

III.—HISTORY OF OBSERVATIONS ON THE FUNGI AND LICHENS OF SOUTH AFRICA.

The settlement founded by Johan van Riebeeck at the Cape in 1652 at first made slow progress; the settlers had to contend with the alternation of drought and flood, so well known in South Africa, their crops were destroyed by the south-easterly gales, great damage was caused by wild animals and much vexation by the pilfering habits of the Hottentots. In 1679, the colony comprised only the settlements round the foot of Table Mountain, a cattle station at Tygerberg, the outposts at Saldanha Bay and the ground beyond the isthmus held on lease from the Hottentots.

After the arrival of Simon van der Stel as Governor, expansion became more rapid. He discovered the beautiful Stellenbosch valley and before many months had passed the first farmer put his plough into the ground there; a few years later 23 farms were marked out along the Berg River in the Drakenstein Valley. In the first years of the 18th century the second terrace upward from the sea began to be occupied by Europeans, who settled in the fertile Tulbagh basin and spread gradually down the valley of the Breede River and over the Witsenberg to the high plateau called the warm Bokkeveld. Some crossed the Hottentots Holland mountains and pushed their way to the sea at Cape Agulhas; others kept up the western coast and in the course of time reached the mouth of the Olifants River.

Expansion continued steadily, and by the middle of the 18th century the eastern frontier was fixed at the Gamtoos River and Brintjes Hoogte; the northern boundary was not defined. On the fringes of the colony lived the graziers, the real pioneers, whose life was often rough and wild. They spent a part of the year as semi-nomads, the cattle breeder and his family passing the day in the open air and sleeping in a great tent wagon. To the north their sheep and cattle were sometimes driven off by Bushmen and a little excitement was caused by pursuit of the marauders. On the eastern border the Xosas were expert stock-lifters, but had not come into direct conflict with the settlers. Behind them as they moved onward, a more settled class of people occupied the country, although thinly, in contrast to the closer settlement nearer to Cape Town.

An old elephant hunter named Willem Prinsloo was the first white man who, in 1771, made himself a home beyond the borders of the Colony, on the banks of the little Fish River, where he occupied the site of the present village of Somerset East.

To this South Africa of 1772 came Dr. Carl Pehr Thunberg, to add to the knowledge of the most rich and beautiful flora, the fame of which had reached Europe in the early days of the Dutch settlement. His means were slender, and in order to reach the Cape he sailed as extra surgeon on one of the East India Company's ships, arriving in Cape Town in the middle of April. Here he * "visited Mr. Auge, the gardener who has made many and those very long excursions into the interior of the country and has collected all the plants and insects which the late Governor Tulbagh sent to Europe to Linnaeus, to the Professors Burmann and van Ruyen."

* Quotations from Thunberg's Travels, English translation.

At first Thunberg's botanical explorations were made in the neighbourhood of Cape Town, on Table Mountain and Paarl Mountain. The flowering plants were his main interest, but during his travels he collected a number of cryptogams; 14 fungi and 39 lichens were listed in his *Flora capensis*, the first plants of these groups to be recorded from South Africa. He rarely states where these were collected; this information, which might be found on his herbarium labels, unfortunately is not available. In the month of May, after rain, he found *Agaricus muscarius* growing near the town, between bushes, and in June and July *Agaricus campestris*; on stones at the top of Table Mountain, on the side facing town, he collected *Lichen tabularis*.

In September a more extended tour was undertaken, which lasted till the end of the year. With Auge for companion and two other Europeans, an ox wagon and equipment for collecting plants and animals, Thunberg travelled first in a northerly direction, past Saldanha Bay, where in September to October he found *Lichen flavicans*, till he reached the Groot Berg-rivier; at this point he turned to the south-east, crossing the Witzenberg and the Hex Rivier to Swellendam. The expedition then continued eastward, visiting the forest at Grootvadersbosch in the Swellendam district, where *Boletus sanguineus* was collected, and travelling along the Attaqua and Outeniqua Mountains, which were crossed in a northerly direction into the Langekloof. Still farther east the sea was reached at the mouth of the Gamtoos River, which was the eastern limit of this journey.

In September of the following year Thunberg set out on a second journey. This time for his fellow traveller he "had an English gardener of the name of Masson, who had been sent hither by the King of England to collect all sorts of African plants for the gardens at Kew. Mr. Masson arrived the year before on the same ship in which Captain Cook with the Professors Forster and Sparrman were to make their celebrated voyage round the world and towards the southern pole." He had arrived in Cape Town after Thunberg had set out for Caffraria. Again Thunberg started his journey in a northward direction, till he reached Elands Kloof, then travelled southward through the Cold and the Warm Bokkeveld to the Winterhoek Mountains, through Goudini to Swellendam, later reaching Mossel Bay. Going again through the Langekloof to the Gamtoos River, which was then the limit of the Cape Colony, he pushed on to the Sunday's River which runs into Algoa Bay to the north-east of Port Elizabeth.

A few quotations from Thunberg's Travels (English translation) suffice to indicate the labour involved in making such journeys and the dangers encountered:

"Roads that can be properly so called are not to be found in all this southern part of Africa; yet the way which people in general take, when they travel, is pretty well beaten in the neighbourhood of the Cape; farther down the country, indeed, very often not the least vestige of a road appears. Therefore . . . it may easily happen that a traveller shall lose his way . . . On the 2nd of November, we were overtaken by some remarkably heavy showers when we crossed Quaiman's drift . . . More weary and wet or in a worse plight we never could have been."

The expedition passed the forests of the "Houtniquas" where Thunberg found *Clavaria capensis* (fide Juel, 1918, this is a *Xylaria*), and on the yellow-woods collected for the first time *Lichen helophorus*, now known as *Corynelia uberata*. Wild animals were plentiful and the expedition was able to shoot game for food; but on more than one occasion the wild animals were a source of danger.

"In the afternoon we arrived at Koukuma River" (Goukamma River near Knysna) "and intended to pass through a thicket to a farm which we discovered on an eminence. . . . We had not advanced far into the wood before we had the misfortune of meeting with a large old male buffalo." The unfortunate horses were abandoned to their fate and Thunberg escaped by climbing a "tolerably high tree", until the buffalo, having expended his rage on the horses, departed along the way they had intended to travel; going in search of his companions he "discovered these magnanimous heroes sitting fast, like two cats, on the trunk of a tree with their guns on their backs. . . ."

"On the 11th we passed over the very lofty mountains that lead to the Lange Kloof. The sides of the mountains that we passed over were sometimes so steep and the path so narrow that we did not cross it but at the hazard of our lives and shuddered when we looked down the precipice."

During the return from Kaffraria in 1772, "having crossed Keurbooms River we proceeded to Diep River and on the 10th came to Ganskraal. Behind the low mountains lay Camenassie Land. The *Lycorperdon carcinomale* grew here on the ant hills, the brown powder of which was said to be used in cancers."

During the second journey into Caffraria, when they reached the Sundays River, Masson and Thunberg consulted their guide and attendants about continuing eastward, but none of them were inclined to proceed farther, on the ground that they were now on the borders of a powerful nation, the Kaffirs. "The Caffres it is true are not bad in themselves, but as they are in great want of iron, they are sometimes so greedy after it as to make no conscience of murdering a Christian for the sake of getting the iron from off the wheels of his waggon."

The third journey, undertaken in 1774 by Thunberg and Masson was in a northerly direction over Riebeck's Casteel through Zwartland to Piquetberg, then north-east over the Maskamma berg to the Hamtam-berg. They then turned south-east through the Lower and Middle Roggeveld and south-west back to Cape Town. It must have been on the return journey that Thunberg found *Lichen incarnatus*, "in Carro infra Bockland" (? in the Karroo below the Bokkeveld). This is a xerophytic lichen, living in calcareous soil and now known as *Lecidea decipiens*. At this time the farms on both sides of the Roggeveld Mountains were subject to the depredations of Bushmen; Thunberg himself relates that in 1772 a party of Bushmen murdered a burgher and his family and drove off the cattle from several farms.

His experiences on these journeys in southern Africa are epitomised by Thunberg in his author's preface to the *Flora capensis*, 1923:—

"Thunberg, Carol Petrus, Suecus, occasione, quam in Florae meae japonicae indicavi, ad hasce Australis orbis oras perductus, ab Anno 1772 usque ad Annum 1775, omnis generis Naturalia, praecipue vero Florae Capensis dilectissimas copias sedula et indefessa manu quaesivi, collegi, examinavi et descripsi. Hunc in finem plura suscepi itinera, saepius molestiarum et periculi plena; imprimis vero quotannis ad remotiores regiones, itinere per plures menses producto, penetravi; atque sic per

Dunas arenosas,
Carro aridissimas,
Littora falsa,
Alpes altas,
Fruteta spinosa,

Rivos infidissimos,
Campos undulatos,
Colles lapidosas,
Praecipitia montium,
Sylvasque inconditas,

pericula vitae adii, feroces gentes at bruta prudenter elusi, Thule hujus australis gazas speciosas detegendi grstia laetus cucurri, sudavi et alsi."

