

II.—NATURAL FEATURES AND VEGETATION.

Southern Africa, for the purposes of this record, includes the temperate and subtropical regions of the southern part of the continent. In the absence of any suitable political or natural boundary, it is necessary to set an arbitrary limit to the area included, and this has been fixed at the 15th parallel of south latitude, a line running approximately from Mossamedes on the west coast to Moçambique on the east coast. The whole area under consideration therefore lies between the 15th and the 35th parallel of south latitude ; it is bounded on the east by the Indian Ocean and the Moçambique channel and on the west by the Atlantic Ocean. The island of Madagascar has not been included.

The area is vast, covering over 1,500,000 square miles and including the Union of South Africa (472,550 square miles), Basutoland (11,716 square miles), Swaziland (6,704 square miles), Bechuanaland Protectorate (275,000 square miles), South West Africa (322,450 square miles), Southern Rhodesia (150,344 square miles) and the greater part of Moçambique (283,800 square miles). The part of Moçambique territory lying north of the town of Moçambique is excluded, but the southern part of the Nyasaland Protectorate and of Northern Rhodesia and the provinces of Mossamedes, Huila and Cubango in Angola fall within the limits fixed.

Topography and Climate.

(Rogers and Haughton, 1940 : 16-23. Schumann, 1940 : 37-55.)

Southern Africa, on the whole, is a high-lying country. The interior is a great plateau with an altitude of 3,000 to 5,000 feet above sea level, a large part being within the 4,000 feet contour. It is a region of great plains from which rise flat-topped hills of irregular plan. This plateau is divided by a well marked escarpment from the diversified tract of country lying between the escarpment and the ocean.

The escarpment which separates the two regions consists of a number of mountain ranges : The Drakensberg or Lebombo Mountains of the Transvaal, the Drakensberg of Natal and the Transkei, the Stormberg of the north-eastern Cape, the Sneeuwberg, Nieuweveld, Komsberg, Roggeveld and Kamiesberg farther south and east. It is continued northward under less well known names to beyond the Cunene River. To the north-east, with an interruption for the basins of the Limpopo and Sabi Rivers, there is a belt of high ground along the eastern border of Southern Rhodesia, including the Chimanimani Mountains, the Udzi Mountains and the Inyanga Mountains, of which the highest point is Inyangeni Mountain, 8,250 feet above sea level, 48 miles north of Umtali. Mont-aux-Sources, the highest point in the sub-continent, where Natal, the Orange Free State and Basutoland meet, is 11,170 feet above sea level.

The presence of ocean currents has a very considerable influence on climate, particularly along the coastal belt. The west coast of southern Africa is washed by the cold Benguella current, which produces important climatic effects from Cape Town almost to the Equator ; on the west coast, much of which is an almost rainless desert, there is, because of this current, a cool and foggy seaboard. The warm Moçambique current flows down the east coast, where

conditions form a striking contrast to those on the west coast, but it is only on the coast of Zululand, the lower part of the Limpopo and Sabi basins and in Moçambique that anything approaching true tropical conditions is found.

The average annual rainfall varies from under 5 inches to 50–75 inches. It is greatest in the east where the highest rainfall known is in some of the mountainous areas ; for example, the Amatola Mountains in the south-east Cape average 70·2 inches on 150 days and in some years have over 100 inches, and the Pietersburg district in the northern Transvaal, where the Woodbush Forest Station shows an average of 71·97 inches falling on 138 days. In Southern Rhodesia the heaviest rainfall is along the eastern border. The driest areas, with less than 5 inches rainfall per annum, are found along the west coast and in the western basin of the Orange River. The Namib of South West Africa is the only true desert, with an average rainfall, at Port Nolloth, of 2·17 inches on 17 days.

A comparatively narrow strip of country at the south-west extremity of the continent is a region of winter rainfall, and adjacent to this, restricted to a narrow belt on the south coast, is a zone where rain falls at any time of the year. Elsewhere the greater part of the precipitation is in summer and often occurs with thunderstorms, not infrequently accompanied by hail ; during these storms falls of 2–4 inches in a day are common.

Owing largely to its plateau structure, the mean annual temperature over the greater part of the Union is extraordinarily uniform. Frost occurs in winter over practically the whole of the interior, but its incidence diminishes gradually from the central Transvaal northwards towards the Limpopo valley which is free from frost ; this frost-free condition also obtains in the Low Veld of the Transvaal and in a narrow belt right round the coast of the sub-continent. The warmest parts of the Union are in the deep valleys of the Orange River and of the Olifants River on the west coast and of the Tugela, Komati and other rivers to the east.

Natural Vegetation.

In a vast country with elevation varying from sea level to 11,000 feet, rainfall from less than 5 inches to 75 inches or more, and considerable though less extreme variation in temperature, it is to be expected that the vegetation will be varied in character.

