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REMARKS ON THE FLORA OF NEW SOUTH WALES.

In considering the Flora of New South Wales as a portion of the Australian plants, now known to number nearly 9,000 species, it may be observed that many changes in the vegetation have occurred since the foundation of the Colony in 1788; that some plants have become rare in the localities in which they were first procured; that others once common in the neighbourhood of Sydney and Parramatta have disappeared before the progress of cultivation; and further, that species from various parts of the world, some introduced accidentally and some for industrial purposes, have taken the place of the primeval forests.

The Flora of New South Wales, therefore, has undergone great changes since the beginning of the century. It is not now what it was at the period when the illustrious Robert Brown wrote his "*Prodromus Floræ Novæ-Hollandiæ et Insulæ Van Diemen,*" and it is certain that before another century greater changes may be anticipated.

In 1805 the whole population of New South Wales was little more than 7,000, and the immediate neighbourhood of Sydney was occupied by the primitive vegetation. Now, according to the last Census, the city and suburbs alone contain 250,000 inhabitants, and extend over 2,000 acres of ground, whilst substantial and in some instances splendid buildings, in 121 miles of streets, cover the area where the early botanists (especially Surgeon-General White) collected their specimens of Eucalypts and Proteads.

By the erection of buildings and the clearing of the land, not merely in Sydney and Parramatta, but even now beyond the Dividing Range (which was crossed by Wentworth, Blaxland, and Lawson in 1813, and opened a new territory to the colonists), there has been a great destruction of native plants, as well as a considerable introduction of foreign elements into the vegetation. It is estimated that between 700,000 and 800,000 acres of land are now under cultivation, and that cereals of various kinds, as well as many industrial plants, are rapidly displacing the flora of the past and establishing a different kind of vegetation; whilst some 170 species of exotics, principally obscure weeds or plants of little interest to the casual observer, are becoming naturalised in the Colony.

These circumstances are working changes of a very marked character in the settled districts, so that except in reserved forests, in gullies and mountainous places, or favoured spots set

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apart for public purposes, the truly Australian plants are daily becoming less numerous. Nor is change limited to the eastern side of the Dividing Range, for the wonderful increase of sheep and cattle in the pastoral districts is exercising a marked influence on the Flora of the interior. It is calculated that the pastoral runs within the boundaries extend over 154 millions of acres, and that these runs are stocked with 2½ millions of horned cattle and between 35 and 36 millions of sheep. Now it is found that, as the sheep and cattle are perpetually feeding over the same runs (excepting in cases where they are removed from one paddock to another, or where in seasons of drought they are driven away to distant runs for pasture or water), certain plants on which they delight to feed are gradually disappearing from some parts of the Colony. This is especially true in regard to certain Salsolaceous plants, popularly termed "Salt-bushes," some of the native grasses once abundant, and even a few species of Acacia and Casuarina, which are eaten down as soon as they spring up. There is reason, therefore, to believe that in process of time sheep and cattle will occasion as marked a destruction of native plants in the pastoral as may now be noticed in the cultivated districts, and that graziers will find it necessary to utilise foreign grasses to supply the place of those passing away.

The wholesale destruction of Eucalypts, sometimes arising from natural causes, such as the ravages of opossums, insects, and fungi, or the unusual prevalence of storms and floods, but more frequently through the process of ringbarking, is another source of change. In the early days of the Colony, as soon as any one had obtained a piece of land, it was customary to set gangs of men to clear and burn off the timber on it without much discrimination. Trees of great economic value, as well as shrubby species of less utility, were thus wantonly destroyed, and consequently some of the farms near the towns first established were completely denuded of their trees, leaving scarcely any to shade the cattle from the scorching rays of the summer's sun, or to afford material for fencing, firewood, or rough buildings. Of late years ringbarking has taken the place of clearing and burning off by manual labour, and the Government encouraged private enterprise by allowing compensation for ringbarking at the rate of 1s. 3d. per acre. I am not now discussing the propriety or the impropriety of ringbarking generally as a means of promoting the growth of grasses; but it is a fact which cannot be overlooked that the destruction of large forests extending over many acres is altering the appearance of the country, affecting the marked features of its Flora, and probably influencing the climate for good or for evil.

