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Report on the progress of geographical botany, during the year 1844.

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GEOGRAPHICAL BOTANY

REPORT  
ON THE PROGRESS OF  
GEOGRAPHICAL BOTANY,  
DURING THE YEAR 1844.

BY DR. A. GRISEBACH,  
EXTRAORDINARY PROFESSOR IN THE UNIVERSITY OF GÖTTINGEN.

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## GEOGRAPHICAL BOTANY.

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IN the first volume of the 'Physical Atlas' of Berghaus, which is now completed, six sheets are devoted to graphic representations in the department of Botanical Geography. The first sheet, entitled 'Outlines,' forms a sequel to the works of Humboldt and Schouw, and refers principally to the geographic subdivision of vegetable formations; in the vertical direction it illustrates the serial gradations of the regions, whilst in the horizontal direction it shows the areal boundaries of the natural Floras. This representation, however, appeared as early as 1838, and on future revision would require considerable improvements. The second sheet, which treats of the Districts in which the most important products of culture are distributed, is of greater interest. Its design consists in an attempt to subdivide the province of agriculture throughout the entire inhabited surface of the earth, according to the kinds of Cerealia which predominate, whence general relations are found between the climate and the productive power of different countries. In the Old World the author distinguishes the following zones between the polar limits to agriculture and the equator.

1. Zone of barley and rye. It might with propriety be called the zone of the summer Cerealia, inasmuch as the duration of the winter is the most important condition which prevents the culture of the more productive

and certain winter corn. In this more comprehensive point of view, the separate denomination of the South of Scandinavia as the district of the exclusive cultivation of rye, and of Scotland as that of barley, disappears, as circumstances not founded upon climatic conditions.

2. Zone of rye and wheat. This is considered as extending southwards to about the fiftieth degree of latitude, or as far as the polar limits of the cultivation of the vine.

3. Zone of wheat. To this, those parts of Europe and Western Asia belong which lie south of the fiftieth degree. In several districts maize is cultivated as well as wheat.

4. Zone of rice and wheat in those provinces which are subject to the influence of tropical seasons. In tropical Western Africa rice and maize occupy the place of the former.

In America, where these relations are modified by the greater extent to which maize is cultivated, Berghaus distinguishes the following zones: rye, wheat, and barley (i. e. summer *Cerealia*); rye and maize; wheat and maize; wheat; in the tropical zone maize is the principal cereal grain. With these sketches the author has combined indications of the distribution of other nutritive plants, and has illustrated, in separate charts, the districts in which the most important plants of commerce are produced. The two following sheets contain the statistical numerical proportions of the Flora of Europe, which, not being susceptible of tabular arrangement, and being subject to very important differences in the views taken of the definition of the species and botanical groups, were not adapted, in the present state of botanical geography, to graphic representation. Although the same applies still more to the last sheet upon Germany, which appeared in 1841, nevertheless the review of the polar and equatorial limits of numerous woody and cultivated plants in Europe, deserves great praise, inasmuch as the observations made use of in it have appeared to us,

on the frequent use of this chart, very numerous. Moreover, many of the sheets intended to illustrate meteorological relations appear indispensable also to the botanist.

M. Römer has commenced the publication of a Memoir entitled 'Botanical Geography and Geographical Botany,' which treats of the subdivision of the surface of the earth into natural Floras. (Lüdde Zeitschr. für vergl. Erdkunde, Bd. iii, pp. 527-534.)

A paper by E. Fries, entitled "The Native Land of Plants," in his peculiar style, the special interest of which is confined to the Swedish public, but also frequently touches acutely more general questions, treats of different botanico-geographical subjects, especially of the native country of the so-called ruderal plants. (Botaniska Utflygta, Bd. i, pp. 229-328, translated in Hornschuch's Archiv Skandinav. Beiträge zur Naturgesch. Bd. i, H. 3.) The *original* native country of many cultivated plants cannot now be determined by empirical proof, but only by rational investigation. Thus rape is no longer met with in its wild state, but when we adduce proof from all extra-European countries that it is not indigenous to them, we must conclude that it is of European origin, although its wild state has disappeared through cultivation. Many plants have been extirpated by use; this is now gradually taking place with *Gentiana lutea*, in the Alps, and *Inula Helenium* in the west of Sweden. The contact of Nature with man exerts no less a modifying influence upon the vegetable kingdom than upon the animal creation. The original vegetation of a country must in general, therefore, be regarded as more rich in species, and in this manner in Sweden and Germany, even under our own eyes, the localities of rare plants are disappearing one after the other, as e. g. of *Trapa*, *Xanthium*, and *Stipa*.

The excellent work of A. Wagner, on the 'Geographical Distribution of the Mammalia,' (Abhandlungen der mathem. physik. Klasse der Bairischen Akad. Bd. iv), which belongs to an allied province, but was not designed without regard to the geographical relations of other organisms, must not be passed over here without notice. The question of the original native country of the various organisms is acutely investigated by the author, and it is found that the distribution of animals, as of plants, cannot be satisfactorily explained by the climatic and local conditions of their existence, but that the most rigid facts, together with the physical relations at present in existence, point to other, perhaps historical causes, with which we are at present unacquainted, and which the author considers as the effects of a general order of the creation, which ought, however, rather to be kept in view *by us* as objects worthy of future investigation. From the observations, in Belgium, upon the Periodical Phenomena of Vegetation, published by Quetelet, and mentioned in the previous Yearly Report, the following brief extract, containing the period of the appearance and fall of the leaves, in the year 1841, of some generally diffused woody plants, may be of use in the determination of the Phyto-isotherms of Northern Europe; and for this purpose it will be conjoined with some observations simultaneously made by Hartmann, in Gefle (60° N. l.) (Bot. Notis. 1842.)

	APPEARANCE OF THE LEAVES.				1841. FALL OF THE LEAVES.			
	Gefle.	Brussels.	Lyons.	Ghent.	Brussels.	Ghent.	Brussels.	Ghent.
<i>Esculus Hippocastanum</i>	15 May	23 April	29 March	27 March	25-30 Oct.	27 March	25-30 Oct.	24 Oct.
<i>Acer pseudo-platanus</i>	...	23 April	...	...	25-30 Oct.	...	...	...
<i>Vitis vinifera</i>	...	26 March	...	24 March	10-15 Nov.	24 March	10-15 Nov.	12 Sept.
<i>Tilia europæa</i>	21 May	27 April	...	25 April	20-25 Oct.	25 April	...	3 Oct.
<i>Juglans regia</i>	...	...	...	...	...	...	...	...
<i>Prunus Cerasus</i>	...	27 March	...	17 March	1-5 Nov.	17 March	1-5 Nov.	27 Oct.
<i>Pyrus Malus</i>	...	24 March	...	...	...	...	...	29 Oct.
<i>Sorbus aucuparia</i>	12 May	...	...	...	...	...	...	...
<i>Ribes Grossularia</i>	...	12 March	17 March	14 March	...	14 March	...	...
<i>Ribes rubrum</i>	...	18 March	20 March	17 March	...	17 March	...	...
<i>Sambucus nigra</i>	...	18 March	15 March	14 March	5-10 Nov.	14 March	5-10 Nov.	24 Oct.
<i>Syringa vulgaris</i>	...	12 March	15 March	17 March	5-10 Nov.	17 March	5-10 Nov.	24 Oct.
<i>Fraxinus excelsior</i>	25 May	...	...	...	...	...	...	...
<i>Daphne Mezereum</i>	3 May	16 March	24 March	...	...	...	...	...
<i>Ulmus campestris</i>	22 May	29 March	...	26 March	1-5 Nov.	26 March	1-5 Nov.	31 Oct.
<i>Salix babylonica</i>	...	17 March	24 March	17 March	15-20 Nov.	17 March	15-20 Nov.	24 Sept.
<i>Populus fastigiata</i>	...	1 April	...	...	20-25 Oct.	...	20-25 Oct.	...
<i>Populus tremula</i>	19 May	...	...	...	...	...	...	...
<i>Corylus Avellana</i>	16 May	24 March	25 March	18 March	...	18 March	...	27 Oct.
<i>Quercus Robur</i>	...	28 April	...	...	10-15 Nov.	...	10-15 Nov.	...
<i>Betula alba</i>	14 May	27 March	...	...	1-5 Nov.	...	1-5 Nov.	...
<i>Alnus glutinosa</i>	20 May	...	...	...	...	...	...	...

Of monographs upon individual groups of plants, in which attention is paid to their geographical distribution, published during the past year, the following require mention: Parlatore on the Fumariaceæ (Giornale Botan. Ital., i, p. 97 et seq.); v. Martius, on the Erythroxyllaceæ (Bairische Abhandl., iii, pp. 325-32); Lomler, on the Distribution of the Coniferæ (Ratisbon Flora, 1844, pp. 440-3).