A study of the topography of South Africa has shown that the regions recognised by the topographer form a satisfactory basis for the division of the country into plant regions. The phanerogamic flora is one of the most important factors in the distribution of fungi, and a brief characterization of the plant regions will not be out of place here. For greater detail and many excellent photographs illustrating the character of the vegetation of the different regions, reference may be made to the work of Dr. Pole Evans (1917, 1920, 1936) and that of Dr. R. S. Adamson (1938).

The plant regions are indicated in Map No. 1, which is adapted from Dr. Pole Evans' Vegetation Map of South Africa (1936) and I am indebted to Dr. R. A. Dyer for the following summary made from that publication.

An Outline of the Vegetation of South Africa.

The natural vegetation of the Union consists of Forest, Parkland, Grassland and Desert Shrub.

Forest occupies a very small proportion of the country ; in fact the indigenous timber forests do not cover more than 778,000 acres. They are restricted chiefly to the region of constant rainfall in the south and to the seaward slopes and deep kloofs of the southern and eastern escarpments.

Parkland vegetation covers the central and north-eastern portion of the subcontinent. Thornbush characterizes the central portion, while evergreen and deciduous trees are one of the main features of the north-eastern portion.

Grassland covers the eastern portion of the Union. Between the great escarpment and the coast tall grass dominates ; on the rolling plains of the high veld short grass is the feature

of the landscape ; whilst to the west, in the lower and warmer country known as middle veld, a much more mixed and varied type of grassland occurs.

Desert Shrub covers a large portion of the western half of South Africa. Perennial succulents and woody shrubs largely compose this desert vegetation, but annual herbs and grasses may also periodically dominate the vegetation in certain parts.

Forest.

Three main types may be distinguished :—

- (1) Evergreen and deciduous bush and subtropical forest.
- (2) Temperate evergreen forests.
- (3) Evergreen sclerophyllous bush.

(1) Evergreen and Deciduous Bush and Subtropical Forest.

Stretching from East London northwards along the coast is a narrow belt of dense vegetation which has a more distinctly tropical character than that seen elsewhere in South Africa. The vegetation includes mangrove swamps, palm belts, thorn thickets, stream bank bush and evergreen forests. It is a region of drowned valleys and sandy, bush-covered dunes. The altitude varies from sea level to 800 feet. It is a frostless region and experiences a summer rainfall of from 30–50 inches. The farther north one proceeds the more tropical the vegetation becomes, both in general appearance and in the actual trees, shrubs and other plants found. Mangroves increase in intensity and importance northwards, while palms and arborescent *Strelitzias* characterize the vegetation which often forms an impenetrable bush.

Lianes and climbing plants form a very conspicuous feature of the bush, and in its shade it harbours a dense growth of shade-loving plants. The forests, which bear a distinctly tropical impress, have been very largely exploited and many of them, especially in Natal and Zululand, have almost entirely disappeared with the cultivation of sugar cane.

(2) Temperate Evergreen Forests.

The true timber forests are found only in coastal and inland sites in southern, south-eastern and eastern portions of South Africa. They are usually situated on the eastern and south-eastern aspects of the mountain ranges extending from the Cape to the Transvaal, and occur where the annual rainfall varies from 35–70 inches and more. The most extensive forests are found in the neighbourhood of Knysna and George, on the Elandsberg and on the Amatola Mountains in the neighbourhood of Kingwilliamstown, in the neighbourhood of Port St. Johns and in the Woodbush Mountains of the Transvaal. Between these centres there are many isolated patches of forest both along the eastern escarpment and along the coast. Nearly all these forests have suffered very severely from the hand of man, and had it not been for State protection little of the indigenous forests would be remaining today. Many have already been entirely destroyed in the southern portion of the Cape and in the Cape Peninsula.

The chief components of the forests are the coniferous “yellow-woods”, *Podocarpus* spp., which frequently attain a height of 100 to 150 feet. They yield valuable timber which is used for structural and other purposes. Associated with the “yellow-woods” are a great variety of broad-leaved, evergreen trees. These increase in number of species the farther north the forests extend, and at the same time become more tropical in character.

In the south-western part of the Cape occur the “cedar” forests of South Africa, composed of *Widdringtonia juniperoides*. They can hardly be termed true forests, as the trees seldom form a close canopy, but occur mainly in isolated formation on the slopes of the Cedarberg Mountains. These trees yield a light, soft, durable timber, which is regarded one of the most valuable in the country.

(3) Evergreen Sclerophyllous Bush.

This covers an angular strip of country stretching roughly from the Olifants River on the west coast to Port Elizabeth on the south. On the north it is bounded by the Cape mountain ranges. The country on the whole is mountainous and includes many wide open valleys. The vegetation is composed mainly of bush or scrub, in which small leathery leaves are the predominating feature. It is commonly known as *sclerophyllous* vegetation. The general aspect of the vegetation has a remarkable uniformity and is of a characteristic dull grey-green colour. The region is essentially one with a winter rainfall and a hot dry summer. The absence of grassland in the general landscape is a noteworthy feature, although there is dispersed throughout the bush and scrub a large number of different species of grasses. The rainfall averages about 30 inches, but in several of the mountainous parts it exceeds this and may even reach 100 inches.