Then, again, useful trees from all parts of the world, of which Baron F. von Mueller has treated so elaborately in his admirable

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work on "Select Plants," are being introduced for economic or ornamental purposes. These, though highly advantageous when planted in suitable localities for the production of timber, cannot fail in the course of time to efface the peculiarities of Australian vegetation. Whilst, however, the general character of the Flora may be changed, and in some areas plants now well known may perish, it is not to be supposed that in the uncultivated and wilder parts of the Colony native species will cease to exist. Great Britain, with an area of 121,000 square miles, which is rather more than a third of that of New South Wales, or 310,937 square miles, still retains in its less accessible districts, or in places reserved for various purposes in all their native features, some 1,600 species of flowering plants. Whilst, however, in Great Britain, certain plants have disappeared from the localities formerly assigned to them by Nature, and others now common are supposed to have formed no part of the primitive Flora, so also it must be with the plants of New South Wales; and therefore it may be reasonably expected that, as the clearing and cultivating of the soil extend, and as trees from different parts of the world take the places once occupied by Eucalypts and Proteads, the character of the vegetation will cease to resemble that of the geological period (miocene) with which it seems now connected, and will assume a very varied appearance.

As regards the Flora now existing, it may be seen that the plants of New South Wales have an intermediate character between those of Queensland and Victoria, and that whilst some of the genera in the Northern Districts are connected with India and China, there are in the Colony generally many of the true Australian type, and apparently endemic. For all Australia, Baron Mueller calculates that of the great orders, LEGUMINOSÆ, MYRTACEÆ, and PROTEACEÆ, the species are respectively 1,058, 651, and 586. Of the first of these orders, Western Australia reckons 38 genera and 439 species, and New South Wales 56 genera and 316 species. The genus Acacia, the most numerous of phenogamous genera in Australia, is represented by 122 species in Western Australia and 98 in New South Wales, only one species of which (A. *Farnesiana*) is common to the warmer regions of the world, and, though occurring in four of the Australian Colonies, it has not yet been found in Western Australia. It may be mentioned that the following genera are represented in New South Wales, and not in Western Australia:—Tephrosia, Wistaria, Sesbania, Carmichaelia, Glycyrrhiza, Zornia, Desmodium, Uraria, Lespedeza, Mucuna, Galactia, Vigna, Rhynchosia, Lonchocarpus, Derris, Sophora, Castanospermum, Cæsalpinia, Bauhinia, Barklya, Mezoneurum, and Neptunia.

Of these genera, New South Wales has 18, which are common to India and other parts; and hence, whilst this Colony possesses

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a large number of leguminosæ of the Australian type, it is also connected, especially in the warmer districts of the North, with the Flora of the East.

The great order of MYRTACEÆ affords another instance of the varied character of the Flora of New South Wales; for whilst of 651 species for all Australia, 380 are found in Western Australia and 140 in New South Wales, there are some genera common to India and this Colony and not represented in Western Australia. The genera not extending to the West are Tristania, Metrosideros, Backhousia, Rhodomyrtus, Myrtus, Rhodamnia, Eugenia, and Acicalyptus.

Six of these, especially those of the berry or drupe-bearing section, form another link with the vegetation of the East, for, as Mr. Bentham remarks, "The fleshy-fruited genera of the order are widely spread over the tropical regions both of the new and the old world, including many of the largest forest trees, and are in Australia almost limited to the tropics, a very few species extending into New South Wales, and only one into Victoria." The typical character of Australian vegetation is seen especially in the genus Eucalyptus; for though in the tertiary period it flourished in Europe, few species are now found beyond the continent of Australia. In Western Australia the species, especially those of the shrubby kind, are the most abundant; but it is remarkable that only one species of the larger kind, so far as yet known (*E. rostrata*), is common to all the Australian Colonies. *E. gracilis*, *E. uncinata*, *E. incrassata*, and *E. oleosa*, the species constituting the mallee-scrub, extend from the West to the arid parts of New South Wales, and give a peculiar character to the regions where they occur, but no species on this side of the Dividing Range is common to Western Australia. The Eucalypts of New South Wales form the most remarkable portion of the forest vegetation. None of them, however, excepting in the Southern ranges, approach in any degree the gigantic proportions of some species in Victoria and Western Australia, but they are widely distributed, and render the scenery truly Australian. Of the shrubby kinds, one (*E. obtusiflora*) is plentiful near the coast, and two (*E. stricta* and *E. stellulata* var. *microphylla*) are abundant on the elevated parts of the Blue Mountains. *E. Gunnii*, sometimes called "Swamp Gum-tree," which attains a height of 100 feet and more on the Mittagong Range, occurs in a dwarf state on the Snowy Mountains, and in company with *E. pauciflora* (*E. coriacea*, A. Cunn.), also much stunted in its growth, it has been found 5,500 feet above the sea-level. Eucalypts, therefore, in different forms adapt themselves to the arid regions of the interior and the snowy ranges of the mountains.