*Fumariaceæ*.—Only 13 species; these are distributed throughout both temperate zones, for the most part, indeed, secondarily transferred from one region to the other. With the exception of the Cape *Discocarpus*, they all grow in the South of Europe, between the 34th and 40th degrees of latitude, and diminish so rapidly from this zone in both meridional directions, that beyond the 50th degree, 3 species only are met with; a statement which, however, is not correct as regards Germany. Spain contains several endemic forms.

*Erythroxyllaceæ*.—Of 58 species of the genus *Erythroxyllon*, Brazil contains 29; the West Indies, 8; Guiana, 7; Columbia, 4; and Mexico and Peru, one each; hence tropical America contains 50 altogether: 5 species grow in Madagascar and the Mauritius, single representatives at the Cape, in the East Indies, and on the north coast of New Holland. In America the district of their distribution extends from the tropic of Cancer to that of Capricorn, in the Old World, from 15° N. lat. to 30° S. lat.

*Coniferæ*.—Lomler enumerates only 208 species. Of these, he calculated that 165 exist in the northern and 51 in the southern hemisphere; moreover, there are 22 in Europe, 87 in Asia, 16 in Africa, 83 in America, and 35 in Australia; lastly, 24 in the tropic zone, 159 in the north temperate, and 33 in the south temperate zone. These statements can only be regarded as preliminary steps to our knowledge on this point.

## I.—EUROPE.

A work, containing copper-plate engravings of the plants of Russia, has been begun by Trautvetter (*Plantarum Imagines et Descriptiones*. Monachii, 1844, 4 fasc., 1-4; at present 20 plates). Also a continuation of the old 'Bieberstein Centuries' (M. de Bieberstein *Centuria Plantarum Rossiaë Meridionalis Iconibus illustrata*; Pt. ii, Dec. 1-3. Petropoli, 1844,) has been commenced in St. Petersburg. Engelmann has published a paper upon the Genera of Plants found in the Russian provinces of the Baltic (*Genera Plantarum, or the Genera of Plants growing wild in Esthonia, Livonia, and Courland*; Mitau, 1844-8).

A. F. C. v. Fischer has written upon the botanical relations of Southern and Central Lithuania, especially in the circle of Sluzk (*Mittheilungen d. Natur. Gesellschaft zu Bern*, for the years 1843-4; Bern, 8). In the immediate neighbourhood of Sluzk, in the district of the source of the Niemen and several tributary streams of the Dnieper, the author only found about 600 Phanerogamia, a catalogue of which he gives, with remarks upon their statistics. In these districts, heathy plains, overgrown with *Calluna* (together with *Juniperus* and *Genista tinctoria*) are still common. Dwarf underwood, consisting of the oak (*Quercus pedunculata*) covers large spaces, and stamps the physiognomy of Lithuania towards the western districts of the Baltic plain. In moist low grounds *Salix angustifolia* and *livida* predominate. The large forests consist of pines or fir trees; the truly foliaceous trees, which are less common, are mostly birch, and in Polesia, the oak, which grows mixed with the birch, poplar, mountain-ash, &c. The following may be mentioned as geographically characteristic species: *Thalictrum aquilegifolium* L., *simplex* L., and *angustifolium* Jacq., *Anemone patens* L.,

*Viola stricta* Horn., *Dianthus arenarius* L., *Euonymus verrucosus* Scop., *Trifolium lupinaster* L. (in pinetis sicciorebus raro), *Spiraea Aruncus* L., *Geum strictum* Ait., *Potentilla norvegica* L., *Agrimonia pilosa* Led., *Saxifraga Hirculus* L., *Cnidium venosum* Kch., *Chærophyllum aromaticum* L., *Inula Helenium* L. (in sylvis udis), *I. hirta* L., *Cirsium rivulare* Kch., *Andromeda calyculata* L., *Pyrola media* Sw., *Polemonium cæruleum* L., *Pulmonaria azurea* Bess., *Pedicularis Sceptum* L., *Dracocephalum Ruyschiana* L., *Melittis Melissophyllum* L., *Amaranthus sylvestris* Desf., *Thesium ebracteatum* Hayn., *Euphorbia virgata* Kit., *Salix nigricans* Fr., *livida* Wahlb. (*depressa* Fr.), *myrtilloides* L., *versifolia* Wahlb., *lapponum* L., *Betula fruticosa* Pall., *Typha pendula* nov. sp.,\* *Malaxis monophyllos* Sw., *Cypripedium Calceolus* L., *Gladiolus imbricatus* L., *Fritillaria* sp., *Veratrum Lobelianum* Bernh., *Tofieldia calyculata* Wahlb., *Carex divulsa* Good., *pilosa* Scop., *Hierochloa odorata* Wahlb., *Calamagrostis stricta* Spr.

Wahlberg has published some remarks upon the plants of Quickjock in Swedish Lapland (Öfversigt af Kongl. Vetenskabs-Akademieens Förhandl., 1844, p. 23). *Rubus castoreus* Laestad. is a bastard of *R. arcticus* and *saxatilis* occurring in two forms.

Lindblom has published some observations upon the Botanical Relations of Norway (Bot. Notiser., 1842-3.) In the outset, we meet with the unfounded assertion, that in most of the regions of the coast of Norway, Alpine plants extend as low down as the level of the sea; an occurrence which is limited to individual species only, and may be compared to the growth of Alpine plants on the Isarkies, near Munich. This statement, made by Lindblom, is one of those erroneous generalizations, borrowed by one person from another. Alpine plants do not occur in Norway below the limit of trees, any more

\* *T. spicis cylindricis*, masc. et fœm. contiguis, foliis planis linearibus culmo longioribus pendulis. (An. *T. Shuttleworthii*, Kch.?)

than in the Alps. Then follow observations upon the limits at which plants occur in the direction from west to east, to which scientific value must be attributed, on account of the climatic contrasts between the internal districts and the western coast of the south of Norway.

a. Plants of the western coast, which, according to Lindblom, are not found in the inner district. (The polar limit of their distribution is expressed numerically according to the degree of latitude, their occurrence in Sweden is inclosed in parentheses).—

<i>Fumaria capreolata.</i> 59°.	<i>Erica cinerea.</i> 62½°.
<i>Hypericum pulchrum.</i> 63½°.	<i>Pyrola media.</i> 61°.
— <i>montanum.</i>	(— Bohuslän.)
Vaerdal in Trondjem.	<i>Lysimachia nemorum.</i> —63°.
<i>Vicia orobus.</i> —62½°, i. e. the limit	(Schonen.)
of the occurrence of the oak.	<i>Primula acaulis.</i> 63°(=).
<i>Sanguisorba officinalis.</i> 60°.	<i>Digitalis purpurea.</i> 63°.
(Isld. Gottland.)	(— Bohuslän.)
<i>Bunium flexuosum.</i> 63°.	<i>Lamium intermedium.</i> 61°.
<i>Myrrhis odorata.</i> 63°.	<i>Teucrium Scorodonia.</i> 59°.
<i>Chrysosplenium oppositifolium.</i> —62½°.	<i>Luzula maxima.</i> 68°.
<i>Rosa pimpinellifolia.</i> 60°.	<i>Carex binervis.</i> 63°.
<i>Ilex aquifolium.</i> 62½°.	— <i>salina.</i> 70°.
(Bohuslän.)	— <i>maritima.</i> 70°.
<i>Galium saxatile.</i> 62½°.	<i>Aira præcox.</i> 62½°.
(South of Sweden.)	(— Bohuslän.)
<i>Centaurea nigra.</i> —	<i>Bromus tectorum.</i> 61°.
Snaasen in Trondjem.	<i>Brachypodium gracile.</i> 62½°.
<i>Hypochaeris radicata.</i> 62½°.	
(— Bohuslän.)	

b. Plants belonging to the western coast, which occur only on the southern coast, e. g. at Christiania, or in the valleys of the Fjeldplateaux, but not in the true inner districts of the south of Norway.—

<i>Arabis petraea.</i> —62°.	<i>Hedera helix.</i> —60½°.
<i>Rosa pomifera.</i> —63°.	<i>Lonicera periclymenum.</i> —
(South of Sweden.)	Valderhong in Trondjem.
<i>Sorbus aria.</i> —63½°.	(— Bohuslän.)
(— Bohuslän.)	<i>Sambucus nigra.</i> —
<i>Sorbus hybrida.</i> —62° (?)	Valderhong. (— Bohuslän.)
(Gottland.)	<i>Gentiana purpurea.</i> —62½°.

*Mentha sativa*.—63°.  
(South of Sweden.)  
*Fagus sylvatica*.—61°.  
(— Bohuslän.)