The seashore with its sand dunes, the sandy flats, the inland valleys and plains, vleis and mountain slopes, all bear their own characteristic vegetation.

Throughout the region the dominating families are the Proteaceae, Ericaceae, Restionaceae and Compositae. The region is also remarkable for a large number of endemic plants. The vegetation of this region has little in common with that of the rest of South Africa, and there is much evidence to suggest that even the origin of this flora may be different from that of the rest of South Africa. It is the richest floral region in Africa, in fact it is one of the richest floral regions of the world, and it has long been renowned for its wealth of bulbous plants, which have for some time been introduced into cultivation throughout Europe and many other parts of the world.

Parkland.

Parkland vegetation covers the north-eastern and central portions of the sub-continent. Three well-marked types occur:—

- (1) Open woodland and orchard country of evergreen and deciduous tree and bush.
- (2) Open woodland country of sub-tropical evergreen and deciduous tree and thorn forest.
- (3) Thorn country.

(1) Evergreen and Deciduous Tree and Bush.

Open woodland and orchard vegetation characterizes the mountainous and rugged country in the western and eastern Transvaal, which is described locally as "Banken veld". The rainfall over this area varies from 25–35 inches, and the underlying rocks are composed largely of quartzites.

In the eastern portion, where the country falls within the rain shadow of the Drakensberg, tall arborescent Euphorbias, *E. ingens* and *E. Cooperi* and arborescent Aloes, *A. castanea*, *A. Marlothii* form a conspicuous feature in the landscape.

Similar open woodland and orchard vegetation covers the mountainous country to the north known as the Limpopo Highlands, especially on the Waterberg plateau, where the sandstones and quartzites give rise to similar soils. On the Pietersburg plateau the vegetation is mainly orchard country in which deciduous trees dominate. The trees are chiefly Acacia spp., "maroola" *Sclerocarya caffra* and the "naboom" *Euphorbia ingens*.

The vegetation on the eastern slopes of the northern Drakensberg is typical of that "open woodland" country. It consists of tall grass (4–6 feet) interspersed with bush and tall trees. The characteristic trees of this region, which receives a rainfall of 35 to 45 inches, are the "mobola plum" *Parinarium mobola*, the "kejatenhout" *Pterocarpus angolensis*, the "waterboom" *Syzygium cordatum* and the "hill matome" *Diospyros mespiliformis*.

On the Zoutpansberg range a remarkable assemblage of temperate and tropical species and of hygrophilous and sclerophyllous plants is found within comparatively short range. Temperate broad-leaved evergreen forests, tropical forests and thorn forests all occur in succeeding ranges from south to north, and with decreasing rainfall.

(2) Subtropical Evergreen and Deciduous Tree and Thorn Forest.

This type of vegetation covers the low-lying country ranging from 500 to 2,500 feet in Zululand, Swaziland and the eastern and northern Transvaal.

The vegetation is mainly dry thorn forest with occasional large evergreen trees scattered through it. Over the northern portion, the annual rainfall rarely exceeds 15 inches, and frequently it is much less. Over the eastern portion it varies from 15 to 30 inches, but a long dry period is nearly always experienced sometime during the year. South of the Olifants River the vegetation is typically an Acacia thorn forest. Tall trees are the dominating feature, and of these *Acacia pallens* is the most characteristic, especially on drier soils. On soils which are inclined to be waterlogged, dense thickets of *Acacia rostrata*, *A. arabica* var. *Kraussiana* and *A. litakunensis* commonly occur. Along the watercourses and at the edges of swamps the "fever tree" *Acacia xanthophloea* is typical of this region.

(3) Thorn Country.

The type of vegetation known as "thorn country" covers practically the whole of the central portion of South Africa as far south as latitude 28°. It covers the greater part of British Bechuanaland, the Bechuanaland Protectorate, the north-western and central Transvaal and the eastern portion of South West Africa.

Over the eastern portion the rainfall varies from 20-25 inches; over the central portion it ranges from 15-25 inches, while the western portion receives 5-15 inches.

Deep sandy soils characterize the region as a whole. Thorn bush and thorn trees are the dominating features of the landscape. The most characteristic tree of the whole region is the "camelthorn" *Acacia giraffae*. It is common throughout the area, except in the low-lying south-eastern portions where the soils are highly alkaline, and here the "vaalkameel" *Acacia haematoxylon* assumes dominance. There is a great variety of Acacias throughout this area.