This is reminiscent of St. Paul's account of his journeyings, "In journeyings oft, in perils of waters, in perils of robbers . . . in perils by the heathen . . . in perils in the wilderness."

Thunberg's fungi and lichens were no doubt sent to Europe with the rest of his specimens; new species were described by the younger Linnaeus (1781) and by Acharius (1798).



Plate 2.—Cradock Pass: "Over the very lofty mountains that lead to the Langekloof", Thunberg. From an engraving by C. C. Michell.

The fact that the mycologist Persoon was born in South Africa is a source of pride to the country of his birth. He was left an orphan at an early age, sent to Germany, and afterwards settled in Paris. He had therefore no special interest in South African mycology and the few references in his *Synopsis Methodica Fungorum* are to fungi collected by Thunberg, e.g. *Sphaeria turbinata*. Hab. ad Caput bona spei in foliis gramineis. Ab illustre Thunberg et celeberrimo Swartz benevole mihi missa est.

Scleroderma carcinomale—*Lycoperdon carcinomale* L. Hab, ad Caput Bonae spei in acervis formicarum.

Some 35 years elapsed before any further observations on South African fungi and lichens were made. During these years the colony had made progress, had become more closely settled and had extended its borders. A number of mission stations had been established, one of the most notable being founded outside the boundaries of the colony in a well-watered valley north of the Orange River. This station, named Klaarwater (now Griquatown) became the nucleus of a settlement which was a place of attraction for Hottentots and coloured people of mixed descent. The missionaries led out water, started cultivation and planted trees, and an attractive village with several outstations grew up.

In November, 1810, William John Burchell landed in Cape Town. His intention was to journey beyond the boundaries of the Cape Colony to the country of the Bechuanas, and from Litakun (now Kuruman) to turn towards the west coast and to try to find his way by sea to St. Helena. In the early days of 1811, however, he had conversation with missionaries from Klaarwater, who were on furlough in Cape Town. From them he learned that it would be inadvisable to travel westward, because of difficulties likely to arise from lack of water and the presence of hostile tribes. He therefore arranged to travel as far as Klaarwater with the missionaries and to make Litakun his objective in the north.

While superintending the building and equipping of his wagon, Burchell stayed in Cape Town with the Lutheran minister, Pastor Hesse, who was an enthusiastic gardener and collector, and amongst other objects of natural history, collected some lichens, which were sent to Europe; one of these was named in his honour *Stictina Hesseana*. During his stay in Cape Town, Burchell found time to make botanical excursions in the vicinity and to undertake, on horseback a tour as far east as Caledon and as far north as Tulbagh. He thus acquired first hand knowledge of some of the ground covered by Thunberg.

Burchell's trek into the interior began in June, 1811, and covered, in all approximately 4,500 miles. At Klaarwater he was unable to procure servants to accompany him farther north, so decided to travel on oxback, with a few Hottentots, a Bechuana and a Bushman, to Graaff-Reinet, to ask help from the landdrost there. For this journey, Burchell relates that one of his Hottentot herdsmen "agreed to furnish three pack oxen and to supply me for my own use with a quiet riding ox and one that could easily be managed, as I was completely a novice in the art of riding on oxback." (Burchell, 1822: 533.) He was the first European to make a track from Klaarwater through Bushmanland to Graaff-Reinet. Having obtained the assistance which he sought, Burchell left Klaarwater for Bechuanaland, arrived at Litakun about five weeks later and reached the Chué spring (Honing Vlei), the most northern point in his route in October, 1812. After returning to Klaarwater, which was his headquarters for his northern journeys, he made his way south to the eastern part of the Cape Colony.

On the eastern border, the encroachments of the Xosas had led to the Fourth Kaffir war, which had ended in the defeat and flight of the Xosas by March, 1812. A line of military posts had been formed from the sea to the second chain of mountains, to prevent their return. These disturbances had occurred while Burchell was in the country north of the Orange River. It was in 1813 that he went to Grahamstown and made excursions to the mouth of the Great Fish River and the Kowie. He then went by way of Uitenhage to one of the new forts, Fort Frederick (now Port Elizabeth), through Plettenberg Bay, Mossel Bay, the Garcia Pass, Swellendam and Stellenbosch to Cape Town.

He reached Cape Town in April, 1815, and shortly afterwards discovered on waste land belonging to the Government, orchilla (*Rocella* sp.) growing in considerable quantity.

He wrote to Lieut. Col. Bird, Deputy Colonial Secretary, pointing out that the collection and export of this weed, a lichen yielding a violet-mauve or purple colouring matter, could be made beneficial to the colony. In a letter written in August, 1815, he states that he is obliged to leave his oxen and wagons to be hereafter employed in the collection of orchilla. What happened to his wagons is not known, and apparently nothing came of the communications between the Governor of the Cape Colony and the Colonial Agent for the Cape of Good Hope about the exploitation of this lichen.

It is not clear which species of *Roccella* was found by Burchell growing in such quantity but in 1866, Lauder Lindsay gave the names of lichens sent to England "attached to specimens of 'Angola Orchella Weed' imported into London for the orchill and cudbear manufacture and sent to me at various times by importers and manufacturers. I have frequently found fragments of trees or shrubs on which the said weed—a species of *Roccella*—grows. These twigs are not such as to enable me to determine the species of the tree or shrub to which they belong. . . . It is of some interest, if not importance, that we should know to a greater extent, and more precisely than we do at present, the species of trees that nourish the valuable *Roccellae* (*R. Montagnei* Bel. and *R. fuciformis* Ach.) which constitute in great measure the 'Orchella' weeds of commerce; which are imported largely from—the coasts especially of—Central Africa, and which generally occur (especially *R. Montagnei*) on trees near the sea. These *Roccellae*, which now appear to have completely superseded all other lichens in the home manufacture of orchill and cudbear, are as common on the east as on the west coast of Africa. Dr. Kirk has favoured me with specimens of a large Everniiform state of *Roccella fuciformis* (with which I am disposed to associate *R. Montagnei* as a variety) growing on *Dalbergia melanoxylon*, on the Rovuma River, about eight miles from the coast, in eastern tropical Africa (Zambesi Expedition), which resembles what now enters the London market as 'Mozambique weed'."

During recent years, 1941–1942, manufacturing chemists in London, whose usual source of supply in Holland had been cut off, enquired about the possibility of collecting and exporting *Roccella* for the manufacture of litmus. According to an unpublished report made by Mr. S. Garside it would appear that 'orchilla' no longer grows in quantity as observed by Burchell. Garside states that *Roccella hypomecha* found on rocks near the sea, but above high tide mark, appears to be abundant on all rocky coasts to the east of the Cape peninsula and has been recorded from a number of localities. There is no record of this species having been used for the manufacture of litmus. *R. Montagnei*, which gives the greatest litmus yield of all *Rocella* spp., grows on trees near the sea coast; it is frequent in the Knysna district and in warmer regions, e.g. Natal and Moçambique. Mr. Garside concludes "These lichens grow in comparatively small quantity. There is no prospect of starting an 'industry' but a considerable probability of exterminating the plants in the more accessible spots."

During his journeyings, Burchell collected a considerable number of fungi and lichens, some 56 fungi and 90 lichens, but his specimens have not been traced; they are listed in his *Catalogus Geographicus* (in Mss. in Library of Kew Herbarium) the lichens being inserted between the leaves dated 12th September and 15 September, 1812. Most of the fungi and lichens were gathered during his return journey in 1813–1815, through the Boschberg and thence westward through Keurbooms River, Knysna and George to Cape Town; but there are a few records of specimens found during the trek northward in 1811–1812, 'on the Windheuvell', 'on the Roggeveld Mountains', at the confluence of the 'Vaal and Orange Rivers', 'at Klaarwater', 'at Litakun' and so on.

Burchell's St. Helena lichens were described by Leighton (Trans. Linn. Soc. XXVII, 1869: 155) as "unarranged lichens in Herb. Hooker"; no reference to his South African lichens has been found in any available literature. In the *Catalogus* most of the lichens are unidentified, or are assigned to a genus. They are usually listed as lichens on branches of his numbered flowering plants or on stones and include species of *Collema*, *Sticta*, *Baeomyces*, *Usnea*, *Opegrapha* and *Lecidea*. Several species of *Parmelia* are included in the list, and some of these are tentatively assigned to species, e.g. *Parmelia pulmonaria*, *P. speciosa* and *P. flavicans*.



Plate 11.—*Aecidium resinicolum* (Rud.) Wint. on *Rafnia angulata*. (Photo.: H. A. V. King.)