*Quercus Robur*.—62°.  
According to Blom, 63°.  
(South of Sweden.)  
*Allium ursinum*.—63°.  
(— Bohuslän.)

c. Inland plants of the eastern districts of southern Norway, which are absent on the western coast. (Excluding those of the Fjeld.)—

*Pulsatilla vernalis*.  
*Trollius Europæus*.  
*Berberis vulgaris*.  
*Astragalus glycyphyllus*.  
*Ledum rupestre*.  
*Galium trifidum*.  
*Hieracium cymosum*.  
*Pyrola chlorantha*.

*Dracocephalum Ruyschiana*.  
*Thymus Chamædrys*.  
*Pedicularis Scepttrum*.  
*Salix daphnoides*.  
— *amygdalina*.  
*Carex capitata*.  
— *parallela*.

d. Plants of the Eastern Fjeld, principally observed on the Dovre-fjeld, but not found on the western coast (some species which I myself found at Hardanger, and which are therefore more widely distributed, are omitted in this list, viz. *Aconitum septentrionale*, *Draba hirta*, *Gentiana nivalis*, and *Salix arbuscula*).—

*Ranunculus hyperboreus*.  
*Lychnis apetala*.  
*Alsine hirta*.  
*Oxytropis lapponica*.  
*Phaca oroboides*.  
— *frigida*.  
*Potentilla nivea*.  
*Saxifraga cernua*.

*Saxifraga controcorsa*.  
*Primula stricta*.  
*Gentiana tenella*.  
*Kænigia Islandica*.  
*Junctus arcticus*.  
*Kobresia caricina*.  
*Elyna spicata*.  
*Carex microglochin*.

A remarkable peculiarity of the highlands of Norway, and which is not merely indicated, but satisfactorily established by this catalogue, yet cannot be explained by means of the variations of climate pointed out above, consists in the fact that the Alpine vegetation appears to attain its maximum, as regards the number of species, on the Dovre mountains, and that it diminishes from this locality both towards the west and the south. Moreover in these directions the individual numbers of many cha-

racteristic species also become less, the Fjeldplateau gradually assuming the condition of a steppe. In this respect, Lindblom's observations on the desert of the Bygle and Hekle-Fjelds, or the most southern part of the highlands, which were made many years ago, but are again brought forward in the present memoir, are instructive. The predominating plants of some tracts in this part, e. g. between Siredal and Lysefjord, are *Molinia cærulea* and *Solidago virgaurea*, and these displace all others. The alpine plants of this region, as shown by the following list of them, also grow in Hardanger, and do not resemble those of the Brocken or the Sudeten, to which, among the whole of the Scandinavian mountains they are most nearly situated.

*Ranunculus pignæus*.

*Arabis alpina*; *Cardamine bellidifolia*.

*Silene acaulis*; *Lychnis alpina*; *Stellaria alpestris*; *Cerastium trigynum alpinum*; *Sagina Linnæi*.

*Epilobium alpinum*, *alsinifolium*.

*Dryas octopetala*; *Potentilla maculata*; *Sibbaldia procumbens*; *Alchemilla alpina*.

*Rhodiola rosea*.

*Saxifraga Cotyledon*, *stellaris*, *aizoides*, *rivularis*, *oppositifolia*, *nivalis*.

*Saussurea alpina*; *Hieracium aurantiacum*, *alpinum*.

*Phyllodoce taxifolia*; *Cassiope hypnoides*; *Arctostaphylos alpina*; *Loiseleuria procumbens*.

*Gentiana purpurea*.

*Veronica alpina*, *saxatilis*; *Bartsia alpina*.

*Oxyria reniformis*.

*Salix glauca*, *Myrsinites*, *Lapponum*, *retusa*, *herbacea*.

*Betula nana*.

*Tofieldia borealis*.

*Juncus biglumis*, *trifidus*; *Luzula arcuata* and *spicata*.

*Aira alpina* and *atropurpurea*; *Poa alpina*; *Phleum alpinum*.

*Carex rariflora*, *pulla*, *lagopina*, *rigida*, *vaginata*, *atrata*, *rotundata*, *capillaris* and *alpina*; *Eriophorum capitatum*.

*Lycopodium alpinum*.

*Polypodium alpestre*.

The second section of Lindblom's memoir treats of the distribution of the Norwegian Ferns, which, according to theory, ought to be more common on the western coast

than in the inland districts, but which, in fact, do not correspond to this view. The author is certainly of an opposite opinion, and states that the number of individuals increases towards the west, which I should much doubt; but it is certain that *Hymenophyllum Wilsoni* can alone be considered as an evidence of the marine climate, whilst the inland country contains five more of the thirty-three ferns which are here enumerated than the west, viz. *Polypodium calcareum*; *Aspidium Thelypteris*, *crisatum*, *montanum*, and *crenatum* Sommf. On the western coast, *Aspidium aculeatum* and *Asplenium adiantum nigrum*, which are not found in the east, extend as far as Trondjem, but they must be considered as forms belonging to the south, not to the coast.

I can only refer here to my paper upon Hardanger (see Wiegmann Arch., p. 1-28); still I cannot omit this opportunity of replying to the editor of the 'Botaniska Notiser' (see that journal, 1844, appendix, p. 64), that the beech is certainly cultivated beyond Christiansund. Blom, whose authority is Blytt, makes this statement. (Das Königreich Norwegen. Leipz., 1843, p. 48.) I did not say that it grew wild there, as Lindblom has erroneously stated in his translation, and the only object I then had in view, was to show how far north the climate was suitable to the growth of that tree. I found single specimens of *Helianthemum alpestre* on rocks near the herdsmen's hut Oppedals-Stölen, and have given specimens of *Phippsia* from the same region to several botanists. However, I place little value upon these new localities, of which I had several, and I should consider it as the best recompense for the labour of my memoir, if Lindblom and other able Scandinavian naturalists, instead of filling their Journal with unsatisfactory lists of the results of their excursions, and critical minutiae regarding the distinction of species and their nomenclature, were also induced by it to direct their scientific attention more and more to the conditions of the distribution of plants in the North of Europe.

Blytt, whose Flora of Norway has long been in prepa-

ration, but is still looked for in vain, has published a Catalogue of the Plants growing wild at Christiania (Enumeratio Plantarum, quæ circa Christianiam sponte nascuntur, Christiania, 1844, p. 4). It contains 790 vascular plants. Fries has continued the publication of his Critical Remarks upon Swedish plants and their stations (Bot. Notis. 1844, p. 1, 49, 75 et seq.) Parts ix and x of his Normal Herbarium have appeared. Anderson and Lindblom have worked at the Alpine *Epilobium* of Sweden (id.) Angerström has issued some contributions to our knowledge of the Scandinavian Mosses (Nov. Act. soc. Upsal. 12, pp. 345-80).

Lindblom's *Botaniska Notiser* also contains the following Memoirs upon the Topography of Swedish plants: Borgström, Contributions to the Flora of Wärmeland (1842); Lindgren and Torszell, Mosses of Upsal (1842-3); Forssell, Catalogue of the more rare Plants which occur in Norrtelge (north-east of Stockholm) (id.); Hofberg, Localities at Strengnäs on the Lake Malern (1842-3); Von Post, Botanical Conditions of the Western Bank of Lake Malern (1844), of some interest, on account of the careful observation of the localities in which 480 phanerogamous plants are distributed; Hamnström, New Localities in Nerike (1842); Lindgren, Localities at Lake Wener, with critical remarks (1842-3); Holmgren, Kalén, and Hamnström, Localities in East Gothland (1841-3); Lagerheim, the same in West Gothland (1844); Sicurin, Diary of Travels in North Holland, containing habitats (id.); Lindblom and Borgström, Habitats at Schonen (1843-4). Nyman has published Contributions to the Flora of Gothland, by which the number of vascular plants found upon this island is increased to more than 800 (Vetenskaps Akademiens Handlingar för år 1840, pp. 123-51). The results of Beurling's voyage now communicated in these Memoirs, are confined to lists of localities, principally in Jemtland; they are copiously detailed as regards the mountain Areskutén.

On the death of C. E. Sowerby, the proprietor of the

'English Botany,' his successor, J. D. C. Sowerby commenced a new series of the parts of this illustrated work, of which, with the aid of Wilson, Berkeley, Babington, and Borrer, up to 1844, the first three parts have appeared (Supplement to English Botany, second series, Nos. 1-3. London). The Botanical Society of London, following the example of that of Edinburgh, have published a catalogue of British plants (The London Catalogue of British Plants, published under the direction of the Botanical Society of London. London). In consequence of critical elaboration, this catalogue contains considerably fewer species (1305 indigenous, and 132 acclimated phanerogamia) than the Edinburgh one, and is ascribed to the pen of Watson. The 'Phytologist,' a journal which was noticed in the yearly report for 1842, is still continued. I may refer to the list of contents given in the 'Botanische Zeitung.'