In the western portion large tracts of country are covered by the "driedoring" *Rhigozum trichotomum* which is frequently associated with *Parkinsonia africana* and *Cataphractes Alexandri*. In the south-west portion the sand has blown into long, wide, undulating dunes, which usually have a west-north-west trend. These are mainly grass-covered with scattered thorn bush. The dominant grasses are the "tall" and "short bushman grass", *Aristida ciliata* and *A. uniplumis* respectively. On the tops of the dunes, the most characteristic grass is the coarse *Danthonia suffrutescens*.

In the country usually referred to as the Kalahari desert, one of the most characteristic herbaceous plants is the "tsama" *Citrullus vulgaris* var. On this most of the animal life in this semi-desert region depends for its water supply.

Grassland.

Grassland vegetation occupies the eastern portion of South Africa. It is a region of spring and summer rainfall and long, cold, dry winters. The rainfall over the area varies from 20-40 inches. Three main types of grassland can be distinguished:—

- (1) Tall grass.
- (2) Short grass.
- (3) Mixed grass.

(1) Tall Grass.

Tall grass covers the country which lies between the eastern escarpment and the coastal belt. The dominant grass throughout is *Hyparrhenia hirta* and allied species. It forms a dense cover and a uniform sward. In moister situations taller grasses belonging to the genus *Cymbopogon* are dominant. *Cymbopogon* and *Hyparrhenia* characterize the vegetation on the higher slopes of the escarpment.

In the low-lying, sheltered and drier valleys at lower altitudes, Acacia trees, thorn bush and arborescent succulents such as Aloes and Euphorbias invade the grass and hold their

own. In such localities the dominant grasses belong to the genera *Themeda*, *Digitaria*, *Panicum*, *Rhynchelytrum*, *Setaria*, *Pennisetum* and *Chloris*.

(2) Short grass.

Short grass covers the high-lying country (5,000–6,000 feet) west of the Drakensberg escarpment. This country is known locally as the Highveld. It is essentially grass country devoid of natural tree and bush. The dominant grass throughout the region is a short or dwarf form of *Themeda triandra*. Associated with the grass cover and intermixed with it is a large number of herbaceous plants.

(3) Mixed Grass.

Mixed grass covers a wide tract of country lying between the Highveld on the east and the thorn country of the Kalahari on the west. The region includes a number of different geological formations and consequently exhibits a great range of soils. These in turn show considerable variation in the grass covering. The region as a whole is pure grassland, but frequently on rocky outcrops bush and scattered trees may occur.

Desert Shrub.

Occupying the high country between the Kalahari on the west and the dry Vaal-Hart Valley on the east, is a mixture of thornscrub and desert shrub not met with elsewhere in the Union.

The Desert Shrub vegetation covers a broad belt of country extending from South West Africa southwards to the Province of the Cape of Good Hope, when it broadens out considerably and extends almost to the coast at Port Elizabeth and Port Alfred, where it creeps down the valleys of the Sundays and the Great Fish Rivers. The rainfall over the whole area varies from 5 to 15 inches. It is greatest in the south-eastern portion. The southern portion of this area is composed of Karoo beds with rich and shallow soils, whilst in the central and northern portions granites and gneiss occur. Although there are many distinct plant associations, there is a remarkable uniformity in the general appearance of the vegetation throughout the area. Except in the extreme south, where succulents dominate, desert shrubs and shrublets characterize the whole area. The plants may be either woody or fleshy, and they are always widely spaced in bare soil. They are generally of a fairly uniform height. The leaves in most cases are small and well adapted to withstand desert conditions. Except in the southern portion, trees are not a conspicuous feature within the area.

The Karoo proper, which occupies the southern portion of this area and is really a great shallow basin lying at an altitude of 2,000 to 3,000 feet, is covered with fleshy succulents widely spaced in the bare soil and harbours many bulbous and tuberous plants. In the southern portion tree growth is sometimes a conspicuous feature.

North of the Karoo, on the country lying above 4,000 feet, the vegetation is composed almost entirely of "karoo bush" or woody shrubs. These occur mainly on shallow and rocky soils. Wherever the soil is sandy and deeper, the "driedoring" *Rhigozum trichotomum*, a bush which usually attains a height of 3 to 4 feet, mostly dominates. After rain this bush is densely covered with white flowers and forms a conspicuous feature of the Karoo. On the rocky kopjes in this area another species of "driedoring", otherwise known as the "wilde granaat" *Rhigozum obovatum*, is a remarkable sight after rain, with its masses of bright yellow flowers.

The central portion of this area, which includes Bechuanaland and Namaqualand is composed of vast plateaux and plains. The granitic soils are mostly sandy and are mainly covered by the "driedoring" *Rhigozum trichotomum*, the "baviaanskos" *Augea capensis*, and, where the drainage is poor, by "ganna" *Salsola* spp. On the deep sandy plains the "bushman grass" *Aristida brevifolia* often dominates.