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Searching for Burchell's fungi, at Kew, Miss Wakefield found a specimen under *Polystictus sanguineus* labelled *Boletus pulcherrimus* B., This she recognised as a Burchell collection, because of a characteristic dark-coloured label, which he used, with a sign in the corner like a double walled P; there is no locality on the label. This is evidently No. 3167/2 in the Catalogus, "*Boletus pulcherrimus* B., on Boschberg in the forests, 29.5.1813". This beautiful drawing of "*Lycoperdon formicarum*" is unmistakably *Podaxis pistillaris*, but this fungus does not appear amongst those numbered and no locality is given.

Unlike Thunberg and some of the later collectors, who were interested mainly in the larger fungi, Burchell listed many a fungus or "fungillus" on the leaves and bark of his flowering plant specimens, e.g. "on bark of *Rhus pyroides*", "on leaves of *Capparis citrifolia* in the forest close to Melkhout" (might this be *Oncospora bullata*?), on *Ilex crocea*, *Podocarpus*, *Olea* and many other hosts. If these specimens could be traced, they would probably constitute the earliest records of a number of parasitic species.

The first rust on an indigenous South African plant of which there is a record was found by a contemporary of Burchell, James Niven, a gardener who collected for Hibbert and the Empress Josephine, 1798-1803, and again for Lee and others, 1803-1812. This fungus, a gall-forming aecidium on species of *Rafnia* (Leguminosae) was first described by Rudolfi (1829: 389) as follows:—

"*Caeoma*—*Aecidium resinaecola* n. spec. *Caeoma* maculis nullis; pseudoperidiis in lacinias aequales liveras fissas; sporidiis pallidis. Habitat in resina effusa fruticum ex familia Leguminosarum, Africae australis. Autumne. Ex interioris Capituli bonae spei a cl. Niven."

Aecidium resinicolum was collected again by MacOwan and by Schlechter on *Rafnia amplexicaulis* and *R. perfoliata*, and a variety, var. *tumefaciens* Wint. on *Rafnia angulata*. The rust was redescribed by Winter (1884 c: 264) and material collected by MacOwan was distributed in Rabenhorst-Winter Fungi Europaei et extra-europaei as Nos. 3321 and 3838. (Plate 11.)

In the third and fourth decades of the 19th century, South Africa was visited by a number of botanical collectors who laid a more solid foundation for the study of cryptogams.

Christian Frederick Ecklon was born in Schleswig-Holstein; he qualified as an apothecary, and in this capacity came to Cape Town in 1823, as assistant to Poleman, a dilettante botanist and the companion of Burchell in his rambles about the Cape peninsula. After some years he gave up his situation and devoted all his time to exploring the flora of Table Mountain and the vicinity of Cape Town. In 1827 he sent away a mass of material and sailed for Europe the following year.

When he returned to the Cape in 1829, Ecklon formed a botanical partnership with Carl Zeyher, who had arrived at the Cape in 1822 with the object of collecting plants. Zeyher went alone to Clanwilliam, Olifants River and the Cedarberg, and then started for Namaqualand and the Khamiesberg, pushing on to the Valley of the Orange River. Meanwhile Ecklon went by sea to Algoa Bay and botanised over the districts of Uitenhage, Albany and 'Kaffirland' as far as the Winterhoek. After returning to Cape Town with their spoil Ecklon and Zeyher set out again in company, ascended the Tulbagh Winterhoek and then undertook their greatest expedition to the eastern frontier. On their return, Ecklon arranged to go to Hamburg to dispose of their joint collections.

This partnership had no particular interest in fungi; Ecklon collected a number of lichens, which are enumerated by Stizenberger (1890) and it is probable that many specimens in the herbarium of the South African Museum, Cape Town, bearing Dr. Pappe's numbers were from his collections. Ecklon probably also collected some fungi, but they are difficult to trace. In the Berkeley herbarium at Kew, there is a specimen of a fungus on *Osyris abyssinica*, collected by Ecklon at the Cape; this was a species first found by Boivin and sent by him to Montagne, who described it in 1843 as *Dothidea amphilaelaena*. *Polystictus Eckloni* Berk. ex Cooke was collected by Ecklon and Zeyher, in some unknown locality at the Cape.

After his partner's departure for Europe, Zeyher went to Uitenhage, where he was for some time in the service of Mr. Joachim Brehm, a notable gardener. During this period he became interested in the fungi of the district and made fairly extensive collections of the larger species. The bulk of this collection was examined by Berkeley, who published a systematic account of Zeyher's fungi in 1843; he listed 31 species and described *Phellorina* as a new genus of the Gasteromycetes. Part of Zeyher's collection was sent by Kuntze to Fries, who found certain remarkable species omitted from Berkeley's account. Fries describe three Agarics as new, and stated that the remainder of Zeyher's Agarics were either common European species or had been fully described by Berkeley.

While at Uitenhage, Zeyher undertook, in November 1840, to accompany James Burke, the zoological collector, in a trip to the north. During this journey a remarkable fungus was found on the banks of the Orange River; this was described by Berkeley in 1843 as *Polyplocium inquinans*, new genus and species.

When Zeyher fell on hard times, he parted with his herbarium to Dr. Pappe, then colonial botanist; in his collection of flowering plants now in the South African Museum, a number of leaf fungi, mostly rusts, have been detected; e.g. *Uromyces Ixiae* has been found on his specimens of *Lapeyrousia corymbosa* (Zeyher 1594) and *Sparaxis bulbifera* (Zeyher 3968); further examination would probably reveal other material of interest. On *Freesia* specimens sent to Europe, Bubak found two rusts, which he described as *Uromyces Freesia* 'in Promontorio Bonae spei (Zeyher)' and *U. Ecklonii* (Ecklon and Zeyher).

Of the lichen collections made by Zeyher, *Leptogium africanum* Zahlbr., from the Winterhoekberg near Uitenhage, was determined by Nylander as *L. Brebissonii*; *Endocarpum peltatum* in Herb. Hooker was also from Uitenhage; other collections recorded by Stizenberger in the *Lichenaea africana* (1890) are from the south-western Cape, on rocks 'Cape of Good Hope' or from the neighbourhood of Saldanha Bay.

J. F. Drège, botanist, apothecary and traveller, a native of Altona in Germany, arrived at the Cape in 1826 and spent nearly 8 years in South Africa. His MS. diary which survives (Laidler 1937: 12) is a document of absorbing interest and gives an intimate account of conditions in the country districts through which he passed in his dual rôle of botanical explorer and travelling apothecary. Drège journeyed extensively in the Cape Colony, north to the Orange River and as far east as the Kei River. In the latter part of 1831 he penetrated farther east.

In consequence of the exterminating wars of Chaka, the Zulu warrior chief, the well-watered and fertile country around Port Natal, more favoured by nature than any other part of South Africa, had been depopulated. Dr. Andrew Smith, the celebrated zoologist and traveller, was sent to report on the possibility of opening up this country to settlers, a service of no little danger, owing to the ferocious character of Dingaan, the brother and successor to Chaka. Drège accepted the invitation of Dr. Andrew Smith to accompany this expedition. From the Umzimvubu to the Tugela, a distance of 250 miles, the land had been utterly ravaged; not more than 50 persons were seen in the whole territory, except near Port Natal. Here a number of natives, the remains of the original inhabitants, had left their hiding places and gathered for protection around the English traders and hunters settled there. Drège proceeded no farther than the Umgeni, but Smith crossed the Tugela to interview Dingaan in his principal kraal on the Umhlatuzi River. Returning with the party early in 1832, Drège spent some time in Uitenhage and then resumed his botanical explorations in the Cape Province, until the beginning of 1834, when he set sail for Germany, taking with him extensive and valuable botanical collections.

In his geographical analysis of South African flora, Drège (1843: 38) mentions 103 collections of 64 species of fungi; of these by far the greater number (90) were collected near the coast, 24 in the south-west between Cape Hangklip and Jeffrey's Bay and 66 between Port Elizabeth and Durban. A set of Drège's fungus specimens was sent by Professor Miquel to the French mycologist Montagne, who, in 1847, published notes on 39 fungi, of which all but four were hymenomycetes. Two species *Trametes captiosa* and *Daedalea Dregeana* were described as new. Other fungi collected by Drège are *Sphaeropsis congesta* on *Podo-*

carpus described by Lévillé and a smut found at Paarl and named by Tulasne *Ustilago Dregeana*. The host was not named in Tulasne's original description, but is now thought to be a species of *Eragrostis* (Zundel 1939 : 573). In the geographical analysis 238 collections of lichens are mentioned, most of which were named ; a few specimens ex Herb. Hampe were described by Massalongo in 1861 in his *Lichenes capenses*.