Watson has made some critical remarks upon individual British plants (London Journal of Botany, iii, pp. 63-81). Newman has issued a description of British Ferns (A History of British Ferns and allied Plants. London, 1844). 'The Annals of Natural History' (vol. xiii, xiv) contain the following contributions to the British Flora: Ball, on *Enanthe*; Taylor, contributions to our knowledge of the *Jungermannia*; Harvey, description of the new Irish genus of Algæ, *Rhododermis*; Berkeley, contributions to Mycology; Dickie, critical catalogue of the Marine Algæ existing at Aberdeen; Spruce, catalogue of the Mosses and Hepaticæ of Teesdale, in Yorkshire; Salwey, of the Lichens of Wales; Graham, on the results of his journey through Wales; Babington, on the Irish Saxifrages.

Babington has shown that *Neottia gemmipara* Lm., the rarest of all the European Orchidaceæ, which was discovered by Drummond near Cork, in 1810, and has only recently been again found, is identical with the *Spiranthes cernua* Rich. of North America (Proceed. of the Linnæan Society, 1844).

Sande Lacoste, and Dozy have been occupied in the study of the cryptogamic plants of the Netherlands. The former has made known localities of the Mosses; the latter, in conjunction with Molkenboer, has published a catalogue of the Fungi indigenous to that country, and some newly-discovered Mosses (both in v. d. Hoeven's *Tidjschrift*, f. 1844, p. 165 and 377).

The general works upon the Flora of Germany, mentioned in the previous Annual Reports, have been continued. Four decades of the seventh volume of Reichenbach's 'Icones,' containing the Aroideæ and the allied groups, have appeared. A cheaper edition, containing a more copious text, was commenced at the same time, with the title of 'Deutschland's Flora;' Parts 23 and 24 of the third section of 'Sturm's Flora;' the fifth volume of Schlechtendal and Schenk's illustrated work; and Parts 48-56 of that upon Thuringia; Parts 34-49 of Link's Publication; and Parts 2-4 of D. Dietrich's 'Cryptogamia.'

Rabenhorst has published the first volume of a 'Cryptogamic Flora,' containing the Fungi (Deutschland's Kryptogamen—Flora. Bd. i. Leipzig, 1844-8). This compilation is adapted to the present time, but does not entirely come up to our expectations. Of the author's valuable collection of dried Fungi, the seventh, and in the following year the eighth, "Centurie" have appeared. Hampe is preparing a similar herbarium of the 'Cryptogamia of the North of Germany,' which comprises at present 230 Mosses, 80 Hepaticæ, and 80 Lichens. (By the author at Blankenberg, on the Hartz.)

In Wallroth's 'Contributions to Botany,' two parts of which are before us, individual genera of the flora of Germany are treated monographically; especially *Agrimonia*, *Armeria* (with two well-marked Hartz mountain-plants, *Agrim. odorata* D. C., Syn. *A. procera* Wallr., and *Armeria humilis* Lk., Syn. *A. filicaulis* Boiss. ! *A. Halleri* Wallr.), *Lampsana*, and *Xanthium*. Then follow critical remarks; as, e. g., upon *Senecio paludosus*,

*Salix hastata*, from which Wallroth distinguishes the form which he discovered on the gypsum-chain of the southern Hartz mountains, as *S. surculosa*. Scheele has continued his work upon German and individual Exotic Plants, which was noticed in the last Annual Report (Ratisbon Flora, 1844, and Linnæa, 1844); and Petermann has followed him in attempts of the same kind, to contribute to our knowledge of native species (Ratisbon Flora, id.).

Provincial Topographies and Sketches of the Vegetation in the Province of the German and Prussian Flora:—Kamp, Catalogue of Plants growing wild around Memel (Preuss. Provinzialblätter, 1844, p. 451-569); Leo Meier, On the Flora of Gerdana in Eastern Prussia (Bot. Zeit., 1844); Roeper, Contributions to the Flora of Mecklenberg (Part 2, Rostock, 1844), representing the Graminaceæ in the manner pointed out above; Fiedler, Synopsis of the Mosses of Mecklenberg (Schwerin, 1844-8); Häcker, Flora of Lübeck (1844-8); K. Müller, Contributions to a Cryptogamic Flora of Oldenburg (Bot. Zeitung, 1844), with additions and corrections by H. Koch (id.); Wimmer's Flora of Silesia, which was mentioned in the Annual Report for 1840, has appeared in a second and enlarged edition (Breslau, 1844); Reichenbach, Upon the Botanical Conditions of the Flora of Saxony (i. e. Gaea of Saxony, 1843-8), contains nothing more than a catalogue of rare plants from the separate districts, in the form of extracts from the author's 'Flora Saxonica'; Pfeiffer, Sketch of the Plants hitherto found in Kur-Hesse (Cassel, 1844-8); this is to be regarded as preliminary to a critical Flora of Hesse, and contains a large number of new localities, especially on the basaltic mountains of Cassel; by the same author, A few words upon the Subalpine Flora of Meissner (loc. cit., 1844); Wirtgen, Supplements to the Flora of the Prussia Rhine Provinces (Verhandlungen des naturhistorischen Vereins der Preussischen Rheinlande, Jahrg. 1); Thieme, Catalogue of the Plants growing at

Hainsberg, in the Territory of Aix (Ratisbon Flora, 1844, p. 209-21); Löhr, Manual of the Flora of Trêves and Luxembourg, with a notice of the surrounding districts (Trêves, 1844-8); Lechler, Supplement to the Flora of Württemberg (Stuttgart, 1844-8); Sailer, Flora of Linz (Linz, 1844-8), an extract from the Flora of Upper Austria, mentioned in the Annual Report for 1841; Sauter, Report upon a Journey to Lungau (Ratisbon Flora, 1844, p. 813-16).

E. v. Berg, at Lauterberg, on the Hartz mountains, endeavoured to prove that the Coniferæ are gradually becoming more widely distributed in the north of Germany (Das Verdrängen der Laubwälder durch die Fichte und Kiefer. Darmstadt, 1844-8). The fact, in the case of the Hartz mountains, rests upon authentic testimony; but how far this change, which in many places has been completed in the space of twenty years, has been produced by external natural conditions, or merely by the economic management of the forests, is difficult to ascertain. In Lüneburg also, where, e. g., in the struggle between the two methods of culture, it was not decided in favour of the pine until after the lapse of a century, as also in Solling, on the Upper Weser, where deciduous forests are still very extensive, the same conditions have prevailed as on the upper Hartz mountains. On the western Hartz mountains, the red pine generally succeeds the beech; but in some parts, on the removal of the latter, the remains of oaks have been found as high as a level of 2000', i. e. an elevation at which they have long since ceased to grow. When we consider that the tree-limits on the Hartz mountains lie extremely low, in comparison with those of the north of Europe, and that even the Coniferæ do not ascend higher on the Brocken mountains than at 9—10° further north in Norway, the fact of the culture of the oak and beech at a former period, would render it, at any rate, tolerably probable that secular changes had taken place in the climate, by means of which the distribution of the forest trees had been

produced, and by which Steenstrup's succession of forest growth in maritime countries would be brought into connexion with the extermination of the Coniferæ in the elevated regions of the upper Hartz mountains.

The work of Fuchs, on the Venetian Alps, contains an account of the limits of vegetation in the southern dolomitic Alps, especially the district of Agordo; it fills up an important gap in the observations upon the vertical distribution of the Alpine plants (Vienna, 1844, fol.) Unfortunately, however, in the case of most of the plants, the lower limits of altitude only are given; and of these, a local value only can be attributed to many measurements. The results, expressed in French feet, are as follows:—

*a.* Upper limits.

*Ficus Carica*, and limit of the cultivation of the *vine*, 1500'. (At Agordo, *Vitis* grows very luxuriantly at a level of 2000', but no wine is made.

*Castanea vesca*, 2000' at Agordo.

*Juglans regia*, 3500' at Frassene.

*Zea Mays*, 2500' in the valley of Cordevoletal.

Cerealia, excluding wheat, 4400' at the Col di S. Lucia; 4600' at Buchenstein.

Dense Forest of Coniferæ, 5500'. In the regions of the mountain-pine, individual larches and fig-trees; 6309' at Sasso di Palma.

*Fagus sylvatica*, 5000'; e. g. at Monte Luna, 4915', still higher at Bosco Medona and in the Val Pegolera.

*Pinus Cembra*, 6665' at the Col di Lana.

Upper limit of the Phanerogamia, = 9000'; *Aretia Vitaliana*, and some Saxifrages.

