1837 under the title "Enumeratio Plantarum quas in Novae Hollandiae ora austro-occidentali ad fluvium cygnorum et in sinu regis Georgii collegit Carolus liber Baro de Hügel. Vindobonae (83 pgs.)". Unfortunately, only a part of the collection was described in this paper. Important families such as the Myrtaceae and Proteaceae were omitted. In spite of this, however, the Enumeratio listed a large number of new species, mainly from the Swan River area, about whose flora next to nothing had previously been published. Because of the work of earlier botanists in the King George Sound region, his collections from that area did not add much that was new.

PREISS

In 1838, Dr Ludwig Preiss visited the colony in order to study its natural history. He devoted most of his time to the investigation of the flora with the intention of establishing a representative collection. His undertaking was the first carefully planned exploration of the flora of Western Australia.

Almost the whole of his first year was devoted to collecting in the immediate neighbourhood of the Swan River and the coastal area near Fremantle. In company with Drummond, he also collected on Rottnest Island. From Perth, he collected eastwards as far as the foothills of the Darling Range. It was not, however, until September of the following year that he extended his collecting to the top of the Darling scarp and beyond to the woodlands on both sides of the main road as far as York. In November and December he visited the district round Geographe Bay, travelling as far south as the point where Busselton stands today. In the following year he again crossed the Darling Range, going as far as the Avon Valley. From here he organised an important trip north into the Victoria District which he penetrated as far as the Quangan Plains. This visit took place at the most unfavourable time of the year as far as flowering was concerned, so that only a small fraction of the rich flora of these regions was collected. Despite this, Preiss made many valuable discoveries there.

During the early winter period of 1840 Preiss does not appear to have collected very much, but in August he organized an expedition south for about six months. From September 1840 to February 1841 he made his headquarters at Albany. He collected very thoroughly in this already well known area, and also made trips into botanically unexplored districts. One of these followed the newly opened mail route to the north-west from Albany as far as the Gordon River. In November 1840 he travelled to Cape Riche where he found a particularly large number of new species. By the end of the summer in March 1841 he arrived back at the Swan River. He again collected here for some months in order to complete his herbarium, especially the Cryptograms. In 1842, Preiss returned to Germany.

The collection of Dr L. Preiss, which comprised some 2,718 specimens, was by far the largest which had been made in Western Australia up to that time. It has only been exceeded since by the collections of Drummond and Diels. However, the thoroughness with which Preiss annotated and presented the collection makes it much more important. In fact, in terms of its understanding of the requirements of science, it was years ahead of its time. It was the first collection from Western Australia to become available in several leading European herbaria. It was also the first in which accurate and careful details were present on the labels giving the locality and time of the year the specimens were collected. It also provided valuable information concerning the colour of the flowers and the habitat of the plants. Finally, it was the first collection in which the plants were carefully studied and named in a relatively short time. To Chr. Lehmann and his co-workers (Endlicher, Nees von Esenbeck, G. Kunze, A. Braun, Hampe, E. Fries, O.W. Sonder, Meissner, Bunge, Bartling, Schauer, De Vries, Reissek, Miquel and Steudel) is due the credit of completing this task within a period of five years. The book was entitled "Plantae Preissianae" and published in 2 volumes, 1844 - 1847. It provided clear evidence of the success and value of Preiss's expedition. One of the most important advances which arose out of Preiss's collections was that it focused attention on certain families (e.g. the Myrtaceae) which up to that time had received less attention from English authors. Regions which Preiss was the first to explore, such as the hinterland of the Avon district, the Upper Gordon River system and the environs of Cape Riche, were particularly rich in new genera and species.

The later success of "Plantae Preissianae" has to some extent been less than its actual worth. The collection was less well known in England than on the Continent and as a consequence of this the views of those who worked on *Plantae Preissianae* were neither sufficiently made use of, nor indeed properly accredited, by the author of *Flora Australiensis* [Bentham]. The detailed notes on the geographical distribution and biology of the types given in *Plantae Preissianae* at first received little attention. It is for this reason

that we wish to emphasize the great value of the work of Preiss and of the co-workers who studied his collections.

JAMES DRUMMOND AND HIS CONTEMPORARIES

The interest by the first European settlers of Western Australia in the botanical exploration of their country has already been mentioned. The flora which surrounded them was exciting both in form and colour. In many homes and farms, small herbaria were started. Orchids and everlastings, in particular, were collected, just as is the case today. Apart from this, a more serious interest in the flora was evident during the early years of the young settlement. Thus, from 1830 until her death in 1843, the wife of Capt. [Georgina] Molloy, who had settled on the Vasse River, was busily engaged in the collection of plants from the district around her home. Her collections, prepared with meticulous care and carefully annotated, are still of great value to several herbaria to which, upon Lindley's recommendation, she forwarded specimens. She is often mentioned in the *Flora Australiensis*.

The name of Drummond is connected with the foundation of the Western Australian colony, and this gentleman exceeded all his forerunners as a botanical collector and investigator of Western Australia. In fact, no-one since his time has gained such an intimate knowledge of the vegetation of this region.

Drummond was in charge of the Botanical Gardens at Cork, Ireland, before emigrating to the Swan River Colony, and so was well fitted to take up botanical work. His brother, Thomas, had also become well known through a botanical expedition he had made in North America. James Drummond was therefore in a sense predestined for the role which awaited him in his new home. He landed on the infertile coast of the almost unknown country as one of the first emigrants in 1829, and helped to found the Swan River settlement. He was involved in all the struggles which the pioneers of this young country had to face in order to overcome their difficulties. But despite the arduous work and the bitter frustrations experienced, he managed to continue with his favourite hobby. With rare devotion and enthusiasm he kept it up right to the end. Soon he was not only better acquainted with the vegetation of the south-west than anyone before or after him but also with the plants of the dry inland eremaeian country. Even today, elderly people who had met him describe his deep involvement in his botanical work. When riding, he would carefully carry a plant for days at a time in the field to ensure that it got back in good condition to his base-camp. They also spoke of his ability to give a name to any plant he was given, no matter how inconspicuous, and to indicate its use.