A few years after Drège's return to Germany, J. A. Wahlberg, a Swedish naturalist and hunter, collected fungi in Natal and parts of the Cape. This was in the years 1839-1840. His specimens were examined by Elias Fries, who published an account of them in his 'Fungi natalenses' in 1848. Forty species were described, again nearly all Hymenomycetes. A few of these had also been collected by Zeyher, some Polyporaceae being common to both collections. Wahlberg was a determined and successful elephant hunter and was very adventurous. He was less fortunate than some of the earlier travellers in eluding the 'perils of wild beasts'. Some years later, he was hunting to the north-east of Lake N'Gami, where in 1856, he met his death—having been gored by an elephant (Chapman 1868 : 350).

Two other travellers in the Cape and Natal about this period had some interest in fungi and lichens.

In 1839-1840, a German naturalist, Wm. Quinzus or Gueinzus, resided with a certain Field-cornet Morkel at Hottentot's Holland, where he acted as apothecary and botanist.* In 1839 he collected *Secotium Gueinzii* which was named in his honour by Gustav Kunze, this fungus was later found by Zeyher at Uitenhage. Gueinzus proceeded to Port Natal in 1841, and in 1842 was resident at Congella at the time of the clash between the English settlers at Port Natal and the emigrant farmers from the Cape who entered Natal from the North. (Bird 1888 : 38, 82). At this time Gueinzus left Natal for the Cape, but probably returned later. Amongst the lichens which he collected at Port Natal was *Rocella Montagnei*, one of the 'orchillas' mentioned by Burchell.

Dr. Ferdinand Krauss, professor at the University of Stuttgart, visited South Africa 1838-1840 ; he travelled in Natal and the Cape Colony, and in 1846 published in *Flora* his "Pflanzen des Cap- und Natal-landes" in which 56 lichen species are listed. Some of the species which he collected, e.g. *Leptogium Kraussii*, *Arthonia violascens* and *Stephanophorus Kraussii* were described by von Flotow (1843) in *Linnaea*.

William Henry Harvey, well known as the author of the "Genera of South African Plants", was at the Cape during the years 1835-1841. During this time he held the post of Colonial Treasurer, but spent all his hours of leisure in collecting and studying plants in the neighbouring mountains and plateaux. While making his extensive collection of flowering plants, he found several Agarics, which were described by Berkeley (1844 : 186) including two new species *Bolbitis mitraeformis* "on Devil's Mount" in 1841, and *Cantharellus (Pleuropus capensis)* on decayed stalks of herbaceous plants on the summit of Table Mt. In his genera (1838 : 407) Harvey states that "the South African fungi are an unexplored field" and lists no species.

About Miss Armstrong, an early collector of lichens, no details have been found, although several families of that name were resident in Natal in the second half of the 19th century. All that can be learned is in the introduction to Nylander's "Lichens of Port Natal", published in 1869, in which he states that Admiral T. Jones (? T. A. Jones, Irish lichenologist) kindly sent a collection of lichens of Port Natal, communicated by M. Mackenzie and collected principally by Miss Armstrong.

During the 19th century, a number of scientific expeditions were sent out from Europe and America, several of them with the intention of circumnavigating the world ; a number of these expeditions made the Cape a port of call.

Charles Darwin was on board *H.M.S. Beagle*, which during 1832-1836 sailed to South America and islands of the Pacific to study the natural history of the countries visited. In 1833, the *Beagle* touched at the Cape, and Darwin made an excursion of some days' length

* Letter in Cape Archives, in reply to a request from Mr. Quinzus of Namnboung, Prussia, for information regarding his son Wm. Quinzus.

into the country. No South African species, however, are included amongst the cryptogamic plants collected by Darwin during the voyage of the *Beagle* and described by Berkeley in 1842. His conception of the vegetation of South Africa is briefly summarised in the "Journal of Researches during the voyage of *H.M.S. Beagle* (1837)": Dr. Andrew Smith (the zoologist with whom Drège visited Natal) informs me that, taking into consideration the whole of the southern part of Africa, there can be no doubt of its being a sterile country. On the southern and south-eastern coasts there are some fine forests, but with these exceptions the traveller may pass for days together through open plains, covered by a poor and scanty vegetation.

Expeditions which touched at the Cape during the years 1855-1875 made a definite contribution to the knowledge of cryptogamic plants.

Dr. Heinrich Wawra, 'Ritter von Fernsee' and ship's surgeon, accompanied three such expeditions; in 1857-1858, he was surgeon to the corvette *Caes. R. Carolinae*, which put in at the Cape. In 1868-1871, he sailed in the Austrian frigate *Donau* on a voyage round the world; this vessel touched at Hawaii, the Sandwich Islands and 'other parts of the world'. He was also in the ship in which the princes Philipp and August of Sachs-Coburg sailed round the world in 1872-1873. On all these voyages Wawra made collections of lichens, on his first voyage in the *Carolina* making fairly extensive collections at the Cape, which were described by Massalongo in 1861; lichens from the other voyages were described in 1876 by von Krempelhuber.

Another voyage round the world was undertaken in 1857-1859 by the Austrian frigate *Novara*. This frigate, which sailed from Trieste on the 30th April, 1857 and arrived at the Cape on October 2nd of that year, had on board, amongst other scientists Antony Telling, described as a horticulturist and referred to by Zahlbruckner (1932: 243) as Jelinek, by Stizenberger (1890) as Jelinek; the botanist to the expedition was Dr. Edward Schwarz. The members of the expedition made excursions in the neighbourhood of Cape Town and into the interior to Paarl, Stellenbosch and Genadendal. On these excursions lichens were collected by Telling and his specimens were described by von Krempelhuber in 1870. The voyage of the *Novara* was not resumed until August 26th, 1858.

Ringgold's United States North Pacific Exploring Expedition arrived in Simon's Bay in 1883 and remained six weeks; C. S. Wright, who was on board made large collections of plants in the neighbourhood, only a few of these were cryptogams, and the lichens went to Tuckerman for identification; these included specimens of *Pertusaria ambigens*, *P. euglypta*, *Lecidea africana* and *L. melamplepa*.

An expedition left England in 1874 for Kerguelen Island, to observe the transit of Venus. The ship put in at Cape Town and was detained there from the last week in July till the first week in September. The Rev. A. E. Eaton was the naturalist attached to the expedition, and at the recommendation of Dr. Hooker he made collections of the lower cryptogamic plants in the immediate vicinity of Cape Town. The fungus specimens which Eaton collected were sent to Berkeley for examination and he enumerated (1876 a) 31 species, of which 24 were Hymenomycetes, 2 Myxomycetes, 3 rusts and 2 ascomycetes. He described 6 species as new, namely *Omphalia paurophyllus*, *Galera Eatoni*, *Marasmius ustorum*, *Panus quaquaversus*, *Boletus subflammeus* and *Daedalea Eatoni*. The list included *Morchella esculenta* found at Groot Schuur. Crombie, who enumerated Eaton's Cape lichens, states that the only locality examined was Table Mountain to which, however, he was able to make only a very few excursions. Unfortunately that to the summit was interrupted by mist, so that but few specimens were there gathered. Up to this time, the only separate list of Cape lichens was that of Massalongo (1861) who recorded 48 species, with a fair proportion of varieties, collected by Wawra, and in an appendix mentioned another 19 species which had been found by previous collectors such as Ecklon, Breutel, Drège and Zeyher. Crombie (1876 a) enumerated 96 species collected by Eaton, of which 34 were described by Nylander as new; there were only 12 species common to this list and that of Massalongo.

Until the middle of the 19th century, no great effort was made to improve the means of travelling from the sea coast to inland districts, and only the most intrepid would undertake



Plate 3.—The Montagu Pass, which replaced the old Cradock Pass. (After Newman.)



Plate 4.—The Montagu Pass, 1945. (Photograph by courtesy of the Royal Automobile Club of South Africa.)

long trips by ox-wagon, northward through the Karoo to the Orange River and beyond. Burchell had crossed the Orange River and reached Bechuanaland. Zeyher had travelled to Namaqualand and the Khamiesberg, pushing on to the valley of the Orange River, but in returning homewards he suffered much from want of water and lost many of his oxen. During his later trip in company with Burke, he travelled as far as the Magaliesburg, in what is now the Transvaal, a distance of some 1,000 miles from Cape Town. This was the farthest north of the earlier collectors.

In 1844, a system of public road-making was initiated, and as a result, travelling conditions were vastly improved. In the succeeding years roads were made, mountain barriers opened up and the larger rivers, including the Gouritz River, were bridged. This river, in common with many other South African streams was liable—in local parlance—to ‘come down’ after thunderstorms ‘up country’; it has been known to rise 20 or 30 feet in a few hours, rushing along with great velocity and sweeping off every obstruction in its path. In the wet season it may be days or weeks before such a river can be forded. The first mountain pass to be tamed was Cradock’s Kloof ‘over the very lofty mountains that lead to the Langekloof’ (Thunberg). This was a mere track over a rugged, rocky ledge, with a steep precipice on one side of the mountain, between George and the Langekloof and to cross it with wagons was an undertaking of extreme peril (Newman 1855: 171). This track was replaced by a beautiful and easy ascent of the mountain now known as the Montagu Pass.