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The PROTEACEÆ of New South Wales are represented by more genera but by a less number of species than in Western Australia; and it is singular that, whilst Dryandra is peculiar to the west, Stenocarpus, Lomatia, and a few species of other genera are found only on the eastern part of the continent. This order connects our Flora with that of Southern Africa; for although none of the species are identical, yet two of the tribes (Proteæ and Persoonieæ) are largely represented in Africa by Protea, Leucospermum, Mimetes, Sessuria, &c. But whilst the relation between the African and Australian Floras is of a tribal nature, one species of Persoonia extends to New Zealand, and Adenostephanus, Grevillea, and Stenocarpus are found in New Caledonia, the order being also represented in the Indian Archipelago and Japan, as well as in South America.

A consideration of the orders so largely represented in New South Wales may serve to give some idea of its peculiar Flora; but the Rev. J. E. Tenison-Woods well remarks, "New South Wales is not the best portion of the continent for studying the distinctive vegetation of Australia; in fact, there is a greater botanical difference between South-East and South-West Australia than there is between Australia and the rest of the globe." If, as Sir J. D. Hooker suggests, the typical character of Australian vegetation is fully developed in Western Australia, and that that region is to be regarded as a centrum from which plants have immigrated to other parts of the continent, it might naturally be expected that the Flora of New South Wales would be of a mixed kind, indicating that, in ages long past, the alpine portion of the vegetation had been connected with that of Tasmania and New Zealand. Hence, as Mr. Tenison-Woods continues, "The Flora is composed of an Australian character, which extends to Tasmania, and a semi-tropical one, which extends into Queensland." On looking at the map of this Colony it will be seen that, whilst great variety of climate is to be expected from its geographical position (seeing that it extends from 28° to 37° S. latitude, and 141° to 154° E. longitude, with a superficial area of 310,937 square miles), the natural features of New South Wales suggest that there must be some diversity in the vegetation. It is often remarked that there is something very monotonous in the forests of Australia, and that from the frequent occurrence of evergreen Eucalypts they assume a sombre and uniform appearance. This is, in a great measure, true; but it may be observed that the different regions of the coast, the mountain ranges, and the dry interior have many plants peculiar to themselves, and thus occasion a much greater variety than is generally supposed; whilst the geological formation of particular localities, especially where the trap has cropped up through the sedimentary rocks, is favourable for

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a luxuriant growth of plants. The eminent botanist, Allan Cunningham, in his trip over the Blue Mountains in 1823, and subsequently the far-famed geologists, the late Rev. W. B. Clarke and Mr. C. S. Wilkinson (the Government Geological Surveyor), noticed the remarkable change of vegetation resulting from this circumstance. The last observes—"From base to summit another range is clothed with a denser growth of vegetation than occurs elsewhere. The reason of this is that a rich chocolate soil has resulted from the surface decomposition of a basaltic trap dyke, which has burst through all the sedimentary rocks." This change of vegetation may be noticed particularly on Mounts King George, Hay, Tomah, and Wilson, and here and there in other parts of the Blue Mountains, where a similar formation prepares the soil for plants which do not occur on the sandstone or the Wianamatta shale. Cunningham noticed that on one spot on the way to Mount Tomah, Banksia *serrata*, Lomatia *salaifolia*, Isopogon *anemonifolius*, Lambertia *formosa*, and other Proteaceous plants were flourishing in their usual soil of decomposed sandstone, whilst a little further on, in the chocolate soil already mentioned, magnificent tree-ferns, gigantic climbers, epiphytic orchids, and trees different from those of the surrounding forests, were seen on every side.