It is very difficult to follow Drummond's travels in detail. His enormous collections were not labelled and his numbering system was somewhat unreliable. Moreover, the various notes often did not correspond with the specimen numbers¹. During the process of sorting and distributing the dried specimens, mistakes also arose. There were also certain difficulties which could not very well be avoided since communications between Western Australia and the outside world at that time were subject to all sorts of delays. In short, in many cases one cannot really be sure where Drummond's plants were actually collected.

Drummond published only a few small articles. However, the more important parts of many letters and diaries which he sent to Sir W. Hooker, and which are still preserved in the Kew Herbarium, were published in *Hooker's Journal of Botany*, Vol. 2 (1840), the *London Journal of Botany*, Vol. 2 (1843) and the *Journal of Botany and Kew Miscellany* (usually known as the *Kew Journal*) I (1849), 4 (1852), and 5 (1853). These provide the only sources whereby some of the data of his field trips can be traced.

At the time when the correspondence commenced (1839), Drummond had settled at Toodyay on the Avon. He had evidently already travelled extensively in the Colony and had at least thoroughly explored the more distant surroundings of the Avon River as far as the Quangan. Besides this, he often visited the Swan River area and adjacent

¹ On the confusion of Drummonds collections in Kew and London see Spencer Moores comparison noted in *Journ. of Botan.* XL (1902) p. 29, 30.

regions along the coast so that he must have been well acquainted with the whole stretch of floristically diverse country between the Avon and the Swan.

The first published letter (Journ. of Botan. II (1840) p. 343 on) describes the flora of the coastal limestone zone and the changing nature of the vegetation as the base of the Darling scarp is approached, together with the vegetation of the plateau as seen on the road towards the Avon.

The next article is concerned with the inland flora of the Avon system and the plants which grow in the "Salt River" area. It also refers to the sandplains which extend far to the east.

In September 1839, Drummond and the visiting German botanist, Preiss, travelled to Rottneest Island. The short sketch of the vegetation of this island gives many interesting details.

In October 1840, he undertook an expedition to King George Sound at the same time as Preiss was collecting in the area. The note about the journey gives little in the way of detail and there is much to indicate that Drummond did not collect very thoroughly in the area of King George Sound.

In 1842, at the beginning of a very wet winter, he traveled down the west coast to the Vasse River and beyond in order to inspect a species of *Dasypogon* (Lil.) which was endemic there. He gave it the name *D. Hookeri*. The letter describing the Vasse River journey is published as a detailed note (London Journ. of Bot. II (1843) 167 on). It is important scientifically as it includes a description of the above-mentioned remarkable species and also personally in that it mentions that he was a guest in Molloy's home.

We have little information about his travels in the following years. But around 1847 a bold project to travel southwards from the Swan River to the south coast in the vicinity of Lucky Bay had to be abandoned owing to illness. Drummond had scarcely begun his long trip (he had travelled about 150 km from the Swan River) when he began to suffer from an inflammation of the eyes which necessitated his return.

In 1848 (Kew Journ. of Bot. I (1849) 247-249) Drummond travelled to Cape Riche on the south coast where he stayed at Moir's farm and made it his headquarters for a number of very important investigations. His letters speak of excursions to the Perongurup Hills [Porongurup Range] and Stirling Range. No mention is made in the article of any trip in an easterly direction, although Mr Moir informed me that Drummond, at that time accompanied by Maxwell (who later collected on his own), explored the country eastward, including Bremer Bay, West Mount Barren and Middle Mount Barren and beyond, until they reached the hills near Mount Drummond (named after him) which mark the eastern limit of his travels. It is a pity that we have no direct information from Drummond himself regarding this trip.

About the middle of 1850 Drummond set out on his most successful collecting expedition and for the first time collected in the north of the Southwest Province. He followed the Avon as far as the Moore River, stopping for a short time at Dandaragan, after which he turned towards the coast along the Hill River. Mount Lesueur provided valuable material and from there his course was northerly. The zone of coastal limestone was followed, and both the Irwin and the Greenough Rivers were crossed and he finally reached the Murchison River at the Geraldine Mines.

Owing to the hostility of the Aborigines, the expedition was in constant danger and had many obstacles to overcome. The expedition continued for eighteen months, the party returning home at the end of 1851. Because of the dangerous circumstances, the collections were not very large but they were strikingly rich in new species and exceeded all the earlier ones in beauty. "They are indeed rather a selection than a collection", writes W. Hooker. In Drummond's notes on his discoveries (Kew Journ. of Bot. V (1853) 115 on) some of the enthusiasm which his unexpected successes had aroused is evident. The description of the newly-found plants is more compelling than usual. Anyone who has visited the districts from which they came, can today write after each description the correct name of each species, so carefully were they described. The floristic richness of the regions between the Moore and Murchison Rivers, particularly in the families Le-

guminosae, Myrtaceae and Proteaceae, is clearly apparent.

After the big undertaking of 1850-1851, news from Drummond became scarce. In the *Kew Journ. of Bot.* V (1853) 312 and on, it appears that some trips were made eastward from the Moore River towards Wangan [Wongan] Hills. This is a region where no-one has botanised since Drummond's time, and so it is all the more regrettable that his communications were so brief.