The first railway was started in 1859, and after 1874, as a result of the general prosperity which followed the discovery and development of the diamond mines in Griqualand West, there was rapid construction of railway lines from the three principal seaports, Cape Town, Port Elizabeth and East London. The line from Cape Town reached Kimberley in 1885, and, as a result of the further stimulus provided in 1887 by the development of the Witwatersrand goldfields, the railways from the Cape were extended to the Transvaal. Railway construction in Natal was rather more tardy, but the line from Durban to Charlestown was completed in 1891; from Charlestown passengers completed their journey to the goldfields by coach, and a current advertisement extolled the advantages of sending goods by ‘train and ox-wagon combined’, i.e. by rail to Charlestown and beyond by ox-wagon.

In such ways the path of the botanical collector was made smooth, and he had at least no difficulty in obtaining transport from the coast to the main inland centres.

In the later years of the century, botanical collecting was no longer a monopoly of collectors who came from Europe and after some years returned laden with their spoils. Several men interested in plants became resident in South Africa and continued, over a period of years, collections and studies of the plants of the districts wherein they resided. The names of Peter MacOwan and John Medley Wood will leap to the mind of the student of South African fungi.

John Medley Wood started life as a sailor, but after seven years of the sea, he went to Natal to join his father, who had also left the sea and was the first deputy sheriff of Natal. He arrived at Durban on May 4th, 1852. On landing, he tramped for some distance the sand and bush along the coast and then said he was not going any farther. He enquired of his companion how far it was to Durban and was told that they were then at the corner of the market square and that a house near by was his father’s office (N. E. Brown, 1915). Such was Durban at that time. In his early years in Natal, Medley Wood traded with Zululand and turned his attention to farming. After some years he went to Inanda and there took up stock farming; it was in that neighbourhood that most of his fungi were collected.

In 1879 there was war with the Zulus on the opposite side of the Tugela, and the disaster of Isandhlwana, where a column of British soldiers was cut to pieces by the Zulu hordes, caused residents in the vicinity, amongst whom was Medley Wood, to remove their wives and families to Verulam, where if necessary, they could be defended. Fortunately the gallant defence of Rorke’s Drift, where 80 men held the position against several thousand Zulus saved Natal from invasion and the farmers were soon able to return to their homes. In 1875, Medley Wood had entered into correspondence with Kew, and in 1879, a list of his

fungi was published in Grevillea by Cooke, who sent the Agarics to be determined by the Hungarian mycologist, Kalchbrenner. Later collections were identified by these mycologists, who in 1881 published a paper on 'Natal Fungi collected by J. M. Wood, Inanda'; a few numbers were also included with fungi listed in Kalchbrenner's Fungi MacOwaniana. Under 'Fungi exotici' in Grevillea for 1882, Cooke described 49 new species from a collection of 200 fungi found at Inanda by Medley Wood, who in the same year reported an outbreak of *Hemileia vastatrix* in the coffee plantations on the Natal coast. In the following years 1883-1889, Cooke continued to describe odd specimens of Natal fungi; in 1899, P. Sydow published a list of 41 Natal fungi, 8 of which he described as new, among the latter being the genus *Woodiella*, named in honour of the collector.

In 1882, Medley Wood was appointed Curator of the Botanic Gardens, Durban, and when the Gardens were separated from the Herbarium, remained Director of the Natal Herbarium until his death in 1915, in his 88th year.

Peter MacOwan arrived in Grahamstown in 1861 to take charge of a projected 'College' and in that town he laid the foundations of his herbarium. He left Grahamstown in 1869 to take up the post of science tutor at Gill College, Somerset East, and it was from this centre that he explored the Boschberg and made his earlier collection of fungi and lichens. The first papers on his fungi were published by von Thuemen in Flora, during the years 1875-1878, and MacOwan also contributed material to von Thuemen's 'Mycotheca universalis'. The greater number of his fungi was listed and described as 'Fungi MacOwaniana' by Kalchbrenner and Cooke in Grevillea during the years 1880-1882; a few went to Dr. Georg Winter and were published in his papers on 'Exotische Pilze' in Flora, 1884, and Hedwigia, 1885.

MacOwan's lichens from the Boschberg were sent to Stirton at Glasgow, who described them in 1877 in 'Additions to the Flora of South Africa'. In this paper were also described lichens collected near 'Diamond Fields' by Dr. John Shaw, who was headmaster of the school at Colesberg and later joined the staff of the South African College, Cape Town. Dr. Shaw was interested in botany, and the first paper read to the newly formed South African Philosophical Society was his 'Remarks on Roridula dentata one of the Insectivorous plants, illustrated by specimens'. Also included in Stirton's paper were specimens collected in the Cape and Transvaal by Dr. J. H. McLea; a few of these, collected at Lydenburg, are in Rehmann's herbarium.

While MacOwan was at Somerset East, contributions to the Fungi MacOwaniana were made by Richard Baur, a Moravian missionary stationed at Baziya in the Transkeian territory of Tembuland, who, in his earlier years, lived in Cape Town and was very friendly with Zeyher (MacOwan). Baur sent his specimens to MacOwan at Gill College, whence the rarer and undescribed species found their way to Kew. Another name associated with the Fungi MacOwaniana is that of William Tuck (called by Berkeley in error Julius Tuck) who was shipwrecked on the Natal coast in 1849, and for a time lodged with the German Naturalist Gueinzus. Later he made his way to the Cape, and, after working in various private gardens, in 1866 became curator of the Botanical Gardens at Grahamstown. Tuck's chief title to fame in the fungus world was the discovery of the remarkable phalloid described by Berkeley as a new genus, *Kalchbrennera*. Berkeley named the fungus *Kalchbrennera Tuckii* in honour of the collector, but as it had been recorded in tropical Angola as *Lysurus corallocephala*, the latter specific name has priority, and the fungus is now known as *Kalchbrennera corallocephala*.

In 1881, MacOwan was appointed Director of the Cape Town Botanical Gardens and Curator of the Cape Government Herbarium; these appointments he held until his voluntary retirement in 1905. His herbarium was left at Gill College, but as it was never used, in 1904 the Trustees were persuaded to present it to the Albany Museum, Grahamstown; it then contained 1,800 fungi. After his transfer to Cape Town, MacOwan had less time for the collection of fungi, although he added a number of specimens to his collections.

As Director of the Botanic Gardens, he had to give attention to horticultural matters and to economic botany generally, with the result that numbers of people from all parts of

South Africa came to him for advice. In 1887, the Cape Government acknowledged this work by employing him as official consultant in economic botany. "From that time he had to pour out a regular flood of reports, many of which were published in the *Agricultural Journal* of the Cape Colony, while hundreds were merely filed" (Schonland 1910). Amongst the published reports are the first papers written in South Africa on subjects connected with Plant Pathology, e.g. "The fungus enemies of apple and pear trees" and some on diseased trees in forestry plantations.

From Cape Town, however, MacOwan made considerable collections of lichens. He entered into correspondence with Dr. Hugo Lojka of Buda-Pesth, who asked him for material for his *Lichenotheca universalis*. After Lojka's death, MacOwan's lichens were handed over to Stizenberger, who described from them a large number of new species in his *Lichenaea africana* (1890). In addition to records from the earlier collectors, the *Lichenaea* includes reference to specimens collected by J. C. Breutel, a Swiss missionary who collected cryptogams at Genadendal, 1853-1854, and a large number of records, and some descriptions, of lichens sent to Europe by Dr. Wilms, a well-known collector of plants, who was for some years resident at Lydenburg in the Transvaal; descriptions of most of Wilms' lichens were published by J. Müller (Arg.) in his *Lichenologische Beiträge*, 1885-1888.

Several botanical collectors from Europe came to South Africa in the second half of the 19th century. Dr. Anton Rehmman, who travelled extensively in extra-tropical Africa in 1875-1880, collected a number of lichens which are listed by Stizenberger.