*b.* Lower limits.

*Ranunculus aconitifolius*, 3500'.

*montanus*, 7000'.

*glacialis*, 8000'.

*Pyrenaicus*, 8000'.

*Anemone baldensis*, 4500'.

*Aconitum Anthora*, 4500'.

*Napellus*, 6500'.

*Stoerkianum*, 6500'.

*Arabis cærulea*, 7000'.

*Hutchinsia alpina*, 7000'.

*Hutchinsia rotundifolia*, 7000'.

*Papaver pyrenaicum*, 5500'.

*Viola biflora*, 3500'.

*Silene acaulis*, 5500'.

*pumilio*, 7000'.

*Cerastium latifolium*, 6500'.

*Cytisus alpinus*, 1300'.

*purpureus*, 2000'.

*Trifolium alpinum*, 5500'.

*Phaca astragalina*, 6500'.

- Phaca alpina*, 6500'.  
*Hedysarum obscurum*, 7000'.  
*Dryas octopetala*, 2000'.  
*Potentilla caulescens*, 1300'.  
     *nitida*, 6500'.  
*Geum montanum*, 5500'.  
     *reptans*, 8000'.  
*Sibbaldia procumbens*, 5500'.  
*Rosa alpina*, 5500'.  
*Sedum atratum*, 7000'.  
*Rhodiola rosea*, 7000'.  
*Saxifraga Aizoon*, 1300'.  
     *aizoides*, 1500'.  
     *cæsia*, 1500'.  
     *rotundifolia*, 2000'.  
     *mutata*, 2500'.  
     *Burseriana*, 2500'.  
     *cuneifolia*, 3500'.  
     *stellaris*, 5500'.  
     *aspera*, 5500'.  
     *controversa*, 6500'.  
     *muscoïdes*, 6500'.  
     *planifolia*, 7000'.  
     *androsacea*, 7000'.  
     *sedoides*, 7000'.  
     *bryoides*, 7000'.  
     *oppositifolia*, 8000'.  
*Bupleurum graminifolium*, 6500'.  
*Lonicera nigra*, 4500'.  
     ' *alpigena*, ' 4500'.  
*Valeriana saxatilis*, 1300'.  
*Aster alpinus*, 1500'.  
*Tussilago alpina*, 2000'.  
*Cacalia alpina*, 4500'.  
*Arnica montana*, 2000'.  
     *Bellidiastrum*, 1300'.  
*Gnaphalium Leontopodium*, 1500'.  
*Chrysanthemum alpinum*, 7000'.  
*Anthemis alpina*, 6500'.  
*Achillea Clavennae*, 4500'.  
     *moschata*, 7000'.  
*Doronicum scorpioides*, 7000'.  
*Aronicum Clusii*, 7000'.
- Senecio abrotanifolius*, 5500'.  
     *carniolicus*, 7000'.  
*Cirsium ochroleucum*, 2500'.  
     *spinosissimum*, 5500'.  
*Carduus defloratus*, 5500'.  
*Saussurea alpina*, 7000'.  
*Sonchus alpinus*, 4500'.  
*Phyteuma comosum*, 1300'.  
     *Scheuchzeri*, 1300'.  
     *hemisphæricum*, 5500'.  
     *orbiculare*, 5500'.  
     *Sieberi*, 7000'.  
     *pauciflorum*, 7000'.  
*Campanula barbata*, 4500'.  
     *Morettiana*, 4500'.  
*Rhododendron hirsutum*, 1300'.  
     *Chamæcistus*, 1300'.  
*Arbutus wa ursi*, 2500'.  
     *alpina*, 5500'.  
*Azalea procumbens*, 7000'.  
*Vaccinium Myrtillus*, 2000'.  
     *Vitis idæa*, 2000'.  
*Primula Allionii*, 2500'.  
     *glutinosa*, 7000'.  
     *minima*, 7000'.  
     *longiflora*, 6500'.  
     *Auricula*, 6500'.  
*Soldanella alpina*, 2500'.  
     *minima*, 2500'.  
*Cortusa Matthioli*, 7000'.  
*Androsace alpina*, 7000'.  
     *obtusifolia*, 7000'.  
*Aretia Vitaliana*, 8000'.  
*Pinguicula alpina*, 2000'.  
     *grandiflora*, 2000'.  
*Gentiana acaulis*, 1300'.  
     *germanica*, 1300'.  
     *utriculosa*, 2000'.  
     *cruciata*, 3500'.  
     *asclepiadea*, 3500'.  
     *ciliata*, 3500'.  
     *punctata*, 5500'.  
     *bavarica*, 5500'.

<i>Gentiana nivalis</i> , 5500'.	<i>Betonica Alopecuros</i> , 1300'.
<i>pumila</i> , 5500'.	<i>Myosotis nana</i> , 8000'.
<i>Linaria alpina</i> , 1300'.	<i>Globularia nudicaulis</i> , 1300'.
<i>Euphrasia tricuspida</i> , 1300'.	<i>cordifolia</i> , 1300'.
<i>Salisburgensis</i> , 1500'.	<i>Daphne striata</i> , 1500'.
<i>Pedicularis tuberosa</i> , 4500'.	<i>Pinus Pumilio</i> , 1400'. Between
<i>rostrata</i> , 6500'.	Agordo and Peron.
<i>verticillata</i> , 6500'.	<i>Nigritella angustifolia</i> , 4500'.
<i>rosea</i> , 6500'.	<i>Himantoglossum viride</i> , 4500'.
<i>Bartsia alpina</i> , 6500'.	<i>Crocus vernus</i> , 2000'.
<i>Paderota Bonarota</i> , 1500'.	<i>Czackia Liliastrum</i> , 2500'.
<i>Veronica alpina</i> , 4500'.	<i>Luzula nivea</i> , 5500'.
<i>aphylla</i> , 4500'.	<i>Carex atrata</i> , 5500'.
<i>Horninum pyrenaicum</i> , 1300'.	<i>firma</i> , 5500'.

Giacich has enumerated the rare plants of Monte Maggiore, in Istria (Ratisbon Flora, 1844, pp. 274-6). Hauffel gives a sketch of the Carices of Hungary, Croatia, Slavonia, and Siebenbürgen (Id. pp. 527-36). The author here again refers his *C. rhynchocarpa* to *C. brevicollis* Lam., and regards *C. saxatilis* Baumg. as *C. dacica*.

Moritz has written a new Manual of the Swiss Flora (Die Flora der Schweiz. Zurich, 1844-8). Trog has published a Catalogue of Swiss Fungi (Berner Mittheilungen, pp. 17-92), in which 1121 species are mentioned.

The upper limit at which the larch occurs on the south side of the Mont Blanc chain at Cramont, in Courmayeur, was found by the measurement of Forbes, to be 7200' Engl.; and on the north side, on the rocks les Echelles which belong to the Mer de Glace, 6800'. (Travels through the Alps of Savoy. Edinb., 1843, pp. 68 and 215.)

The seventh and eighth centuries of F. Schultz's 'Flora Galliae et Germaniae exsiccata' have been issued, and are accompanied by critical remarks upon individual plants (see Bot. Zeitung, 1845). By the same author, four French plants are proposed as new in the 'Ratisbon Flora' (1844, pp. 806-9); *Orobanche brachysepala* Sch. according to the description given, and comparison with the

original plants, is identical with *O. apiculata* Wallr. Rehb. (Spicil. rum., 2, p. 58); *O. macrosepala* is probably my *O. Bartlingii*, a name which obtained priority by several months.

French local Floras: J. Lloyd, 'Flora de la Loire inférieure' (Nantes, 1844, 12); Guépin, 'Supplément à la Flore de Maine et Loire' (Angers, 1842).

Martins has worked out an exposition of the climatal contrasts which occur within the boundaries of France (les Régions Climatoriales de la France), in the 'Bibliothèque de Genève, 1844, pp. 138-60, and pp. 347-50. The author distinguishes the five following climates in France.

1. *Climate of the Vosges.* This comprises a district in the north-east of France, which is bounded by the cities of Basle, Dijon, Auxerre, and Mezières. Mean temperature =  $9^{\circ} 6$  C. The relatively most intense winters predominate in this region, the difference between the mean summer and winter heat amounts to  $18^{\circ}$  C. ( $18^{\circ} 6$  and  $0^{\circ} 6$  C.); the greatest cold observed in Strasburg and Metz amounted to about  $23^{\circ}$  C. The mean quantity of rain (from meteorological observations made at Strasburg, Mühlhausen, Nancy, Metz, and Geneva) = 669 mm.; of this, 19 p. c. fall in the winter, 23 in the spring, 31 in the summer, and 27 in the autumn. Average number of rainy days = 137. Predominant winds, those from the south-west and north-east.