Among the botanists who have helped to open up Western Australia, Drummond was the first and only "colonial". Over the last fifty years his example and achievements have stood alone and he remains a model for the future.

By a curious chance of fate, the two most thorough botanical investigations of Western Australia during the last century coincided, so that Preiss and Drummond were able to meet and spend time together in active work. This co-operation was all the more successful since both men embodied opposite traits. Preiss as a cultured scientist of old Europe always endeavoured to bring order out of the chaos arising from purely superficial knowledge but was seldom aroused to explore new country. Each plant in his collection was very carefully labelled, giving the locality and other data in a way which no-one had previously tried to do in Western Australia. Drummond, on the other hand, was a bushman, always in the saddle, and most happy when riding along uncharted tracks. He was always on the lookout for something new and was quick to observe differences in characters. He was a great collector but not one who liked keeping a carefully written account or to spend time in arranging his specimens in order.

The vast number of rare and unusual plants, including all the species which have never been re-collected since his time, must make up for the meagre information which his travels provided for the subject of plant geography. However, provided one knows the country, it is possible to distill a great deal of information regarding the habitats and distributions of species from his letters.

These letters as stated above are to be found in Hookers Journals. Some additional letters were published in the Perth-based newspaper, "The Enquirer" (1843). These letters contain a great deal of valuable information concerning the habit and life forms of plants typical of the area. In addition, more general comments were included regarding, for instance, the colour variation of the flowers in certain genera and species, local variants and the effect of soil type. Everything of possible interest to the farmer is emphasized, and reference is also made to species valued as sources of food or medicine by the Aborigines - information which unfortunately we can no longer obtain.

As far as their value to science is concerned, Drummond's collections (the largest ever made from Western Australia) did not have the fate they deserved. All appeared to go well at first, but the collector had soon to suffer the disappointment of seeing type descriptions published in "Plantae Preissianae" of much that he had sent years before to Europe. Lacking any formal arrangements, the description and publication of his material took place at different centres¹ until it was finally completely broken up. It was only when Bentham worked on the relatively complete collections at Kew for his "Flora Australiensis" that some degree of order was reached. Even with this, however, the work was incomplete and to this day there are specimens from Drummond in the Kew Herbarium which have never been described or at least remain insufficiently studied.

Only two works among the numerous scattered publications referring to Drummond's material require mention here, since they are relevant for our study of the development of knowledge of the Western Australian flora. The first is Lindley's "Sketch of the Vegetation of the Swan River Colony", and the second, Bentham's "Flora Australiensis".

Lindley's "Sketch of the Vegetation of the Swan River Colony" appeared in 1839 in London, as an "Appendix to the first 23 volumes of Edwards Botanical Register" together with a general index of this periodical.

The description of the vegetation could not be very detailed at this early date, and consequently the value of Lindley's work for plant geography is limited. Rather, its value lay in the 283 new and important species, the descriptions of which were included in the

¹ Particularly valuable contributions supplied Meissner and Turczaninow (see Literature)

text. In addition, brief comments were added relating to their systematic position, horticultural potential and aesthetic appeal. The genus *Eremaea* (Myrt.), the much discussed *Byblis gigantea* and many other species were described here for the first time. The work was illustrated with nine colour plates.

The material on which the descriptions for these numerous new species was based, came from Drummond's first collections. It was unfortunate that after such an enthusiastic start the study of Drummond's material was allowed to lapse. Only in Bentham's "Florae Australiensis" were all the various pieces of Drummond's life work brought together.

Bentham's great work, "Flora Australiensis", which commenced publication in 1863 and was finished in 1878, contained the first and so far the only systematic description of the Western Australian flora. This work, together with the labours of earlier and later botanists, has at long last given Drummond's contributions their proper place in history.

Bentham's work, "Flora Australiensis" has received the approval of those best in a position to criticise and value it. But only those who have used it month after month in the field, identifying species which the author never saw in the living condition, can appreciate properly the magnitude of the undertaking. It is doubtful if any other flora has been so successfully described and keyed out on herbarium studies alone. As far as the Western Australian sections are concerned, there are very few families which in the light of modern investigation require major changes. In my opinion, only the Styliaceae requires treatment, but Bentham himself appreciated this and emphasised this fact. I have already remarked that the results of "Plantae Preissianae" did not in fact receive adequate attention in "Flora Australiensis", but this was probably due to the lack of Preiss's material in English herbaria.

The main defect of "Flora Australiensis" (and this applies generally to British colonial floras) is the neglect of locality names and notes. Western Australia has suffered especially, in this respect. Too often the locality of Drummond's specimens is given simply as 'Swan River'. This could mean the vicinity of that river, but could also refer to the whole settlement - thus including entirely different floristic areas. This may result in serious errors. On the other hand, the very precise annotations in "Plantae Preissianae" appear to be arbitrarily handled and by grouping with other citations often become quite incorrect. If one adds to this the confusion arising out of the inadequate labelling by collectors such as Oldfield, and the uncertainty as to the correctness of the information in Robert Brown's collections, one comes to the conclusion that the "Flora Australiensis" must be used with great caution as far as information regarding the details of the plant geography of Western Australia is concerned.

Despite this, one need scarcely mention how much Western Australian plant geography owes to Bentham's "Flora Australiensis", and how it remains the taxonomic foundation upon which geographical work can safely be built.

Having looked at how Drummond's collections were of major importance in the publication of the pioneering "Flora Australiensis", we must now turn back in order to refer to a contemporary of Drummond's, who was only involved in botanical collection as a sideline.