Friedrich Rudolf Schlechter, a German collector, first came to the Cape in October, 1891. In Cape Town he made the acquaintance of MacOwan and Marloth, his contemporaries and fellow enthusiasts. In the course of his travels he went to the Transvaal, visiting the Woodbush and Lydenburg and reaching the Limpopo in the north. After his return to Cape Town in 1893, he went up the west coast as far as the Olifants River and then eastward through Knysna and Humansdorp to the Transkei, Pondoland and Natal. He visited Durban, where he met Medley Wood and returned to Europe via Moçambique and German East Africa. In 1896 he returned to South Africa on a second collecting trip. Schlechter's main interest was the flowering plants, particularly orchids, but in the course of his travels in South Africa he collected a number of fungi. In 1895, P. Hennings described six fungi collected by Schlechter, which he found in the *Königlichen bot. Museum* in Berlin, and in 1898 a further 15 fungi were sent to him for study: of the latter 9 were described as new species of which 7 were rusts. In 1899, P. Sydow described *Cystopus Schlechteri* found by Schlechter in the eastern Cape on *Salsola aphylla*. Hennings (1895 b) stated that more comprehensive fungus collections had for years been sent to Prof. Magnus, but no account of these can be traced. Apparently no complete list of Schlechter's fungi has ever been published, but from time to time new species, especially rusts, have been described from his collections.

P. Hennings also described in 1892 and 1895, a number of fungi collected by P. Bachmann in Pondoland during the years 1887-1888, and in his *Plantae Pentherianae* in 1900, a few fungi found in the Cape and East Griqualand and at Harrismith by P. Krook. Bachmann also collected a few lichens, which are mentioned in the 1895 supplement of Stizenberger's *Lichenaea africana*.

The collectors of South African fungi and lichens mentioned thus far drew most of their material from the Cape and Natal, only a few extending their activities to the 'diamond fields' of Griqualand West and to parts of the Transvaal. Until the later decades of the 19th century, no information is available about cryptogams found in South West Africa nor in the Portuguese territories of Angola in the west and Moçambique in the east.

Dr. Friedrich Welwitsch, an Austrian botanist, who had spent a number of years in Portugal where he made extensive collections of plants and had charge of botanic gardens, was commissioned in 1851 by the Portuguese Government to explore the Portuguese possessions on the west coast of Africa (Hiern, 1896). He left Lisbon in 1853, and at first made Loanda the base of his operations, exploring the maritime region and later the mountainous district of Golungo Alto with its tropical forests, then travelling south-west through the

park-like vegetation of the Pungo Andongo. His health became seriously affected by his prolonged stay in these tropical regions and he was forced to return to Loanda. When his health had been somewhat restored, Welwitsch proceeded by sea to Mossamedes. He extended his journey southward as far as the bay of Tigers (lat 17°) and working inland approached the elevated plateau called Huila. His later explorations during 1859 and 1860 were thus conducted within the region regarded for the purposes of this review as 'southern Africa', and fungi and lichens collected in the districts of Mossamedes, Huila and Cubango, south of the 15th parallel have been listed.

Welwitsch's collections form the best and most extensive herbarium of the flora of tropical Africa it and consists of about 5,000 species, not only flowering plants, but valuable collections of cryptogams. The fungi were described by Welwitsch and Currey in the *Fungi angolenses* (1868) and by Annie Lorrain Smith (1898, 1901), the lichens by Wainio (1901).

During the years 1884-1887, Hans Schinz conducted his "Explorations through the German territory of Great Namaqualand and Hereroland to the river Cunene, the Lake N'gami and the Kalahari" (Schinz, 1891). In his account of these explorations, he gave a general account of the flora of the country, but his botanical collections were studied by a number of German botanists and the results published elsewhere. Fayod (1890) described 8 Agarics, of which 2, *Naucoria pediades* and *N. semi-orbicularis*, are cosmopolitan; the rest were described as new species. There seems to be no further publication on Schinz' fungi, but a few parasitic species, e.g. *Puccinia desertorum* Syd. on *Evolvulus alsinoides*, collected near Okahandja, have been found on his flowering plants. His lichens, amongst which a number of new species were found, were described by J. Müller (Arg.) in *Flora* (1888) and by Wainio (1900).

In 1899, a German expedition under the leadership of H. Baum set out from Mossamedes, to explore the natural resources of a strip of territory, newly acquired on the southern border of Angola. This expedition known as Kunene-Sambesi expedition—covered part of the maritime region explored by Welwitsch, but travelled farther south as far as the Habungu river; inland it penetrated as far east as the Zambesi river, for the most part following the course of the Kunene, Kuito and Kuando rivers, and apparently skirting the southern limit of the Huila plateau. This expedition brought back to Europe about 1,000 plant specimens, including 53 species of fungi, of which 36 were described by P. Hennings (1903) as new.

Karl Dinter, who went to South West Africa in 1897, was Government Botanist in the territory 1900-1914; he apparently went back to Germany in 1914, but returned later and continued his botanical explorations, some of which were undertaken in company with R. Marloth. In his account of the flora of South West Africa (1909) Dinter states that, owing to the dry nature of the country, the fungus flora is poor. He mentions an *Agaricus* growing on termite hills, common in wet seasons and apparently edible, a *Geaster* and other fungi belonging to the genera *Catastoma*, *Tulostoma* and *Polyplocium*. At Okahandja he found *Broomeia* and a few species of *Polyporus*. In a later publication (1912), he describes the *Agaricus* mentioned above, but distinguishes it only by its native name; he also mentions a species of *Terfezia*.

The Percy Sladen Memorial Expedition, 1910-1911 and 1912-1913, went northwards from the Cape and via Warmbad into Great Namaqualand; it also travelled from Mossamedes eastward to Huila, then south-east to Fort Humbe, following part of Welwitsch's route. The new fungi collected in South West Africa by H. H. W. Pearson, the botanist to the expedition were described by Pole Evans (1915 a).

Later collections in South West Africa were concerned mostly with lichens. Zahlbruckner (1926 b) has described a number of lichens collected by 'Apotheker Fincke' on Haifischinsel off Lüderitzbucht and in the neighbourhood of Windhoek. Magnusson (1933 : 13) mentions one I. Örtendahl, garden inspector of the Botanical Gardens, Uppsala, who made a journey through Great Namaqualand in 1931, and brought home a rich collection of lichens from the deserts. Of special interest were a number of yellow species of *Acarospora*,

yellow species being as numerous in Africa as brown species in Europe ; the latter are rare in Africa.

On his Zambesi expedition, which lasted for over 5 years, and started from the east coast to explore the Zambesi River, David Livingstone was accompanied by John Kirk in the dual rôle of physician and naturalist. Only one or two odd records of cryptogams collected by Kirk during this trip can be traced, one from Lupata, another from Rovuma River. It is possible that fungi and lichens were amongst the specimens lost when, in 1860, Kirk's canoe was upset as he was traversing a narrow gorge where the river current was swift.

Apart from Kirk's few specimens, the earliest records of the fungus and lichen flora of Moçambique were the work of two missionaries.

Henri Alexandre Junod, who spent 30 years in southern Africa, entered the service of the Swiss mission and arrived in Moçambique in 1889. In addition to his educational and ethnological work, he was keenly interested in entomology and botany and made extensive and valuable collections of insects and plants. His name is associated with that of his friend Hans Schinz in the account of his collections published in the Bull. de l'Herb. Boissier (1899, 1903) and the Memoires de l'Herb. Boissier, No. 10, 1900. These papers are concerned mostly with his flowering plants, but a few ferns are listed, and, in one paper, 6 lichens. A number of his Moçambique fungi, mostly from Rikatli, about 20 miles north of Lourenço Marques, were sent to Pretoria ; they include a number of species of special interest including two collections of the fungus described by Pole Evans and Bottomley as *Diplocystis Junodii*, now considered identical with *Broomeia ellipsospora* v. Höhn. After leaving Moçambique, Junod was stationed for years at Shilowane, in the Low Veld area of the northern Transvaal ; this was fever country, and holidays were spent in a hut on Mount Mamotsuiri known as the 'Sanatorium'. Here, in 1900, he collected a number of lichens, which were examined by Steiner, who erroneously placed the locality in the Cape Province. Steiner (1907) listed 33 lichens of which 3 species and 7 varieties were described as new.

Father Ladislau Menyharth was a Jesuit missionary. Always interested in natural science and especially in botany, his hope for 20 years was to be sent to a mission station in Africa. It was not until 1889 that he embarked for the east coast of Africa ; he was stationed at Boroma on the Zambesi during the years 1890-1894 and it was from this centre that most of his collections were made. He was then transferred to Zumbo, higher up the river, at the junction of the Loangwa River with the Zambesi ; here he died of fever in 1897. Father Menyharth made extensive collections of flowering plants and cryptogams ; five of his fungi were listed by P. Hennings (1906) including two rusts which were named *Aecidium Menyharthi* and *Uromyces Schinzianus*. He was apparently more interested in lichens, of which 55 species and varieties were listed by Wainio.

Le Testu, a French botanist, better known for his collections in tropical Africa, sent a small number of Moçambique fungi to Maublanc, who described them in 1906. Later, in 1908, C. W. Howard, who was appointed entomologist at Lourenço Marques collected a number of fungi, mostly at Umbelusi, Quelimane, and up the Maputo and Zambesi rivers. Some of these were listed by H. & P. Sydow (1909) in *Annales Mycologici*, where 6 new and 18 known species sent by Howard were mentioned ; he left Moçambique in 1911.