In the coast region, as circumstances are more favourable for the growth of plants than in the interior, where long-continued droughts not unfrequently prevail, the species are comparatively more numerous and varied. It was from this region that R. Brown and the early botanists derived their specimens; and even now, in gullies, creeks, and uncultivated places, many of the beautiful plants which charmed the first collectors of them may be procured. Of the ten Eucalypts described in Willdenow's "Species Plantarum" (1799), nine were found in the immediate neighbourhood of Sydney; and though the hand of destruction has long been raised against them, they may yet be found in diminished forms between Sydney and Parramatta. The labours of Mr. R. D. Fitzgerald, F.L.S., in his elegant work on Australian Orchids (some of which were figured in 1813 by Ferdinand Bauer), clearly show that the numerous species of that order found by R. Brown in the vicinity of Port Jackson, in the early part of the century, still spring up in their appointed seasons, though some of them appear further inland than they were first seen. In the neighbourhood of Lane Cove, such plants as Doryphora *sassafras*, Quintinia *Sieberi*, Abrophyllum *ornans*, Hedycarya *angustifolia*, Alsophila *Leichhardtiana*, and Lomaria *Patersoni*, are yet to be found; and in more than one favoured spot on this side of the Dividing Range, Geijera *salicifolia*, Elœodendron *Australe*, Cargillia *Australis*, Aphanopetalum *resinosum*, Claoxylon *Australe*, Alchornea *ilicifolia*, Croton

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Verrauxii, Cupania *semiglauca*, Nephelium *leiocarpum*, Euodia *micrococca*, and many interesting Cryptogams grow in all their native luxuriance. There is reason to believe, however, that in all these cases, where the vegetation differs materially from that of the surrounding country, the underlying rock is some modification of trap.

On the banks of the Northern rivers and in the adjoining districts (particularly those of the Richmond and Clarence) some of our finest timbers and most interesting plants occur; and there Mr. Fitzgerald discovered several of the Orchids which had escaped the notice of previous observers. To the south of Sydney, likewise, in the district of Illawarra, the favourable situation of the coast has given a semi-tropical character to the vegetation. Ferns of various kinds, from the lofty Alsophila to the minute Trichomanes, luxuriate in abundance, and at least one species of palm (Ptychosperma *Cunninghami*) common to the northern part of Queensland, and also the "Cabbage Palm" of the colonists (Livistona *Australis*), which is gradually disappearing from the bays near Sydney.

The vegetation of the mountainous parts of New South Wales, though sharing many species in common with the coast districts, has its peculiar features. On the Southern ranges some of the Eucalypts (especially E. *amygdalina* and E. *Stuartiana*) rise to the height of 150 to 200 feet; whilst the truly alpine plants common to Victoria and New South Wales are found equally in Tasmania. Baron F. von Mueller enumerates forty-two such species, amongst which Stackhousia *pulvinaris* and Dichopetalum *ranunculaceum* are found 6,000 feet above the sea-level. The same writer states that the following alpine plants are identical with European species:—Turritis *glabra*, Alchemilla *vulgaris*, Veronica *serpillifolia*, Sagina *procumbens*, Carex *pyrenaica*, C. *echinata*, C. *canescens*, C. *Buxbaumii*, Lycopodium *selago*, and Botrychium *lunaria*.

Veronica *densifolia*, a small, densely-tufted, much-branched, prostrate plant, occurs on the summits of Mount Kosciusko, and is nearly allied to the New Zealand V. *pulvinaris*. Gaultheria *hispida*, also remarkable as being the only plant of the heath family in New South Wales, grows at an elevation of 4,000 to 7,000 feet on the Australian Alps, and at 4,000 feet on the Snowy Mountains, at the head of the Bellinger River; whilst the genus Aciphylla, which extends to New Zealand and still further south, is represented by A. *simplicifolia* and A. *glacialis* on the snowy summits of the Australian Alps.