J. S. Roe became famous as an explorer of regions which even today are little opened up. He was the first chief of the Western Australian Lands Department. After several surveying trips in the Southwest Province he set off eastwards from the Avon River in 1836 and reached the Eremaean zone, with its loamy claypans and salt pans, in the far inland areas of Western Australia. His explorations took him as far east as the Lake Brown area. In 1848-49 he carried out a more extensive exploration from the Avon to the south coast. This journey (which Drummond earlier had attempted but abandoned because of ill health) made Roe's name famous among the pioneers of Australian exploration. He set out in September from York on the Avon, reaching the Pallinup River in October and then turned eastwards towards the Bremer Range. However, owing to lack of water and the dense vegetation, Roe had to abandon his objective of penetrating further inland. Following a route rather closer to the coast, he then travelled due east until he

reached the Russell Range where, at its south-eastern extremity, water and grass were obtainable. On his return journey, keeping close to the coast, he investigated the valleys of this region and reached King George Sound at the end of January 1849.

A small number of plants collected on these journeys reached Endlicher in Vienna and were described by him. A few others are in the collection of Sir W. Hooker in the Kew Herbarium. Part of the collection of specimens is housed in the Western Australian Museum, Perth, but I was unable to locate the collection so I cannot report anything about its size, etc.

Roe published a note concerning his second journey in Hooker's Kew Journ. VI and VII (1854, 1855). This paper is noteworthy from the point of view of plant geography since the greater part of the district traversed is still botanically *terra incognita*.

In the second half of Drummond's period of activity Dr W. H. Harvey visited Western Australia. This famous phycologist stayed here for several months in 1854, essentially to investigate the fine algal flora of the coasts of King George Sound and the Swan River region. A few short letters regarding his sojourn were published in Hooker's Kew Journal VI (1854) and VII (1855). Some flowering plants collected from Cape Riche and on an overland trip between King George Sound and the Swan River are listed and were cited in Bentham's "Flora Australiensis".

Following the period of exploration and collection by Drummond and Roe, the next phase of botanical investigation in Western Australia was initiated by Ferdinand von Müller.

FERDINAND VON MÜLLER AND HIS CORRESPONDENTS

Ferdinand von Müller visited south-western Australia twice, but on both occasions stayed for only a few weeks. His knowledge of the state of botany in this country, however, enabled him to make the greatest possible use of his time. He chose King George Sound as the starting point for his first field trips in 1867. He knew that in this area the different zones of the flora were more closely crowded than was apparent in any other part of the State. He studied the woodlands and swamp communities around Albany and Wilsons Inlet. At the Perongerups, where scarcely anyone had collected since Drummond's time, he saw one of the best examples of forest development in south-western Australia. Later on, he made his headquarters near Kendinup in order to have easier access for collecting in the rich region of the Stirling Range. He climbed the highest peaks of this range and also investigated the extensive sandplains to the north of the range where the character of the south-eastern sand heaths is strongly evident.

His second visit to Western Australia in 1877 was undertaken under the auspices of the Western Australian Government. The first part of his stay seems to have been devoted to the investigation of the more northern areas whose floristic richness was known from Drummond's descriptions. F. v. Müller had become familiar with some of these through his study of Oldfield's collections. The Arrowsmith, Irwin and Greenough rivers were crossed along the old road which passed over the sand heaths. He travelled from Champion Bay beyond Northampton to the Murchison River. From there he journeyed across the apparently endless, barren waterless plains further northward to Shark Bay. Here the extreme northern limit of the Southwest Botanical Province was reached at Freycinet Harbour. He then returned to the Swan River. This journey was followed by a short trip across the Darling Range to the Avon Valley and finally a further small excursion to the south. He stopped at the Preston River area for some time and then visited the most beautiful parts of the south coast in the Shannon River area. Some new species were discovered which rank amongst the most important mesophytic plants of the flora.

The other districts visited by F. v. Müller also provided additional new information which helped him to complete descriptions already available. The overall number, however, was not very large. The importance of his journeys is more related to the fact that they made him acquainted with the habitats and life forms of the flora where there is a higher proportion of endemic species than in any other part of the continent. It enabled

him to appreciate the beauty of form and flower which he was to describe so enthusiastically later. His sensitive nature was moved by the aesthetic qualities of the flora and the range of its species aroused feelings of devotion. An eyewitness gave me an account of how, on one occasion when on an isolated heath, he came across a stand of *Verticordia oculata* (Myrt.) and stood quite entranced. He could barely drag himself away from the wonderful floral display. Later he referred to this species as the "princess of the Australian flora". All this was a tremendous experience for him, and it is moving to read the words at the end of his last short description of the Western Australian vegetation.

It is well known that F. v. Müller was able to infect others with his own enthusiasm for botany. In this there lies another effect of great importance which his journeys to Western Australia had upon the botanical investigation of this country. Wherever he went he taught people to appreciate and observe the wonders of nature. Many needed only a little encouragement to commence useful scientific studies, while others collected purely out of friendship or high regard for von Müller. Many sent him the results of their excursions through the bush. He came to be regarded in Western Australia, as the botanical authority in Australia. Even today the memory of the 'Baron' lives on in the whole province. This is particularly true of isolated farm houses where he had once been a guest for perhaps only one or two hours.