At the beginning of the 20th century, a new chapter in the history of South African mycology was opened. In the Transvaal Department of Agriculture established in 1903, the agrostologist and botanist, Joseph Burt Davy, soon had to deal with numerous enquiries about plant diseases, for which he had to ask the assistance of Geo. Massee at Kew. The chief problems which came to his notice were connected with cereal rusts and with the coffee leaf disease caused by *Hemileia vastatrix*, which had been destructive on the Natal coast since it was detected by Medley Wood in 1883 and was now wiping out the coffee plantations in the northern Transvaal. He soon realised the desirability of appointing a plant pathologist, who could devote his time to studying the life histories of parasitic fungi and carry on practical experiments with fungicides.

With these problems in view, enquiries for a suitable candidate inevitably led to Marshall Ward, then occupying the chair of Botany at Cambridge, whose reputation as a mycologist had been established by his investigation in 1880 of the cause of the coffee leaf disease in Ceylon, and whose later work was largely concerned with the rusts of cereals and grasses. One of Marshall Ward's most brilliant students at this time was Iltyd Buller Pole Evans, who, since 1903, had been working in the Botany school on problems connected with the cereal rusts. To him was offered the post of mycologist in the Transvaal Department of Agriculture, and he arrived in Pretoria on July 28th, 1905. He at once attacked the cereal rust problem and made a large number of cultures. The absence of any information about alternate hosts of the heteroecious rusts in this country and the fact that *Hemileia* species occurred on indigenous hosts, early convinced him of the necessity for a survey of fungi on native plants and for a general study of the cryptogamic flora of the country. In his first year, he collected 200 specimens, which formed the nucleus of the mycological herbarium at Pretoria. At this time there were three small mycological herbaria in South Africa; the Albany Museum, Grahamstown and the South African Museum, Cape Town each had a rather incomplete set of MacOwan's fungi and Medley Wood's collections were housed in the Natal Herbarium, Durban.

With all his energy and enthusiasm it was impossible for Pole Evans to cope single-handed with the numerous problems which were brought to him, and in 1908, the author had the honour of being appointed his first mycological assistant. The third member of the staff of the mycological section at this time was a clerk, P. J. Pienaar; he became interested in fungi and made a very comprehensive collection on Garstfontein, a farm in the Pretoria district. A few years later, he was further pressed into the service of plant pathology and made some inspection trips over a wide area; from all these he brought back interesting specimens for the herbarium.

When, in 1910, the Union of South Africa became an accomplished fact, a separate Division of Plant Pathology and Mycology was formed for the investigation and control of plant diseases throughout the four provinces. The increased scope of the work obviously called for an increase of staff. P. A. van der Byl was appointed in 1911, and in July 1913, Miss A. M. Bottomley joined the staff. Miss Bottomley took charge of the herbarium, and under her care and with the loyal co-operation of members of the staff, it developed rapidly. During the 12 months after her appointment 2,651 specimens were registered and by 1918 there was 11,369 fungi in the collection. Medley Wood presented most of his fungi to the Government and after his death, these were incorporated with the collections at Pretoria; an incomplete set of MacOwan's fungi was purchased from Dr. Schonland on his retirement from the curatorship of the Herbarium of the Albany Museum. Many important sets of exotic fungi have been acquired by purchase or exchange. At the end of 1945, the Cryptogamic Herbarium at Pretoria housed over 61,200 specimens, of which about 35,500 are fungi, including a major part of the South African fungi listed in this publication. The lichen collections, 2,194 numbers, are comparatively poor and most of the South African specimens await identification.

While building up his staff and attending to all the work involved in the investigation and control of plant diseases, Pole Evans did not neglect his first love—mycology. He continued his work on the cereal rusts and his search for the aecidial forms of the heteroecious species. He studied the life history of the fungus on *Rhamnus prinoides*, which had been variously described as *Aecidium Rhamni* f. *Rhamni prinoidis* by von Thuemen, as the aecidial form of *Puccinia coronata* by Kalchbrenner and as *Aecidium elegans* by Dietel, and found that it was a species of *Endophyllum* which he named *Endophyllum MacOwani*; the aecidium of *Puccinia coronata* is not known in this country. He also made collections of rusts on other indigenous plants and published his first paper on these fungi, "The species of *Puccinia* on *Compositae*" in 1916.

In 1912, he discovered and described a fungus, *Isaria Psychidae*, causing a disease of the bagworm (*Acanthopsyche Junodi*) which is a serious pest in the Natal wattle plantations. The fungus was grown in bulk and the spores disseminated in the plantations, but this

attempt at artificial infection of the insects was not successful as suitable climatic conditions were seldom present when the inoculum was available.

At the request of the Governor General of Moçambique, he left Pretoria on 29th August, 1913 to visit the coconut plantations of the Campanha da Zambesia in the district of Quelimane, to study and report on the diseases affecting palms; he returned on September 25th. The trip was briefly mentioned in his annual report, but a full account of his investigations into coconut palm diseases was not published until 1918. No further studies of plant diseases in Moçambique were made until 1932, when J. G. A. Cardoso was appointed plant pathologist in the Department of Agriculture at Lourenço Marques; he has published a number of papers on phytopathology.

During the next few years, until 1919, Pole Evans continued to publish mycological papers, such as those describing *Diplodia natalensis*, a variety of *Kalchbrennera Tuckii*, *Terfezia* 'a truffle from the Kalahari' and, in collaboration with Miss Bottomley, studies on the genera *Broomeia* and *Diplocystis*. About this time, the increasing pressure of administrative work made itself felt and other interests, such as the botanical survey and the study of pasture grasses, made great inroads on his time. He was unable to continue his study of South African fungi, but the work was continued by members of his staff, some of whom had worked with him in the early days and had been fired with his enthusiasm.

In 1921, the publication "Bothalia", so named after the first Union Premier and Minister for Agriculture, General Louis Botha, was launched as a medium for the publication of papers based on material in the National Herbarium, with Pole Evans as its editor. In this publication will be found records of the work of the staff on several groups of fungi, including phycomycetes, ascomycetes, rusts and Fungi Imperfecti.

Amongst those who joined the staff after 1918, several were interested in fungi. Miss Mary Thomson (now Mrs. Pole Evans) was appointed in 1919; she studied the life history of the maize rust with its aecidium on *Oxalis corniculata*, and worked out the life cycle of a heteroecious species with teleuto-sori on an indigenous grass, *Tristachya*, and aecidia on the 'wild sweet pea', *Sphenostylis angustifolia*—the only work of this kind which has been done in South Africa.

V. A. Putterill in 1918 published notes on the morphology and life history of *Uromyces Aloes*. In the same year a mycological laboratory was opened in Cape Town, of which he was put in charge, and there studied diseases of plants in the South-western Cape. This work was later taken over by the Stellenbosch-Elsenburg College of Agriculture, but, transferred to the fruit inspection service, Putterill retained his interest in fungi and is responsible for records of a number of organisms associated with fruit decay or found in packing sheds.

V. A. Wager, appointed in 1926, has made studies of South African Pythiaceae, and is now stationed at Durban where he has prepared specimens of a number of fungi found on the Natal coast. An appointment was made in 1934 of a mycologist to study fungi attacking locusts, as swarms of these insects were particularly destructive at this time. E. E. Schaefer, who joined the staff in this capacity, made a study of *Empusa Grylli* and other locust fungi, and still maintains his interest in fungi attacking insects.

Here may be mentioned S. H. Skaife, then Inspector of Science in the Cape Education Department, who published several papers on entomogenous fungi during the years 1920-1925, and A. McMartin, on the staff of the experiment station of the Natal Sugar Association, who published the results of his studies of locust fungi in 1935.

Thus far the appointment of P. A. van der Byl in 1911 has been no more than mentioned. At first he studied a number of plant diseases, including the dry rot of maize caused by *Diplodia Zeae*, but he soon became interested in the larger fungi, especially the Polyporaceae found on indigenous trees. In 1915, he went through the forests of the eastern Cape Conservancy in company with the Conservator of Forests, J. D. M. Keet; extensive collections were made, which provided material for his later work on the Polyporaceae. After Medley Wood's death in 1915, it was decided to establish a phytopathological laboratory in connection with the Natal herbarium and van der Byl went to Durban to take charge there.

During the next few years, he studied fungi affecting sugar cane and those causing deterioration in the sugar refineries. Later and more extensive studies along these lines have been made by McMartin (1937-1945) at Mount Edgecombe, the experiment station of the Natal Sugar Association.