As the Blue Mountains do not exceed 4,000 feet in height, the vegetation has not the same relation to the alpine plants of other countries as that of the Southern mountains. At the Katoomba

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cataract, however, Pherosphœra *Fitzgeraldi*, a diminutive plant of the Cypress kind, connects the flora with that of Tasmania. In the same category may also be mentioned Pennantia, Celmisia, Quintinia, Caladenia, and Todea, which have species common to both; whilst the beautiful tree-fern Dicksonia *Billardieri* is distributed through Queensland, Victoria, Tasmania, and New Zealand. Amongst the species as yet only known from the Blue Mountains the following may be enumerated :—

Epacris *reclinata*
E. *rigida*
E. *coriacea*
E. *apiculata*
Monotoca *ledifolia*
Zieria *involucrata*
Boronia *microphylla*
Phebalium *lachnoides*
Asterolasia *buxifolia*
Grevillea *laurifolia*
G. *Gaudichaudi*
G. *acanthifolia*
Alania *Endlicheri*
Atkinsonia *ligustrina*
Velleia *perfoliata*
Goodenia *decurrens*
Acrophyllum *venosum*
Pultenœa *glabra*
Acacia *asparagoides*
A. *gladiiformis*
A. *obtusata*
Persoonia *chamœpithys*
P. *revoluta*
P. *mollis*
P. *angulata*
Caladenia *Nortoni*
Cryptostylis *leptochila*
Lyperanthus *ellipticus*

These plants may serve to show that on the Blue Mountains there are many species of great interest to the botanist, not merely as indicating alliances with those of other countries, but as illustrating the effect of geological formation. A reference, however, to the maps of the late Revd. W. B. Clarke and Mr. Wilkinson confirms the sameness of the vegetation in general; for whilst the Wianamatta and Hawkesbury rocks cover extensive areas of the Eastern ranges, the basaltic rocks crop up only here and there, and occasion that rich harvest of species to which I have already referred.

In the depressed regions of the Western interior, though in favourable seasons numerous grasses, some other Glumaceæ, and flowering herbs spring up and cover the plains, the vegetation differs materially from that of the sea-coast or mountains. Amongst the trees, the Eucalypts (excepting those growing on the banks of the rivers) are for the most part stunted, and in some districts constitute in various species the "mallee scrub," whilst the most widely-distributed families are represented in the following manner :—Sapindaceæ, by Atalaya *hemiglauca*, Heterodendron *oleifolium*, Dodonœa *petiolaris*, D. *lobulata*, D. *viscosa*, and D. *boronifolia*; Casuarineæ, by Casuarina *stricta*, C. *glauca*, and C. *Cunninghami*; Leguminosæ, by Acacia *pendula*, A. *homalophylla*, and various species of Swainsona, Bossiœa, Templetonia, &c.; Capparideæ, by Capparis *lasiantha*, C. *Mitchellii*, C. *nobilis*, and C. *loranthifolia*; Myoporinæ, by Myoporum *acuminatum*, M. *deserti*, and M. *platycarpum*; whilst of the beautiful genus Eremophila, the following species seem to cheer the loneliness of

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the desert, viz. :—E. *Bowmanni*, E. *oppositifolia*, E. *Sturtii*, E. *Mitchellii* (the so-called "Sandalwood"), E. *longiflora*, E. *polyclada*, E. *bignonifolia*, E. *Brownii*, and E. *maculata*; SANTALACEÆ, by Santalum *lanceolatum*, Fusanus *acuminatus* (Quandong), Leptomeria *aphylla*, Exocarpus *spartea*, E. *aphylla*, &c.; RUTACEÆ by Geijera *parviflora*; and PITTOSPOREÆ, by Pittosporum *phillyroides*. The pine tribe, or the CONIFERÆ, are confined to two species, Callitris *robusta* and C. *Endlicheri*; but these are sometimes of considerable size, and available for industrial purposes. None of the RHAMNEÆ in the interior can be regarded as trees. The species which occur most frequently are Ventilago *viminalis*, Pomaderris *racemosa*, Spyridium *subochreatum*, Cryptandra *tomentosa*, and C. *amara*. Of the STERCULIACEÆ, of which so many species are limited to Western Australia, very few extend to the interior of New South Wales, the principal being Sterculia *diversifolia* (a tree rising sometimes to the height of 60 feet) and the shrubs Lasiopetalum *Baueri*, L. *Behrii*, Rulingia *pannosa*, &c. Codonocarpus *cotinifolius* of the PHYTOLACCACEÆ is a remarkable tree, occurring on pine plains or sandy scrubs; and, according to Baron von Mueller, attaining sometimes a height of 40 feet. Sir Thomas Mitchell, in his "Expeditions" (vol. ii, p. 121), speaks of it as a rare tree, singular in appearance, and foliage tasting strongly of horse-radish.