F. v. Müller was untiring in his efforts to place even the smallest discovery in its correct taxonomic position and consequently, he ranks very highly among the investigators of the Western Australian flora. The herbarium which he established in Melbourne contained no Western Australian plants at all when he commenced work. Now it is perhaps the richest in the world in representatives of this flora. In the first volume of his *Fragmenta* he published an account of some new species, most arising from the collections of Maxwell, whom he had sent to the south-eastern part of the Province, and some from those of Oldfield who collected in the north-west of the Southwest Province, particularly near the mouth of the Murchison River. Both these collections provided much material for taxonomic work. The results were published in the "*Fragmenta*" pending their incorporation in Bentham's treatise. Nevertheless, during the period of production of the "*Flora Australiensis*" the number of F. v. Müller's Western Australian correspondents increased to such an extent that the later volumes of the "*Fragmenta*" and even his last publications contained new species from this region. Unfortunately, F. v. Müller was unable to complete the study of a large number of the specimens forwarded after 1880 and they still lie undetermined in the National Herbarium of Melbourne.

In addition to the articles published in "*Fragmenta*", F. v. Müller also published an impressive series of papers which deal with certain districts in Western Australia. Some of these deal with the tropical portion of the country with which we are not concerned. Of more relevance is his list of "Gascoyne River Flora" (The Plants indigenous around Shark Bay and its vicinity. Perth 1883), which deals with the collections of J. Forrest and the results of his own journey to the Shark Bay area. This catalogue is also of considerable interest to plant geographers as it showed that species with features characteristic of the south-west did not extend beyond Shark Bay.

Taxonomic papers also resulted from his work on the collections of E. Giles, who became famous for his pioneer travels into the interior of Australia. In terms of worthwhile botanical results, his expedition of 1875 was the most important. In August, Giles and his companions crossed the boundary from South to Western Australia. They kept to an almost east-west course and after one stretch of almost 500 km without water, they reached Queen Victoria Spring almost exhausted. A large number of interesting species was collected here. After a short rest the journey was continued, extensive collections being made at Ularring and Mount Churchman. Perth was reached in November. The next year, Giles started off on the return journey, commencing from the upper reaches of the Murchison River. He passed the sources of the Ashburton and then travelled eastwards between 25 and 24°S, slightly south of Lake Amadeus.

Useful notes on the vegetation of the region traversed by the expedition are given in Giles journal ("*Australia twice traversed*", London 1899). The list of species collected

was recorded by F. v. Müller in "Journal of Botany" XV (1877) pg 269 on. Many species were shown to have a wider westward distribution than had been expected. As a consequence, this work has considerable value for plant geographers.

For the same reason, one of the last works of F. v. Müller is important for its analysis of the Eremaean flora. This was his joint work with Prof. Tate on the species collected by Helms on the Elder Expedition. A complete record of this important collection has been produced (in Transactions of the Royal Society of South Australia XVI 333-383). Unfortunately the work is less thorough than is usual with the investigations of F. v. Müller and there are several misdeterminations.

With regard to the plant geography of Western Australia and the analysis of the economic problems presented by its vegetation, no work is of greater value than F. v. Müller's "Report on the Forest Resources of Western Australia", London 1879. The important trees of the country, mostly *Eucalyptus*, were described for the first time, finely illustrated and organized in terms of their habit and commercial value. The publication of this work marked a big advance over the rather vague descriptions and quite inadequate account of their distribution given in "Flora Australiensis". This report of F. v. Müller's laid the foundation for all later reports on the forests of Western Australia. For the first time, too, boundaries for the different plant-geographical zones of the south-west were proposed.

Finally, reference must be made to the monographs in which F. v. Müller described certain important groups of the Australian flora -*Eucalyptus*, *Acacia*, the Myoporaceae and the Chenopodiaceae. These are essential for the study of the Western Australian vegetation. A wealth of material, collected by the early pioneers in the course of hazardous journeys, is described for the first time. They are especially valuable because of the important information they provide regarding the flora of the interior.

It would occupy too much space to go any deeper into the details of F. v. Müller's work, and we must refer the reader to the long list of publications which very clearly shows the extent of his activity with regard to the western half of Australia. In fact, he was almost as familiar with the flora of this part of the continent as he was with that of Victoria itself. Consequently, he was proud to be asked to write a chapter on the vegetation of Western Australia for the [1894/5] "Western Australian Year Book". The result was a warmly written eulogistic essay, the value of which was enhanced by the inclusion of a detailed list of the components of the Western Australian flora, the first that we possess. He believed himself to be an authority on the botany of this isolated colony, and no-one ever disputed this claim.

F. v. Müller had a major influence on the botanical investigations of the last ten years of the nineteenth century in Australia. F. v. Müller had at his fingertips all areas of botanical development in Western Australia. Every activity concerning the flora benefited from his untiring readiness to help.

The list of names of those who co-operated with him in Western Australia is extensive. Around 1858 and 1859 there were Maxwell and Oldfield and from this date up to the time of his death the master was linked with many other correspondents. Information regarding many of these collectors is lacking and details of the time and places of the collections are often uncertain. It must suffice therefore, to mention only the general localities where they collected and to indicate the value of their collections in terms of botanical exploration of the west.

In the extreme southerly part of the Southwest Botanical Province comparatively little collecting was carried out. Miss Irvine collected around Geographe Bay and Mrs MacHard in almost the same locality. Neither found much that was new to science, but the carefully prepared specimens enriched the Melbourne Herbarium. The collections of Mr Muir of Deeside and Lake Muir, together with several specimens sent by James Forrest from the woodland regions along the Blackwood River, are of interest. The small, but fine, collections of Mr Webb from Mount Lindsay (between Denmark and Hay Rivers) are of rather greater value. The latter contain several species only known previously from Drummond's collections.

The remaining collections owe their origin to the gradual eastward movement of settlement. Drummond's field trips had already indicated the presence of a rich flora in the transition zone between the coastal vegetation in the south and the Eremaea. F. v. Müller, working through Maxwell, organized a fairly thorough exploration of this region. However, there are still wide stretches further inland where even today very little is known. Mr Hassell later discovered a few novelties in the region of the sources of the Pallinup and Gairdner Rivers. Mr Muir travelled further north collecting, while Mr Cronin carried out explorations from the vicinity of Wagin Lake eastwards towards Lake Lefroy and collected a few specimens.