2. *Climate of the Seine,* or north-west of France, as far as the Loire and Cher. Mean temperature  $10^{\circ} 9$  C. Difference between the mean summer- and winter-temperature =  $13^{\circ} 6$  C.; diminishing in the direction from Brussels (=  $14^{\circ} 3$  C.) to Brest (=  $10^{\circ} 8$  C.); the former average value is the arithmetical mean of observations made at Dunkirk, Arras, Abbeville, Paris, Cherbourg, Angers, and Denainvilliers. Average amount of rain = 548mm.; in Finisterre, however, it amounts to 900mm. (from observations made at Paris, Brussels, and Denainvilliers, 21 p. c. of the rain falls in winter, 22 in spring, 30

in summer, and 27 in the autumn. Average number of rainy days = 140. The prevailing wind is the south-west, the next is the north-east.

3. *Climate of Garonne*, or south-west of France, as far as the Pyrenees. The eastern boundary is situated in Auvergne, but cannot at present be accurately defined; it probably includes the plateau of Auvergne, and follows the course of the Rhone and Saône. Mean temperature =  $12^{\circ} 7$  C. Difference between summer- and winter-heat =  $160^{\circ}$  C.; on account of the smaller extent of the coast-line, the marine climate is less developed here than in the north-west; mean summer-temperature =  $20^{\circ} 6$  C., winter-temperature =  $5^{\circ}$  C. Greatest intensity of cold at Poitiers, La Rochelle, Toulouse, and Agen, where it attains to  $-12^{\circ}$  C. Average amount of rain = 586 mm.; of which, 25 p. c. fall in winter, 21 in spring, 23 in summer, and 34 in autumn. Average number of rainy days = 130. The prevailing wind is the south-west, which in the neighbourhood of the Pyrenees passes into the west.

4. *Climate of the Rhone*, comprises the valley of the Rhone, from Dijon and Besançon to Viviers, and the mountainous regions of the Higher Alps; the boundary in the department of the Lower Alps is at present undefined. Mean temperature =  $11^{\circ}$  C. Difference between summer and winter =  $18^{\circ} 6$  C. Mean temperature of summer =  $21^{\circ} 3$  C., of winter  $2^{\circ} 5$  C. Average quantity of rain = 946 mm., i. e. the greatest amount precipitated throughout the whole of France; of which 20 p. c. falls in the winter, 24 in the spring, 23 in the summer, and 34 in the autumn. Number of rainy days in the valley of the Saône = 120-30, in the valley of the Rhone = 100-15. Prevailing winds, north and south.

5. *Mediterranean climate*. The northern boundary runs through the Rhone at Viviers, near Montélimart, thence follows a line drawn on one side to Montpellier, on the other to Marseilles, and, lastly, comprises the coast-districts of Provence and the regions of Aude as far as

the Pyrenees. Mean temperature =  $14^{\circ}$  8 C. Mean summer temperature =  $22^{\circ}$  6 C., and winter temperature =  $6^{\circ}$  5 C. Greatest intensity of cold observed —  $11^{\circ}$  5 C. Average amount of rain = 651 mm.; of which 25 p. c. fall in the winter, 24 in the spring, 11 in the summer, and 41 in the autumn. Prevailing wind, north-west. —(Mistral.)

A work by Grenier, relating to the botanical conditions of the French Jura, appears of importance; at present, however, I am only acquainted with it from Von Schlechtendal's review (Thèse de Géographie Botanique du Dép. de Doubs, Strasbourg, 1844-8). According to this work, the upper limit of the oak here occurs at an altitude of 6-700 metres, that of the beech at 8-900 metres; above these deciduous trees comes the Coniferous region, covered with both kinds of fir-trees.

Lloyd's Flora of the Mouth of the Loire also notices the local conditions of vegetation. The diffusion of several plants belonging to the south of Europe, along the sea-beach, as far as the 47th degree of latitude, is characteristic: e. g. on the lagunes, *Inula crithmoides*, *Sonchus maritimus*, several *Statices*, *Salicornia fruticosa*, *Scirpus Savii*, *Spartina stricta*; on the downs, *Matthiola sinuata*, *Silene portensis*, *Tribulus terrestris*, *Otanthus maritimus*, *Ephedra distachya*, *Pancratium maritimum*, &c. But on the heaths of Bretagne are also found *Erica ciliaris*, *vagans*, and *scoparia*, *Simethis bicolor* Kth. (*Phalangium* D. C.), *Asphodelus albus*, *Pinguicula Lusitanica*, *Serapias triloba*, in conjunction with northern plants, as *Ulex Europæus*, *Narthecium ossifragum*, *Anagallis tenella*, *Hypericum elodes*, *Myrica Gale*, and *Alisma ranunculoides*.

To this place belong, on the French coast of the Mediterranean, the investigations of Duchartre upon the vegetation of the district around Béziers in the Dép. Hérault (Comptes rendus, 1844, v, 18, pp. 254-9). This work gives an accurate and complete survey of the vegetable formations which occur there. The author divides

them into two principal classes, according as their growth is consequent on proximity of the sea or not.

1. The following formations belong to the coast-plants: *a. Formation of the Dunes.*—Herbs or low shrubs, which are either of very pubescent or of glaucescent tint. To the former belong, e. g. *Matthiola sinuata*, *Medicago marina*, *Orlaya maritima*, *Mercurialis tomentosa*, *Diotis candidissima*; to the latter, *Eryngium maritimum*, *Echinophora*, *Euphorbia Paralias*, and *Crucianella maritima*. The shrubby plants consist of *Astragalus massiliensis* and *Ephedra distachya*. As regards the number of forms, the Grasses predominate (12 species are known), the Cruciferæ come next, with 4 species, the Leguminosæ and Euphorbiacæ number 3 species, and the Chenopodeacæ, Polygonacæ, and Synantheracæ: altogether more than 40 species grow there. Among the dunes 2 allied species of *Juncus* are found (*J. acutus* and *maritimus*), a formation peculiar to the humid soil, which in the Landes is denominated Joncasses, and forms the transition to the following formation.

*b. Formation of the Salt-water Marshes.*—Shrubs and herbaceous perennials, with succulent leaves. Chenopodeæ and Staticeæ predominate here, both as regards the number of individuals and of species: among woody plants, *Tamarix Gallica* is found arborescent. Characteristic forms among the Chenopodeacæ (11 sp.): *Chenopodium fruticosum*, *Ch. setigerum*, *Salicornia*, 3 sp., *Salsola*, 2 sp., *Atriplex*, 3 sp.; of the Staticeæ (5 and more species) *St. oleifolia*, *bellidifolia*, and *ferulacea*; of other plants (15 sp.), *Frankenia*, 2 sp., *Spergularia*, 2 sp., and *Artemisia Gallica*. The Graminacæ are here represented by *Crypsis schenoides* only.

2. The plants independent of the influence of the sea, resolve themselves into formations of a moist and dry soil; the latter are either independent of the cultivation of the land or not so.

A. Water-plants.

*a. Fresh-water Formation.*—Amongst numerous Gramineæ, Cyperaceæ and Naiadeæ, with Nymphæaceæ and Typhææ, it possesses but few forms which are characteristic of the climate; as, e. g. *Vallisneria spiralis* and *Marsilea pubescens*, Ten. (*M. Fabri*, Dun.)

*b. Formation of those soils which are occasionally overflowed*, are characterised, e. g. by *Mentha cervina*. These are the localities of *Cicendia Candollei* and *Conyza sicula*.

B. Plants of the uncultivated part of the district. The author believes that three or four formations may be distinguished, of which the first, that of the Cistaceæ, is more distinct than the rest are from each other.

*a. Garrigues*, i. e. *Formation of the Cisti*. A stony soil is densely covered with shrubs of *Cistus* or some other firmly interlaced and frequently thorny bush. These shrubby forms are the following: *Cistus crispus*, *salvifolius*, *albidus*, and *monspeliensis*; *Ulex provincialis* and *Europæus*; *Daphne Gnidium*; *Quercus coccifera*; *Erica scoparia* and *cinerea*, *Calluna vulgaris*; *Phillyrea angustifolia* and *latifolia*; *Lavandula Stœchas*; *Osiris alba*; *Juniperus Oxycedrus* and *communis*, and *Rosmarinus officinalis*. Among other plants, the following are characteristic: a number of species of *Helianthemum*, growing with the *Cisti*, some *Euphorbias*, *Santolina*, *Helichrysum Stœchas*, *Aphyllanthes*, &c. From this formation also more than 40 species are enumerated.