True desert occurs along the west coast of South Africa from just beyond the Olifants River in the south to beyond our boundary in the north. The belt varies in width from 10

to 80 miles. Its broadest portion is from Lüderitz Bay to Conception Bay. It extends inland down the valley of the Orange River nearly as far as Upington, and broadens out over a large part of Great Namaqualand, with a corresponding extension north of the Orange River. The average rainfall throughout this area is from under 1 inch up to 5 inches. Over many parts of the country rain frequently does not fall for several years. The whole country throughout the year has a typical desert appearance. The few plants that do occur are mainly stem succulents, and there are always wide spaces of bare ground between them.

The coastal desert extends from the western slopes of the escarpment to the coast line and five distinct zones can be distinguished, viz. the western slopes of the escarpment, the gravel plains, the sand dunes, the rocky hills and the seashore.

The plants that characterize the western slopes are the "kokerboom" *Aloe dichotoma*, the "gifboom" *Euphorbia virosa*, the "melkboom" *Euphorbia Dregeana* and the "Bushman's candle" *Sarcocaulon Burmannii*.

The gravel plains may be destitute of obvious plants for miles and miles. Sometimes they bear a scanty growth of the "vogelstruisgras" *Eragrostis spinosa* and the "twa grass" *Aristida brevifolia*, and occasionally the "baviaanskos" *Augea capensis* and several species of the "Bushman's candle" *Sarcocaulon* spp. In the north in the neighbourhood of Walvis Bay, the extraordinarily interesting and remarkable coniferous plant, the "tumboa" *Welwitschia Bainesii*, occurs. With it is commonly associated one of the "schilpadbossies" *Zygophyllum Stapfi*.

There is little vegetation on the sand dunes, but occasionally the "steekriet" *Eragrostis cyperoides* and the "vogelstruisgras" *Eragrostis spinosa*, in widely isolated tufts, are found. Along the seashore a few interesting succulents belonging to the genera *Salicornia* and *Salsola* have established themselves.

The vegetation found in the valley of the Orange River is equally remarkable and interesting. The rocky mountains which flank this river harbour an apocynaceous plant, the "halfmens" or "elephant's trunk" *Pachypodium namaquanum*, a tall cylindrical stem succulent which attains a height of 12 to 15 feet and bears a crown of leaves and flowers. It has the remarkable habit of always pointing northwards. Other interesting stem-succulents in these hills are the Namaqualand "spekboom" *Ceraria namaquensis*, the "kokerboom" *Aloe dichotoma*, the "gifboom" *Euphorbia virosa*, and several species of *Cotyledon*, *Sarcocaulon* and *Commiphora*.

In this brief outline of the vegetation of South Africa, it has been possible to give only a rough idea of the main botanical features of the country. The flora, more than 15,000 species, is one of the most diverse and interesting in the world.

Fungi in Relation to the Natural Vegetation.

As might be expected, the forest country has had a special attraction for the mycologist. In the "bush" on the coast of Natal, Zululand and the Transkei large numbers of fungi have been found, including those collected by Medley Wood at Inanda and in the neighbourhood of Durban, and a part of Miss A. Pegler's collections in the district of Kentani. Other localities explored for fungi in this region of "evergreen and deciduous bush and tropical forest" are in the neighbourhood of East London and on the Natal coast; only a few specimens have come from the more tropical coast of Zululand and Moçambique, which would well repay exploration.

The "temperate evergreen forests" have yielded a very large proportion of the fungi known to occur in southern Africa, particularly the Hymenomycetes, Ascomycetes and Myxomycetes. They also harbour a great variety of lichens, few of which have yet been identified. Many of MacOwan's earlier collections were made in the forests of the Boschberg near Somerset East, and the forests of the eastern Cape were extensively explored for Hymenomycetes by J. D. M. Keet of the Forestry Department and P. A. van der Byl. The latter also collected in and around Knysna, and it was partly on specimens from the Knysna forests that Miss A. V. Duthie's studies of Myxomycetes and her outstanding contribution to the knowledge of South African Gasteromycetes were based. W. G. Rump,

on the staff of the Natal Museum, has searched the forests in the neighbourhood of Pietermaritzburg and has added much to the knowledge of the Hymenomycetes in that area.

Many of the indigenous forests have been visited on numerous occasions by those interested in mycology, especially the Xumeni forest in the Polela district of Natal, the forests of the Amatola Mountains in the eastern Cape, especially the Pirie forest and the Hogsback, those of the Knysna, George and the Tzitzikama farther west and of the Woodbush in the northern Transvaal. In these forests in addition to the larger fungi, many leaf-inhabiting ascomycetes have been found, and these, in damp places, are in their turn attacked by numerous hyperparasites. Leaf spots and other lesions caused by Fungi Imperfecti are common, but few have yet been put on record. During the wet season Agarics develop in variety and profusion on tree trunks, on fallen logs and in humus. Owing to the difficulty of preserving specimens in a recognizable condition practically nothing is known of the more ephemeral species. A few cosmopolitan species have been recorded and some were described as new from specimens collected by Medley Wood and MacOwan; the type specimens of the latter are often in poor condition and unrecognizable. Apart from the Hymenomycetes, little is known of fungi attacking wood and living as saprophytes in the humus forming the floor of the forest.