A larger band of collectors was active in the transition zone between the Avon River and the true Eremaea, just to the north of 32°S. This is the region where settlement has extended eastwards from the rich farm districts of the Avon. Drummond had collected a good deal there but the district was so rich in species that he had far from exhausted the flora. Many of the species found by him in this transition zone have never been recollected again. On the other hand, many new species unknown to him have since turned up. Several women took part in collecting in this district, especially Miss Eaton (of Youn-degin), Miss Sewell, Mrs Heal and Miss Adams. Their combined collections were quite extensive and would provide more information if they were thoroughly worked on.

Eastwards are the regions now opened up by the goldfields railway. These areas had only been reached by one or two collectors up to the end of the 1880s. It was only following the establishment of the goldfields at Southern Cross that gradually further outposts of civilization were established. From these goldmine camps new settlements developed and many new botanical discoveries were made. Cronin's excursion from Wagin Lake to Lake Lefroy has already been mentioned. Merrall sent collections from Parker's Range, south-east of Southern Cross, which contained such interesting material that a further exploration of these hills seems highly desirable. Sayer forwarded a number of specimens from near Southern Cross. Unfortunately, the number of these was much less than one might have expected from an experienced collector. He had, in fact, collected for F. v. Müller in North Queensland and was the discoverer of the important mountain flora of the Bellenden-Ker Range.

The flora of the goldfield areas of Coolgardie and Kalgoorlie, which were only discovered shortly before F. v. Müller's death, are mostly only represented in the Melbourne Herbarium by the earlier collections of Giles and Young, and of those made at a later date by Helms. On the other hand, important contributions came from the adjacent districts to the south-east which stretch to the south coast. Some species from this district originated from the overland expedition of Sir John Forrest, from Western Australia to Adelaide via Eucla in 1870. At a later date, valuable collections were sent by Dempster from sites between Esperance and Frasers Range and beyond. Study of these collections is not yet complete. Even the furthest outposts of settlement on the south coast are well represented by material in the Melbourne Herbarium. Among these are Israelite Bay, through the contributions of the Brooks family, and Eucla, through a series of correspondents among whom the names of Brooks, Batt, Webb and Mrs Richards may be mentioned. These collections showed that the Southwest Province extended only a little to the east of Israelite Bay at 124°E, and then was abruptly replaced by the Eremaean flora typical of the northern margins of the Great Bight.

The other extremity of the Southwest Province at the lower Murchison River had already been investigated by Drummond. At the end of the 1850s, Walcott and Aug. Oldfield made valuable additions to our knowledge which was incorporated in early volumes of F. v. Müller's "Fragmenta", and to a further extent in "Flora Australiensis". To mention only one item, it was Oldfield who collected a most peculiar Capparaean species, *Emblingia calceoliflora*. This is one of the most isolated of the Western Australian endemic species. After Oldfield's time, collections were made in the Murchison River area by Sir John Forrest, while Mrs Guerin at Champion Bay [near Geraldton] made extensive collections. F. v. Müller's trip, mentioned earlier also covered this area. Material forwarded to F. v. Müller at a later date contained some specimens collected by Stuart Carey who

discovered the peculiar genus *Pentaptilon* (Goodiaceae) between the Murchison River and Shark Bay.

The journeys and prospecting expeditions which penetrated into the Eremaea from the Champion Bay area provided many new discoveries. The traffic increased as the excellent pasture lands of the upper Murchison became increasingly attractive to settlers. It increased markedly when gold was discovered at Lake Austin and at many other places scattered through the interior. This resulted in botanical discoveries from places where otherwise one would not have expected material for a long time. King was responsible for some of the first material from the Lake Austin district. The upper Murchison had already been investigated by Oldfield who traveled along the river up to about 450 km from the mouth, but unfortunately his botanical collections were confined to one or two species. The collections at Melbourne from this area were significantly increased by the work of Tyson and Crossland, although only a little has been published. J. Tyson's plants came from Mount Narryer close to the upper Murchison River at about 26° 30'S. Crossland travelled further north taking in the Mount Hale area and several places in the western area of the Peak Hill goldfield. These collections supplement those already mentioned, which came from the Gascoyne River system where the two Forrests, together with Pollack and later on King, collected material. F. v. Müller described these in his paper "Plants indigenous around Sharks Bay, etc." 1883.

SPENCER LE MOORE

Following completion of the "Flora Australiensis" (1878) and in the last years of Ferdinand von Müller's work (1890-1896), investigation of the flora of Western Australia appears to have almost reached a standstill. However, it was at this time that two great undertakings were being initiated in Europe in connection with the botanical exploration of this country. They were to be the first expeditions which would concern themselves exclusively with floristic investigations. These expeditions may well be the last in which botanists stationed in Europe would engage in active work in Australia, as this country had now formed its own botanical institutions which would increasingly undertake studies here.