*b. Duchartre* has not been able to distinguish the peculiarities of those surfaces and hills (*campi*) which are covered with shrubs and annuals, and to illustrate them according to their characteristic vegetable forms. We shall, therefore, pass over this part of his memoir, and merely mention some of the more rare species which belong here: *Biscutella coronopifolia*, *Linum salsoloides*, *Centaurea Pouzini*, and *Echium Pyrenaicum*.

*c. Plants of the cultivated soil.*

*a. Formation of the ruderal plants.* The species are all widely diffused.

b. Plants accompanying those which are cultivated. The author makes several divisions of these, which it is not necessary to detail. The number of species enumerated is very considerable, but they are not characteristic of the south of France, as distinguished from other countries on the Mediterranean.

c. *Formation of the meadow-lands.* The same remark applies to this: *Euphorbia pilosa* and *Iris spuria*, however, deserve to be mentioned.

d. *Formation of the forests.* The evergreen forests consist of *Quercus Ilex*: there are no others. Underwood: *Pistacia Lentiscus* and *Terebinthus*, *Erica arborea* and *Calluna*, *Sarothamnus scoparius*, *Cytisus capitatus*, *Genista Scorpius*, *Spartium junceum*, &c.

From the appended sketch of the cultivated plants, it is seen that the preparation of soda from Halophytes has entirely ceased in that district, that the cultivation of the olive is very much on the decrease, in consequence of several cold winters having destroyed the plantations, and that latterly attempts have been made to cultivate *Ricinus* on a large scale. The principal production of Béziers is wine; the cerealia do not suffice for home consumption.

Desmoulins has given a description of his botanical journey in the Pyrenees, during which he made some observations upon the vertical limits of the Alpine flora of the Pic du Midi (Etat de la Végétation sur le Pic du Midi de Bigorre. Bordeaux, 1844, 8vo.) We extract from it the following additions to the earlier statements of De Candolle and Ramond:

- Cochlearia pyrenaica*, 5500'—6000'.  
*Herniaria pyrenaica*, 3000'—7500'.  
*Paronychia polygonifolia*, 6000'—7500'.  
 — *serpyllifolia*, 7500'—8400'.  
*Astragalus depressus*, 6000'—7500'.  
*Vicia pyrenaica*, —8500'.  
*Carduus carlinoides*, 6000'—8100'.  
 — *carlinifolius*, 3000'—6900'.  
*Cirsium eriophorum*, 0'—6600'.  
*Scabiosa pyrenaica*, —8400'.

*Pedicularis pyrenaica*, —9000'.

*Crocus nudiflorus*, —7500'.

*Aniungium ciliatum*, —8400'.

*Parmelia chrysoleuca*, 5400'—9000'.

— *cartilaginea, elegans, cinerea, badia*, —9000'.

*Lecidea vesicularis bififormis*, 6000'—7500'.

— *polycarpa, atrobrunnea, morio, geographica, umbilicata*, —9000'.

*Umbilicaria cylindrica*, 6000'—9000'.

Some interesting letters, written by M. Willkomm during a journey in Spain, have been published in the 'Botanische Zeitung' (1844-5). They commence in May 1844, bearing date from Valencia, where the author remained until the middle of June. He then went to Madrid, botanised at Aranjuez in the beginning of July, passed over the Sierra Morena, reached Granada, and during the latter part of the summer and the autumn, explored the Sierra Nevada and the Alpuxarras. In the present report, we shall confine ourselves to the first part of the journey, intending to recur to the notices regarding the south of Spain next year, when the conclusion of Boissier's illustrated work, together with Willkomm's observations of 1845, will conjointly furnish a more copious illustration of that part of the subject. In the Huerta of Valencia, the original vegetation is greatly displaced by cultivation: wheat, rice, and hemp are principally cultivated; mulberry trees, olives, and fruits belonging to the south are common, date-palms, from 40 to 60 feet high, are frequently met with. On the Lagune Albufera is a wood of *Pinus Halepensis*, containing abundance of the original plants of this district: the underwood here consists of *Quercus coccifera*, *Myrtus*, and *Chamærops*, and growing with them we find *Pistacia Lentiscus*, *Rhamnus lycioides*, *Erica arborea*, *Rosmarinus*, *Juniperus Oxycedrus*, and *Ruscus aculeatus*. The adjacent sandy hills contain *Cistus albidus* and *salvifolius*; *Passerina hirsuta* and *Solanum sodomæum*, the stems of which are of the thickness of the arm.

The Sierra de Chiva, 12 miles north of Valencia, belongs to the limestone mountains, which separating from the

Spanish plateau, between the Ebro and Xucar, traverse the province from west to east as far as the sea. This broad mountain-range, which is about 6000' in height, and intersected with deep Barrancos, was once covered with forests of Coniferæ, the only remains of which at the present time are isolated stems of *Pinus Halepensis*. The dry slopes, which are almost entirely free from springs, are now overgrown with a low bush (Montebaxo), the extreme summits only being bare. Willkomm admits the following stages in the Mediterranean vegetation of this region, which attains an unusual elevation, ascending to 4000'.

0—500'. To about this height the *Opuntias* and *Agaves* extend, together with the culture of *Ceratonia*. The Montebaxo consists of *Chamærops*, *Erica arborea*, *Daphne Gnidium*, *Retama sphaerocarpa*, *Ulex*, *Rosmarinus*, and some oaks.

500'—2000', i. e. as far as the upper limits of *Chamærops* (also of *Retama*, *Juniperus Oxycedrus*, and *Pistacia Lentiscus*). *Rosmarinus* and *Chamærops* predominate; in addition to those already mentioned, *Erica arborea* from among those of the first stage, and *Rhamnus lycioides*, *Pistachia Terebinthus*, and some *Cisti* are here first met with. Characteristic Grasses: *Macrochloa tenacissima* and *Stipa juncea*.

2000'—4000' up to the limits of the cultivation of the olive and wheat. The greater part, however, of the slopes at this level consists of uncultivated mountain-land. In a Montebaxo, the principal plants associated here with *Rhamnus*, *Rosmarinus*, *Erica*, and *Cisti*, are *Juniperus Phœnicea*, *Fraxinus* sp., *Arbutus unedo*, and *Quercus Ilex*.

Isolated pine-trees and a Montebaxo formed of *Ulex Australis* and *Juniperus Phœnicea* characterise the region extending from 4000'—5500', which may be distinguished from the Mediterranean by the occurrence of the plants of the north of Europe. On the summit of the Monte de la S. Maria (5500'—6000'), of woody plants, *Arctostaphylos uva ursi*, *Taxus*, and some *Cotoneasters*

are also found; and with them few shrubs only and a single species of Saxifrage.

V. Martens, in a general work, has described the botanical geography of Italy from literary sources (Italy, Stuttgart, 1844, 8vo, 3 vols.)

Works upon the Flora of Italy. The first two parts of the sixth vol. of Bertolini's *Flora Italica*, which treat of the 14th class, have appeared (Bologna, 8vo.) The *Flora of Nice*, by A. Risso (Nice, 1844, 8vo), is of no scientific value. We have not yet received Cesati's paper upon that of Lombardy (*Saggio sulla Geographica botanica e sulla Flora della Lombardia*. Milano, 1844, 8vo, p. 74). Purcinelli *Additamentum ad synopsis plantarum in agro Luccensi sponte nascentium* (in the *Giornale Botanico Italiano*. 1844, pp. 118-123). Savi *Florula Gorgonica* (id. pp. 243-283), a catalogue enumerating 290 sp. of vascular plants observed in Gorgona, a small island opposite Leghorn, and covered with *Cisti*, *Ericas*, and Leguminous shrubs, may be considered as a companion to the *Flora of Capraja*, published some years ago by Moris and Notaris. De Notaris, Appendix to his *Specimen Algologiæ Ligusticæ* (id. pp. 191, 311). Meneghini, *Algarum species novæ vel minus notæ* (id. pp. 296-306), 33 species from the coasts of Italy and Dalmatia. The fourth part of *Alghe Italiane e Dalmatiche*, by the same author, has appeared (Padova, 1843, 8vo). Tenore has shown that the Dalmatian *Arenaria Arduini* is identical with his former *A. Rosani* (*Rendic. Acad.* 1842, p. 266). V. Heldreich describes four new Sicilian plants (*Ratisbon Flora*, 1844, p. 65): 1 *Helianthemum*, 1 *Elichrysum*, 1 *Centaurea*, and 1 *Lithospermum*. Nyman's *Observationes in Floram Siculam* (Linnæa, 1844, pp. 625-665) contain a catalogue of his collection which is for sale in Sweden, with descriptive remarks. The only new plant is *Parietaria populifolia*, N. from Malta.