In 1921, van der Byl was appointed Professor of Plant Pathology at the University of Stellenbosch, where he continued his studies of the larger fungi, and later became Principal of the Stellenbosch-Elsenburg College of Agriculture. At Stellenbosch he found a willing co-adjutor in Miss A. V. Duthie, lecturer in botany, who had for some years been collecting Myxomycetes and had published lists of South African species. With her help, van der Byl made further collections, mostly in the neighbourhood of Stellenbosch and in the Knysna forests. Most of these fungi, and those which he had collected earlier, went to C. G. Lloyd in America for identification; Lloyd remarked on the excellent and rare specimens of Gastromycetes contributed by Miss Duthie. In his later years, van der Byl became interested in lichens and made extensive collections, which, as well as his fungi, he bequeathed to the University of Stellenbosch.

As time went on, a group of van der Byl's students took up mycological work and made studies of fungi in the south-western Cape; amongst these may be mentioned Len Verwoerd, who succeeded van der Byl as Professor of Plant Pathology, B. J. Dippenaar, who occupies a similar post in the University of Pretoria and S. J. du Plessis.

In 1923, F. Eyles from Southern Rhodesia spent six months at Stellenbosch working under van der Byl. Eyles had for many years been interested in plants, and published a record of plants of Southern Rhodesia in 1915; in this only four fungi were listed, and these probably because they had been detected on flowering plant specimens. Soon after, he gathered a number of fungi, especially on a trip to Umtali in 1919. After his return to Salisbury from Stellenbosch, he began serious work on mycology and plant pathology in the Department of Agriculture, and in 1926 published a preliminary list of plant diseases. In March, 1928 he retired from the Department and was appointed Curator of the Queen Victoria Memorial Museum. His work in the Agricultural Department was carried on by J. C. F. Hopkins, who had joined the staff in 1926. In 1932, Eyles compiled a list of fungi of Southern Rhodesia, which he had collected and recorded, but unfortunately did not live to have this published; his records are incorporated in the list of fungi of Southern Rhodesia published by Hopkins in 1938 and his specimens are to be found in the herbarium of the Department of Agriculture at Salisbury.

In Southern Rhodesia valuable work, particularly on fungi associated with Citrus, has been done by G. R. Bates, who, for a number of years, was plant pathologist at the Mazoe Citrus Experimental Station and has now joined the Department of Agriculture at Salisbury.

The year 1930 saw the inception on the Witwatersrand of the first South African Institution in which industrial mycology was to play an important part. The brewing and wine-making industries have made no study of the organisms employed and little is known of the flora of kaffir beers or of the 'wild yeasts' used by the natives in various fermentation processes; nor has any systematic study been made of the organisms causing wastage in commercial products.

In 1929, Miss R. Lurie started work at the University of the Witwatersrand on organisms causing decay in mine timbers. Specimens, both of untreated timber and timber treated with zinc sulphate, were sent up from different mines, and it soon became obvious that the zinc sulphate treatment was not sufficiently effective against certain types of organisms. Experiments on a commercial scale were inaugurated and a preservative process involved which was an improvement on the old method. In 1934 a laboratory for this work was established at the Exchange Yard (Pty.), Ltd., and there, in 1935, experiments were extended to include the preservation of fabrics, such as airfiltration bags, blanketing, canvas, hessian and coconut matting. As a result of Miss Lurie's preliminary work, the Transvaal Chamber of Mines established the Timber Research Laboratory. Miss D. Weintraub, and later Miss M. W. Simpson were appointed to assist in the mycological work. Miss Lurie married in

1936, and when she was unable to continue full-time work, for 5 years acted as consultant to the laboratory, again taking charge in 1942 until the end of 1945.

An extract from her report as consultant in 1939 indicates the scope of the work: "The importance of the mycological aspect of combatting the disintegration of wood and fabrics cannot be over-emphasised, as, without a knowledge of the causes of destruction, satisfactory control measures cannot be adopted. A study has been made of the more commonly occurring fungi, but the problem has been complicated by the discovery that a large number of organisms thrive under the conditions prevailing underground. Thus a considerable time must elapse before all the organisms already established in culture from various sources can be subjected to detailed examination. To add to the complexity of the situation, research into the morphology and biology of some of the fungi suggests the existence of several strains of the same organism, some of which are more active than others in their attack on timber. This is naturally of importance in studying the toxicity of preservatives, when the most virulent strain must be chosen for test purposes. With the variation in depth of the Witwatersrand mines the resulting problem of ventilation with its concomitant factors of temperature and humidity, has a direct bearing on the occurrence and distribution of fungal flora. The variety of materials used for mining purposes, which are liable to destruction by fungi, calls into play specific action by different organisms, and this perhaps in some measure accounts for the large numbers found underground. One of the problems still under investigation at the laboratory is the determination of the organisms responsible for the destruction, not only of different species of timber, but also of the many different fabrics used in the mines. The physical and chemical nature of the material will determine the organism that will destroy it. For instance, the coconut matting is not attacked by the same fungi which disintegrate cotton, nor do the destroyers of flannel break down other fabrics. Much work still remains to be done in this connection, as the technique for the isolation of the causal organisms of decay in fabrics such as coconut matting and hessian is extremely difficult." In 1940, it was reported that about 1,460 organisms had been collected and over 1,000 cultured.

Amongst the enthusiastic collectors who, since the beginning of the 20th century, have made material contributions to the knowledge of South African fungi, Miss Alice Pegler has a place of honour. Miss Pegler lived for many years at Kentani, where she made a systematic study of the flora of the district and prepared representative sets of plants for her herbarium of over 2,000 specimens, and for distribution. During the years 1911-1915, she collected a large number of fungi; 77 species from her collection were listed by Pole Evans and Bottomley in 1918, and later study added to this number.

In Southern Rhodesia, C. F. M. Swynnerton, a very keen all round naturalist, perhaps best known for his researches in connection with the tsetse fly problem, made collections of birds and plants in the Melsetter district, then known as Gazaland, and sent a large collection of plants to the British Museum. These were mostly from the Chirinda forest, a most interesting patch of residual rain forest; his collections included some fungi and lichens.

Several other collectors who have made contributions to the cryptogamic herbarium at Pretoria are mentioned elsewhere. W. G. Rump has been on the staff of the Natal Museum since 1904; after gaining considerable experience in collecting arachnids, insects, myriopods and mollusca in the forests, some of which have been described in the Annals of the Natal Museum, on the advice of the Director widened his activities to include fungi. He has made extensive collections of the larger fungi, especially in the forests near Maritzburg. Gideon Joubert, a farmer of the Cape Province, collected a number of particularly interesting fungi between 1916 and 1936. The fungi which he found in the Albert District, included *Polyplodium inquinans*, two species of *Phellorina*, *Battarea Tepperiana*, *Kalchbrennera corallocephala*, a species of *Phallus* and some Agarics; from Matatiele he sent some *Geasters* and *Tulostomas*. L. C. C. Liebenberg made interesting collections in the eastern Transvaal, A. O. D. Mogg in the grasslands of the Transvaal and Natal. The contributions made by J. P. H. Acocks are remarkable for the rare Gasteromycetes which he found first in the Cape

Peninsula in his student days under the direction of Miss E. L. Stephens, and later in the arid region of Griqualand West.

South Africa in the 20th century still attracts botanical travellers from Europe. When the British Association for the Advancement of Science held its meetings in South Africa in 1905, one of the visiting members was W. N. Cheesman, an amateur Yorkshire naturalist, who took a keen interest in fungi. He found a number of fungi, chiefly near the Victoria Falls; these were identified by Massee.

Other botanical collectors known to have visited this country, were interested chiefly in lichens. J. Brunthaler, conservator of the botanical museum of the University of Vienna, visited Africa in 1909 and made extensive collections of lichens and hepatics. He journeyed through the south-western Cape, through Worcester to the Karroo, then via Swellendam to Port Elizabeth; other localities visited were Van Reenen's Pass, Victoria Falls and Bulawayo; thence he travelled through Mozambique to tropical Africa. Brunthaler handed his lichen collections to Zahlbruckner, who (1926 b) described from them a large number of new species.

During the years 1929-1930, O. A. Høeg, curator of the museum at Trondheim, travelled through South Africa. His fungi were examined by Miss Wakefield (1936). The lichens, which made up by far the greater part of his collections, were he stated "under examination, in so far as it has been found possible to find specialists able and willing to undertake the task for the various groups". Unfortunately no published record of Høeg's lichens has been found with the exception of those listed in the first two volumes of Motyka's monograph of the genus *Usnea*.

It is also unfortunate that it is not possible to include in this record the work of S. Garside, who for years has been making a study of South African lichens and has built up a valuable herbarium. During the past years he has been making comprehensive collections from MacOwan's stamping grounds in the vicinity of Cape Town and endeavouring to establish MacOwan's types. His studies of South African lichens, with the exception of a short paper on *Siphula tabularis*, have not yet been published and thus are not available for the purposes of this record.