The first of these expeditions was that undertaken by Spencer Le Marchant Moore. It centred on the exploration of the arid interior which had attracted considerable attention at the beginning of the 1890s owing to the gold discoveries in the districts of Southern Cross and Coolgardie. As set out in the report of this expedition (in *Journal of the Linnean Society London, Botany XXXIV*, 171-261), the party set out from Southern Cross at the end of December 1894 and travelled north-east over the sandy scrub-heath to Siberia Soak and Goongarrie, not far south of the present town of Menzies. As the party progressed, a major change in the vegetation became apparent. The *Eucalyptus* communities of the more southerly regions petered out and were replaced by a mixed shrub formation. The change was so marked that it had been noticed by the settlers. However, Moore was the first to recognise its importance for the plant geographer. He placed 30°S latitude as the boundary between the two floras which differed so markedly. From this boundary, Moore's journey led to the north-east from Goongarrie to Mount Margaret, from where most of his specimens came. A short trip to the north-west brought the party to the Bates Range north of Lake Darlôt about 27° 30'S.. In June 1905 [sic 1895], the return journey to Coolgardie was begun. The weather there had been so favourable that the "rain flora" was well developed and Moore was fortunate in obtaining a richer collection than would have been possible in many other years. His base camp was about 25 km to the south-west of the mining town [Coolgardie] and he remained there until October [1895].

Spencer Moore's collecting expedition was the longest which had been made to date for the specific purpose of studying the flora in the interior of Western Australia. Its value was heightened by the fact that the explorer himself studied and identified the plants in his collections of the "desert flora". Also he was not satisfied with just enumerating his species and describing the new ones, but went on to include an account of their biology.

It was the first time that this kind of approach had been used on the Western Australian flora. In addition, Moore used the opportunity to prepare a statistical analysis of the plant geography of the Western Australian flora using information from all available sources. Unfortunately, it proved to be of little use as it was much too schematic in approach.

DIELS AND PRITZEL

In 1900, I planned a botanical exploration of Western Australia with special reference to its plant geography. The major task was to study the plant formations, giving more attention than in the past to the structure of the vegetation in relation to climate and soils. In contrast to the journey of Spencer Le Moore, the aim of the expedition was to investigate the better-known regions using a more modern approach. The project was submitted to the trustees of the Humboldt-Foundation for Natural History and Travel for funding and was approved. The expedition was carried out during the years 1900-1902.

In company with Dr Ernst Pritzel, I traveled by way of South Africa. From August 1900 we studied the flora of the western Cape colony and the adjoining Karroo (around Calvinia) until the middle of October. Western Australia was reached on 30 October, and by the middle of November we were able to commence our studies. We soon found that the tremendous advances that the colony had made in the previous decade gave us many advantages over our forerunners. The rapid expansion of the railways since 1890 permitted a flexibility in travel which no-one had experienced before. Due to the generosity of the colonial government, we were able to make the widest use of this facility. In the relatively short period of 14 months we were thus able to cover a great deal of territory and to collect so many plants that we were almost independent of earlier collections.

We commenced our investigations in the neighbourhood of the capital, where Preiss had once collected. Later on, the woodland vegetation of the Darling Range, which was still in bloom towards the end of November, provided us with excellent collections.

As the winter rains of 1900 had penetrated far inland and had been unusually heavy, we decided to make a short trip to the Coolgardie district during late November-early December. However, the winter flora, with the exception of some composites, had already withered by the time we got there. The remains, however, showed what a profusion of flora the arid eremaeian country could produce in a favourable year.

In December 1900, we made trips to the south-west to Geographe Bay, to areas near Perth and also to the Darling Range. During early January 1901, a visit to Champion Bay [Geraldton area] gave us an opportunity to learn something of the coastal flora to the north. On the way there, we were able to confirm the surprising species richness of the sand heaths north of the source of the Moore Rivers. Despite the fact that we were well into summer, these sand heaths were still bright with flowers.

After this, we journeyed south to the Collie River and investigated some of the surrounding forest areas, but the greater part of January was devoted to the flora of King George Sound. The presence of numerous species not found in the Swan River area and the unusual ecological conditions prevailing on the south coast provided excellent material for study. Stops along the Great Southern Railway also gave us the opportunity of collecting plants in Wandoo zone flowering during summer.

In February the rate of collecting diminished. We arranged excursions which were of value in studying the plant communities. These included trips to the lower Moore River, the Avon River as far as Newcastle [Toodyay], and in particular, to the extreme south-west in the neighbourhood of the Blackwood River.

In March, most of our investigations were carried out in the southern Jarrah regions. We visited the Vasse River and travelled from there to Karridale. A trip from the Blackwood River via Lake Muir to Hay River, with a short diversion to the south coast, took us through part of the southern forest area which had been least investigated. A second visit to King George Sound was made but extended only over a few days.

The last part of the dry summer season, during which the vegetation of the south-west remains dormant, appeared the most suitable time for a visit to the tropical regions

of Western Australia. We therefore spent most of March and early April on a journey to the district around Nickol Bay. We made our base headquarters at Roebourne which proved very suitable for both long and short excursions.

By the time we returned, the rainy season had commenced and we made a collection of early winter-flowering plants around Perth and the Serpentine River. A short trip to Southern Cross showed that the plants of the interior were still in a dormant state, nothing being in flower with the exception of a composite shrub and a eucalypt. On the other hand, flowering had already begun on the sand heaths of the transition zone of the Southwest Province. An excursion to Tammin on 21 May showed us that many of the strange species there were already in flower. In the Darling Range, between the Avon River and the western slopes of the plateau, the number of shrubs in flower increased daily. Flowering in the south coast region, on the other hand, was still lagging as was clear from a visit at the end of May to King George Sound. On the way there we investigated the plant communities present on the plains and foothills around the Stirling Range. This was our first introduction to the unusual flora of the south-east.

With the beginning of July and the onset of winter conditions in the south, it seemed a suitable time to make a more thorough investigation of the warmer regions to the north. After several short excursions around the Swan River, we spent June and early July north of the Irwin River. The flora of the creeks, the inexhaustible supply of species on the sand heaths near the Irwin and Greenough Rivers and the bush thickets around Champion Bay gave us the most rewarding material during this period. From Champion Bay we visited a little-known region, the district around Cue not far from Lake Austin. This expedition of about 400 km crossed the boundary between the Southwest Province and the Eremaea. Although our stay there was short it gave us an understanding of the northern interior.