In a region so extensive as that from the Dividing Range to the districts lying beyond the Darling there is considerable diversity of vegetation, arising from the difference of soil, the average rainfall during the year, and the comparative distance from any great river. There are some parts, for instance, in which, in good seasons, the native grasses and herbs suitable for pasture are very abundant. And then, again, there are parts where plants of the SALSOLACEÆ, AMARANTACEÆ, CRUCIFERÆ, UMBELLIFERÆ, and GERANIACEÆ (known by the popular names of "Salt-bushes," "Cresses," "Carrots," and "Crowfoots") seem wonderfully adapted to the nature of the soil, and afford nourishment for sheep and cattle when the ordinary grasses fail. The plains on which such herbage prevails consist for the most part of a red and chocolate loam; but, as Baron Mueller observes in reference to the wide depressed interior, it is characterised "by subsaline or grassy flats, largely interspersed with tracts of scrub, and occasionally broken by comparatively timberless ranges. The great genus Acacia sends its shrubs and trees also in masses over this part of the country, where with their harsh and hard foliage they are well capable to resist the effect of high temperature during the season of aridity, while they are equally contented with the low degree of warmth, to which during nights of the cool season the dry atmosphere becomes reduced. . . . . Salt-bushes in great variety stretch far inland in this part of

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Australia." In seasons of drought, when the annual rainfall does not reach 10 inches, vast tracts become destitute of herbage, and even in seasons comparatively good the vegetation, owing to the less quantity of rain which reaches the interior, forms a striking contrast with that of the coast districts. Our eminent Astronomer and Meteorologist, Mr. Russell, has afforded the means of estimating the effects of climatic changes on the Flora of New South Wales. In his invaluable work on the "Physical Geography and Climate of the Colony," he tells us that "the rainfall along the coast districts is very abundant, ranging from 45 inches at Eden to 70 at the Tweed River, in the extreme north. At Sydney it is 50 inches. Along the top of the mountains the rainfall is from 30 to 40 inches, on the Western slopes from 20 to 30 inches, and over the flat country from 10 to 20 inches." The temperature also, as recorded by the same writer, is very suggestive, for he states that, "whilst the mean temperature during the hottest months is 79·1 at Sydney and 82·6 on the Blue Mountains (Mount Victoria), it is 92·2 at Bourke and 94·1 at Wentworth, and that a considerable part of the Colony forming the Western plains is subject to greater heat, caused, no doubt, by the sun's great power on treeless plains and the almost total absence of cooling winds, the temperature there frequently rising over 100°, and sometimes up to 120° in the shade." The meteorological observations made by the able and distinguished astronomer, Mr. John Tebbutt, F.R.A.S., at his private observatory, Windsor, are also eminently calculated to show the wide range of temperature and great variability of rainfall on the Hawkesbury. These facts may serve to show the causes which for ages past have tended to characterise the Flora of New South Wales in the arid interior; but it is reasonable to suppose that, as the progress of pastoral pursuits yields gradually to the irrigation of the soil and the planting of forests wherever practicable, a new order of things will arise, and that the vegetation will be much altered in its essential features. Recent investigations of the fossil Flora of New South Wales and Victoria plainly indicate that the vegetation of this Colony was very different in ages long past from what it now is, and that species common to Europe in the Tertiary period are now found in a fossilised state in this Colony; whilst, in the opinion of Baron Mueller, to whom we are indebted for describing and figuring some relics of our former vegetation, the prevalence of certain species seems to indicate great climatic changes. The Flora of the past, therefore, is widely different from that of the present; and as time rolls on the Flora of the future will assuredly be associated with new elements. "*Tantum ævi longingua valet mutare vetustas!*" Whilst then we are reminded that change is impressed on everything in this world,

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