The number of fungi recorded from the region of "evergreen sclerophyllous bush" is far below what might be expected in so rich a floral region. Some interesting Gastro-mycetes come from this region, including those collected by Miss Duthie around Stellenbosch and by Miss E. L. Stephens near Cape Town. A number of parasitic fungi have been found, including some interesting species on the Proteaceae, but a systematic search would probably reveal many more on the indigenous flora. Many of the rusts and other parasitic fungi which are known were originally found on flowering plant specimens prepared by early collectors. MacOwan's later collections, including a large number of lichens came from the vicinity of Cape Town.

The vast region of parkland, covering the north-eastern and central portions of the sub-continent is mycologically practically unexplored. A few collections have been made in the eastern Transvaal, largely by L. C. C. Liebenberg and in the neighbourhood of Lourenço Marques by C. W. Howard once entomologist in this territory, by J. G. A. Cardoso and by the Swiss missionary Rev. H. Junod. Another missionary, Father Menyharth contributed fungi and lichens from the lower Zambesi area. In Rhodesia, the collections of F. Eyles and J. C. Hopkins are mostly from this type of country.

In the section of this region known as "thorn country", with a long dry season and low rainfall, very few fungi have been found and they are apparently sporadic in appearance. Some of those found are of particular interest. *Polyplocium inquinans* was found near Vryburg, and a number of remarkable fungi were collected by J. Acocks in the thorn country of Griqualand West, including *Montagnites Candollei*, *Gyrophragmium Delilei*, *Secotium agaricoides*, *Phellorina inquinans* and *Gastrum arenarium*. The Broomeias are found in the thorn country and also some truffles of the genus *Terfezia*.

The extensive grasslands have also been very imperfectly explored for fungi, although a number of parasitic species have been described. Very little is known about the Agarics which frequently appear in considerable numbers after rain; some of the species found by MacOwan have not been noted in recent years, and it has been observed near Pretoria that certain Agarics are sporadic in appearance, and in localities under observation may only appear once in 5 to 7 years.

Part of MacOwan's earlier collections were made in the vicinity of Somerset East in the extreme south-east of the grassland area, and the inland part of the Kentani district, where Miss Pegler found some hundreds of fungi, is also grassland. I. B. Pole Evans has contributed specimens found in the course of his botanical explorations and some fungi of interest have been contributed by A. O. D. Mogg, especially from the grasslands of Natal. A fair number has also been found in the Transvaal, especially in places within easy reach of mycologists stationed in Pretoria.

Of the fungus flora of the desert shrub little is known. *Polyplocium inquinans* was first discovered on the banks of the Orange River and again in the Burghersdorp district by Gideon Joubert, who found several other interesting fungi. A few parasitic species including rusts have been found, and judging by the few collections of which records are available, there is a particularly rich and interesting lichen flora in this region.

Some thousands of specimens of South African fungi have been collected and named, but the mycological work so far accomplished can only be regarded as a foundation for further research. In very few areas has any systematic search for fungi been made and many of the specimens collected have been imperfectly studied. In few cases is any information available about seasonal prevalence, geographical distribution, host range and spore forms of the fungi recorded.

South African mycology is a very broad field and the workers are few. Apart from the earlier collections, the work has been done by those whose main interest was plant pathology. Only in recent years has a post been created in the National Herbarium for a systematic mycologist. This is a small beginning, but it is encouraging, as it implies an official recognition of useful work accomplished and of the necessity for a study of fungi in relation to indigenous as well as cultivated plants.

Plants in Cultivation.

The history of plant introduction into South Africa begins in 1651, with the arrival of Johan van Riebeeck to establish a settlement at the Cape; van Riebeeck was accompanied by a gardener, as the settlement was to be half-way house to the east where water and provisions could be obtained. *Vegetable seeds were brought from Holland, sub-tropical trees and plants from Batavia and from Europe apple and pear trees, chestnuts, olives, plums and cherries. The trees planted by van Riebeeck at the Cape were the beginning of South Africa's great fruit industry. Vines were introduced at a very early date, and with the arrival of the Huguenots the quality of the grapes and of the wines produced, gradually improved; so also did the general cultivation of the land.

In the Paarl and Stellenbosch districts, where many of the Huguenots settled, viticulture is still one of the most important agricultural pursuits; many thousands of vines are grown in other parts of the south-western Cape, especially in the districts of Worcester, Robertson, Montagu, Malmesbury, Tulbagh, Ceres, Cape and Caledon. This region, of which the natural vegetation is evergreen sclerophyllous bush, is also the most important for deciduous fruit trees.