By the time we returned to the Swan River (10 July), many more species were in flower, especially on the slopes of the Darling Range. In mid-July we again travelled to the south coast, where many major species were in full bloom. We spent several days collecting in the neighbourhood of King George Sound and then moved eastwards to Cape Riche. This was a relatively short journey but important in providing information on the vegetation types of the Southwest Province.

We spent the early August at Carnarvon on Sharks Bay. This region had been little investigated so we were interested to see what role the south-western floral element played there. On the return journey we inspected the flora at Champion Bay again and found it at the peak of its flowering. Further south, flower development was proceeding rapidly. Every excursion in the neighbourhood of the Swan River showed this very clearly. A short trip to the southern Jarrah forests of the Blackwood River also provided much new material. The highlight of August was the journey from the Avon River at Newcastle [Toodyay] to the Moore River. This was carried out at the end of the month and almost the whole bush appeared in flower - the number of species of flowering shrubs appeared almost inexhaustible.

In September, our first trip was to Champion Bay, the Greenough River and the Irwin River at Mingenew. The second trip was to King George Sound and its environs and the plains to the west of the Stirling Range. In between times we also undertook short excursions around the Swan River.

The first three weeks in October were devoted to an expedition to the south-east along the road from King George Sound to the Phillips River, a region already visited by Drummond and Maxwell. Our course lay through the Stirling Range and gave us the opportunity to ascend two of the highest peaks, Tulbrunup and Mount Trio, and to examine their interesting flora.

Using the Goldfields Railway, we collected first at Tammin (east of York) and then in the neighbourhood of Southern Cross at the end of October. This was particularly rewarding with species from the sand heaths. Still more prolific in terms of species collected was an excursion undertaken during October-November. Menzies was the first town aimed at and a rich sand flora was discovered there. Later, we traveled to Coolgardie

and from there through partly unexplored territory to Esperance Bay. This course led us from the eucalypt communities of the Eremaea to the eastern extremity of the Southwest Province, which at this point is only about 60 km in width.

In November we visited areas near the Swan River, King George Sound and the Denmark River to complete our information. Towards the middle of November we once again visited the sand heaths to the east of Southern Cross, with their extremely xeromorphic members peculiar to the south-west. Finally, we travelled for the last time to Champion Bay and crossed from there towards the Murchison River, over the undulating sandy country where many fascinating endemic species had been discovered and praised by Drummond.

A short excursion from Moore River westwards as far as the Dandaragan plateau completed our work. We left Western Australia at the end of December 1901 in order to travel to the eastern States and New Zealand.

Dr Pritzel was responsible for a collection of 1,016 specimens. Duplicates of these were sent to most of the major world herbaria. A detailed list of these has been published in *Englers Botan. Jahrb.* XXXV, 632-43. My collection, containing 4,700 specimens from Western Australia, is housed in the Royal Botanical Museum, Berlin. The results of the taxonomic study were published fairly quickly 1904 – 1905 (L. Diels and E. Pritzel *Fragmenta Phytographiae Australiae occidentalis*; in *Englers Botan. Jahrb.* XXXV, pp. 55-662, Fig. 1-70). The number of new species described and illustrated was 235. Details of habitat and distribution were included in order to provide an understanding of the biology of the species.

CURRENT ENDEAVORS

Owing to its arresting beauty, the vegetation of Western Australia arouses both interest and affection. From July to November there are “wildflower excursion trains” to key areas from the large towns, so that the public at large can see and pick wildflowers.

Serious study of the botany, however, has only recently begun. In 1897, the “Mueller Botanic Society” was founded. During the early years it served to draw popular attention to the native flora rather than to engage in scientific work. Lately, however, men educated in the natural sciences have taken up the administration of the society, setting it to work along lines which are likely to be profitable. Alex Purdie, who died in 1900, investigated the orchids of Western Australia and discovered a number of new species. The journal of the Society, in existence since that 1 July 1897, the “Journal and Proceedings of the Müller Society” has also published (No. 8 and following) interesting reports by W. V. Fitzgerald and Cecil R. P. Andrews. In Volume 2 (April, 1903), W. V. Fitzgerald published a short account of the trees in Western Australia, including those in the tropical parts of the State, largely compiled from data in “*Flora Australiensis*”.

In 1904, the Mueller Botanic Society enlarged its scope and took the title “The West Australian Natural History Society”. The first two issues of the Journal appeared in May 1904 and 1905, and contained valuable papers by W. V. Fitzgerald and C. Andrews. Both had collected specimens on field trips in 1903 and 1904. W. V. Fitzgerald collected along the Midland Railway and near Cue or Nannine in September, then again at various places along the Goldfields Railway in November. C. Andrews collected along the road from the Stirling Range to Esperance and from there northwards to Coolgardie and finally towards Cue. The success of these naturalists, as well as the discoveries of G. H. Thiselton-Dyer along the goldfields line (see literature under Hemsley), demonstrate what rewards await the newly formed society in the field of botany.

Examination of the results of all investigations of the vegetation of Western Australia (see Fig. 1), shows that there are still gaps in our knowledge of the flora of the State. Although the botany of the country between the Swan River and King George Sound is now well known, the remarkable finds of the last few years show that important discoveries remain to be made from areas already well collected. Large gaps are present from the other areas, and it should be noted that the collections that we do possess have been largely made along the same routes taken by Drummond. The full extent of the wilder-

CHAPTER 2. - Literature

Those marked with * denote papers which also include descriptive systematic contributions

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