Citrus trees, which were introduced at an early date into this region are still to be found there, but more extensive orchards have been planted in other parts of the Cape, in the Transvaal, in Natal and in Southern Rhodesia; some 56,000 acres are planted with citrus trees in areas where frost is not known or is slight. A variety of tropical fruits is grown in the warmer districts, chiefly in the Low Veld and sub-tropical forest areas; the chief centres for pineapple growing are near the coast of the eastern Cape and Natal.

In 1652, at the back of Table Mountain, van Riebeeck found in the kloofs of the mountain "fine, thick and fairly long trees" and higher up the mountain "hundreds of such trees fit for masts for ships but difficult to remove". These yellow-woods were cut for building purposes and the natural forests on the mountain destroyed. To provide timber, sacks of acorns were sent from Holland and kernels of stone and cluster pines from Italy; these were planted in quantity and flourished amazingly. In other parts of the country the indigenous forests have also been heavily exploited and now cover only a small acreage. Plantations of exotic trees have been established to provide a part of the country's timber requirements and the greatest acreage under trees is to be found adjacent to the natural forests, the majority being species of Pinus, Eucalypts and poplars.

* A most interesting account of the early days of agriculture in South Africa is to be found in 'Historic Farms of South Africa; the wool, the wheat and the wine of the 17th and 18th centuries' by Dorothea Fairbridge. Oxford University Press, 1931.

Large plantations of the Australian wattles (*Acacia mollissima* and *A. decurrens*) are grown for the production of bark extract used in tanning. Of over 568,000 acres planted with these trees, about 500,000 acres are in Natal. Other exotic trees are grown in considerable variety but in comparatively small numbers.

Wheat, oats and barley, introduced into the Cape by van Riebeeck, are grown mostly in the south-western Cape in the region of sclerophyll vegetation. In the north-western Cape and the eastern Orange Free State, wheat is a winter dry land crop; in the Transvaal a considerable quantity is grown under irrigation. Maize, one of the agricultural mainstays of the country, was introduced into Africa in early years by the Portuguese; it probably reached southern Africa towards the end of the 18th century and has become the staple food crop of the South African native. Maize is cultivated extensively, but the main production is in the grassland country of the Natal midlands, the Orange Free State and the southern Transvaal.

Sugar cane is an important crop in the coastal belt of Natal and Zululand, where the plantations have largely replaced the natural bush. Coffee, once cultivated on the Natal coast and in the northern Transvaal is no longer grown on a commercial scale; the decline of this industry was due in part to the attacks of the coffee rust, *Hemileia vastatrix*.

In most parts of the country, potatoes are grown, the largest quantities being produced in the grassland. Tobacco is an important crop in certain areas of the Transvaal, the Cape Province and Southern Rhodesia, and other solanaceous crops such as the tomato, brinjal or egg plant and the "Cape Gooseberry" *Physalis peruviana* are cultivated freely, tomatoes being a winter crop in the sub-tropical areas.

Peanuts are grown extensively, chiefly in the sub-tropical parts of the Transvaal, and numerous other plants are in cultivation, including a variety of fodder crops, agricultural grasses and drought-hardy plants.

Some mention must be made of garden plants. South Africa has a natural wealth of flowers and has given the world many of its most beautiful plants. The Ornithogalums, Freesias, Ixias and many other bulbous plants are well known in the gardens of the world and the cultivated varieties of many well-known genera such as Gladiolus and Pelargonium were derived from South African species. In addition, many flowering plants have been introduced; roses and carnations flourish and gardens are gay with all the well-known annuals, of which the hardier varieties can be grown during the winter months.

Fungi in Relation to Cultivated Plants.

Since the middle of the 17th century there has been a steady flow of plants into South Africa, from Europe and Batavia in the early years and later from all parts of the world. During this time many of the fungi parasitic on cultivated plants were introduced into the country with their hosts, some of them at an early date. Describing agriculture at the Cape of Good Hope in the 18th century, Mentzel writes: "The purest wheat is from time to time spoilt by rust, which covers the ears with black dust and spoils the grains . . . No better remedy has yet been found than to sow seed wheat from other places where this has not occurred." In 1820, according to Theal, the wheat crops throughout South Africa were attacked by a kind of blight previously unknown in the country and those in the Albany district were completely destroyed. In 1821 the wheat crops in that district again entirely failed from blight; this was a severe blow to the newly arrived settlers. During the years 1820-1825, the repeated failure of the wheat crop in the Albany district owing to the attacks of rust is mentioned by Thompson (1827) as a serious obstacle to the progress of the new settlement. In a foot note he refers to earlier failures of the wheat crop: "The nature and causes of the vegetable disease called the *rust*, which has been recently so calamitous to the Cape, I do not profess sufficient agricultural or scientific skill satisfactorily to explain. Its prevalence is not altogether unprecedented in South Africa; for there are records of its existence in 1708-9-10, to such an extent that there was scarcely sufficient seed corn left in the Colony—and again about 50 years ago though not in a shape so virulent."

Many fungi on cultivated plants are widespread and occur wherever the host is cultivated, others are limited in their distribution and some which have been introduced have not become troublesome because of climatic conditions.

The cereal rusts such as *Puccinia graminis* on wheat and oats, *P. anomala* on barley and *P. coronata* on oats are common and widespread. These are heteroecious species, but are perpetuated from year to year without the development of aecidia on an alternate host. *Puccinia maydis*, another heteroecious rust is equally widespread; although an alternate host, *Oxalis corniculata* is fairly common, aecidia are found only occasionally. *Aecidium Oxalidis* occurs on other species of *Oxalis* but spores from these hosts failed to infect maize.

Smuts of cereals are common and many fungi parasitic on fruit trees such as *Puccinia pruni-spinosae*, *Cladosporium carpophilum* causing freckle on peaches and apricots and *Taphrina deformans* causing peach leaf curl, occur in most areas where the hosts are grown. Equally common and widespread are many parasites of field and garden plants.

Other introduced fungi are only found in certain limited areas. *Cercospora Leoni* is found on sultana vines in the Upington area, where it causes considerable damage; in the same district a destructive wilt of cotton is caused by *Verticillium albo-atrum*. *Cercospora Leoni* is not known elsewhere, and of *Verticillium albo-atrum* in other parts of South Africa there are only one or two records on *Solanum* spp.

Phoma citricarpa, causing black spot on oranges, known in China, Formosa and parts of Australia, was introduced many years ago into the Town Bush Valley and the Chase Valley near Pietermaritzburg. Until a few years ago it was restricted to these valleys, where mist and rain are common in the early spring; recently it has spread into citrus orchards in other parts of Natal where less humid conditions prevail, and has also been found in the Transvaal.

Another fungus which has become destructive in recent years is *Phytophthora infestans*; this fungus has been introduced into the country not once, but many times with imported seed potatoes, but for some 25 years during which observations were made, only two outbreaks of "Irish potato blight" of any consequence were reported. The potato variety "Up-to-Date" which was the chief maincrop variety grown, was until recently regarded as one of the most resistant varieties; for some reason, during the last decade, its resistance has broken down. It is now very susceptible, and *Phytophthora infestans* is a troublesome parasite in potato fields in areas such as parts of Natal, and near Haenertsburg in the Transvaal, where conditions are suitable for its development.

Some parasitic fungi common in other countries have not reached South Africa. Rusts of the genus *Uromyces*, common on Australian Acacias, are not found in the wattle plantations; this may be due to the fact that only seed of these trees has been imported and that it is subjected to considerable heat before planting.

Puccinia Asparagi which causes great damage to the cultivated asparagus in America has been found on *Asparagus Cooperi* and *A. plumosus*; in America this rust is said not to occur on *A. plumosus*; in South Africa there is no record of its occurrence on the cultivated *A. officinalis*.

On the other hand, *Uromyces transversalis*, a rust which occurs commonly in indigenous *Gladiolus* spp., causes serious losses in commercial plantings of the cultivated varieties of this genus.

A few plant parasites have been introduced but do not survive under South African conditions. One of the most noteworthy of these is *Spongospora subterranea*; in some seasons a large percentage of seed potatoes imported show lesions of corky scab caused by this organism, but owing to high soil temperatures and low humidity it does not survive; the only case on record where a crop was infected was during an exceptionally wet season in a locality nearly 7,000 feet above sea level.

Plasmopora viticola has occasionally been observed in the eastern Cape and eastern Transvaal, but it is not a troublesome parasite there and has comparatively little effect on the grape vines. Fortunately, this fungus does not seem to have been introduced into the vine-growing districts of the south-western Cape.

The introduction of fungi on cultivated plants continues, and a number have come to South Africa in the last decade. Amongst these may be mentioned *Puccinia Antirrhini* which was first seen in 1939 and spread throughout the country with great rapidity. In 1943, *Puccinia Helianthi* was reported for the first time in Mozambique and in Southern Rhodesia. A report of a destructive outbreak of rust in large plantations of sunflowers in the Transvaal was received during the same year, but the fungus was not identified until the following season. In the Transvaal *Puccinia Helianthi* was associated with *Cystopus Tragopogonis* which had previously only been found on *Scorzonera* in the south-western Cape.

Another recent introduction is *Sphaerotheca pannosa* var. *persicae*, which is an active parasite of peach trees. This fungus was apparently introduced on some trees which came from South America; it has spread rapidly through the peach orchards and has become one of the most troublesome of the fungi with which fruit growers have to contend.