Link distinguishes a new *Erica anthura*, obtained from Spalatro (*Sitz. des Ges. naturf. Freunde*, 1844, in the *Ratisbon Flora*, 1845). Visiani raises *Turinea Neu-*

*mayerina* Vis., which was figured, in the Flora Dalmatica, into a separate genus as *Amphoricarpos* (Giorn. Bot. It., vol. i, p. 196).

Ebel's essay on Montenegro (Zwölf Tage auf Montenegro, Hft. 2. Königsberg, 1844, 8vo), contains a catalogue of all the Phanerogamous plants hitherto observed in Dalmatia (2003 sp.), with a statement of the frequency of their occurrence, expressed in a manner peculiar to the author, but the localities are not given. It contains preliminary observations upon the statistical relations of the flora of Dalmatia, in which the most abundant families form the following series, according to the number of species contained in them: Synantheraceæ (225 sp.), Leguminosæ (220 sp.), Graminaceæ (142 sp.), Cruciferæ (107 sp.), Umbelliferæ (103 sp.), Labiatæ (91 sp.), Caryophyllaceæ (85 sp.), Scrophulariaceæ (82 sp.), Liliaceæ (61 sp.), Rosaceæ (59 sp.), Ranunculaceæ (54 sp.), Orchidaceæ (46 sp.), Cyperaceæ (43 sp.), Boraginaceæ (42 sp.) The reports upon the vegetation of Montenegro itself, the productions of which, according to the author, entirely agree with those of Dalmatia, belong here. This small tract of land, which is covered with arid, rocky mountain-pastures, and elevated into limestone summits, which are either barren or slightly surrounded with forests of pines, and from which narrow fluviatile valleys descend to the sea of Scutari, is extremely unfruitful from a deficiency of soil and water. Nevertheless, the plants appear, as in Dalmatia, to be various, 450 sp. having already been mentioned by the author: there are no new ones among them, the two which are proposed as new are untenable.

In my work upon Rumelia and Bithynia (Spicilegium Floræ Rumelicæ et Bithynicæ, exhibens synopsis plantarum, quas anno 1839 legi: accedunt species, quas in iisdem terris lectas communicarunt Friedrichsthal, Friedwaldzki, Pestalozza vel plene descriptas reliquerunt Buxbaum, Forskal, Sibthorp, alii; vols. i, ii, Brunsnigæ, 1843-4, 8vo), 2300 Phanerogamous plants are treated of systematically, and in regard to their geographical dis-

tribution. The families containing most species form the following series: Synantheraceæ (264 sp.), Leguminosæ (203 sp.), Graminaceæ (156 sp.), Labiatae (134 sp.), Caryophyllaceæ (130 sp.), Cruciferae (121 sp.), Umbelliferae (114 sp.), Scrophulariaceæ (90 sp.), Ranunculaceæ (78 sp.), Rosaceæ (68 sp.), Boraginaceæ (55 sp.), Liliaceæ (53 sp.), Rubiaceæ (48 sp.), Campanulaceæ (41 sp.), Orchidaceæ (41 sp.), Cyperaceæ (41 sp.) When this series is compared with that given above for Dalmatia, the increase in the Labiatae and Caryophyllaceæ becomes one of the characteristic peculiarities of Rumelia. The former family does not reach the centre of its distribution through the south of Europe until we arrive at Greece; but the Silenaceæ, which abound in endemic forms of *Dianthus* and *Silene*, do not appear to be anywhere more numerous than in Rumelia. The increase in the Ranunculaceæ, Boraginaceæ, and Campanulaceæ is also worthy of consideration; but I must confine the deductions to these few facts, since if carried further than the extent of our present knowledge admits, they would lose in truth. The extent of our knowledge of the flora of Rumelia is much better shown by the examination of those vegetable forms which are endemic to that country, than by sketches of the entire vegetation, in which so many constituents are still wanting. Of these 2300 species of plants, about the seventh part are peculiar to the peninsula of Europe: from these about 80, which have only been found in Bithynia, are excluded, a great part of which, however, will probably be found also on this side of the Bosphorus. Moreover, if we take into account the distribution of Greek plants over the south, and of Dalmatian over the west of Rumelia, we may consider more than two thirds of the endemic plants of the south-east of Europe as known. *Summary of the endemic plants of Rumelia*: 23 Leguminosæ, principally species of *Trifolium* (5), and *Astragalus* (9), mostly belonging to the evergreen region; 5 Rosaceæ, of these, 3 Dryadeæ to the mountainous region; 2 Rutaceæ (*Haplophyllum*); 4 Euphorbias, of which

2 belong to the alpine region ; 2 Geraniaceæ to the alpine region ; 25 Caryophyllaceæ, especially species of *Silene* (6), and *Dianthus* (10), only 5 Alsineæ : species from all three regions, but the pinks mostly indigenous to the central European and alpine ; 5 Hypericineæ (*Hypericum*) from the evergreen region ; 14 Cruciferae, one half of which consist of alpine species of *Arabis*, *Cardamine*, *Koniga*, *Thlaspi*, and *Eunomia* ; 15 Ranunculaceæ, with 7 species of *Ranunculus*, mostly from the evergreen region ; 2 Crassulaceæ ; 3 Saxifrages from the alpine region ; 21 Umbelliferae, increasing towards the coast ; 2 Ericaceæ : *Erica verticillata* and *Arbutus Andrachnus* ; 3 Primulaceæ ; 26 Scrophulariaceæ, principally alpine *Pedicularis* (3), species of *Veronica* (4), *Digitalis* (3), *Scrophularia* (4), and *Verbascum* of the evergreen region (8) ; 2 Orobanches ; 9 Boraginaceæ, among these 4 species of *Alkanna*, 2 of *Borago* ; 20 Labiatae, of these 6 species of *Stachys* in both the lower regions ; 9 Rubiaceæ in the evergreen and alpine region (instead of the term *Galium trichophorum*, which was elsewhere proposed at the same time, I prefer that of *G. Trichodes*) ; 2 Valerianaceæ ; 9 Dipsaceæ ; 40 Synantheraceæ, principally Anthemideæ and Cynareæ, mostly from the genera *Anthemis* (6 : mostly in the evergreen region), *Achillea* (5 : mostly in the alpine region), *Senecio* (4), *Centaurea* (5), *Cirsium* (5) ; 13 Campanulaceæ, of which 10 were *Campanula*, most of which belonged to the evergreen region ; 2 Amentaceæ : *Quercus Ægilops* and *infectoria* ; 3 Coniferae : *Pinus maritima* in the lower, *Juniperus sabinoides* in the middle, and *Pinus Peuce* on the boundary of the alpine region ; 3 Orchidaceæ ; 4 Iridaceæ, species of *Crocus* in the evergreen region ; 12 Liliaceæ, e. g. *Ornithogalum* (3) ; 2 Cyperaceæ ; 11 Graminaceæ from all three regions. The remaining endemic plants are as yet single members of their families : the Bithynian, &c. Of the Cryptogamia, we are not yet acquainted with 200 species.

Heldreich observed at Athens a form of *Arbutus*, which was probably *A. hybrida* Ker., but is regarded by him as

a distinct species, intermediate between *A. Unedo* and *Andrachne* (Ratisbon Flora, 1844, p. 13). He denies its hybrid origin, because *A. Unedo* flowers in October and November, *A. Andrachne* in February and March; I have, however, met with both plants in flower at the same time in Bythynia.

## II.—ASIA.

Among the endemic plants of Bithynia described in the 'Spicileg. Rumelic.,' part of which belong to the evergreen coast-region, part to the high mountains of Olympus and Bolu, the following are the principal families represented: 5 Leguminosæ (mostly *Trifolia*); 2 Geraniaceæ; 5 Caryophyllaceæ (consisting of 3 Sileneæ and 2 *Dianthi*, all from Olympus); 4 *Hyperica*, 9 Cruciferae (all from Olympus, and consisting of 3 sp. of *Arabis*, 2 sp. *Eunomia*, &c.); 3 Papaveraceæ; 2 Ranunculaceæ; 5 Umbelliferae (mostly from Olympus); 4 Scrophulariaceæ; 2 Boraginaceæ; 3 Labiatae; 3 Rubiaceæ; 13 Synantheraceæ; 4 Campanulaceæ; 3 Liliaceæ; 3 Graminaceæ, &c.

The oriental Umbelliferae have been worked out by Boissier (Ann. Sc. Nat. 1844), comprising 300 species. The number of species proposed as new is very large. The new genera distinguished are the following: *Lereschia* (*Cryptotænia Thomasii* D. C.); *Elwendia*, from Persia, near *Carum*; *Microsciadium* (*Cyminum minutum* Urv.); *Muretia* (*Bunium* sect. *Chryseis* D. C.); *Diploætania* from Persia, near *Peucedanum*; *Stenotænia* from the same place, near *Pastinaca*; *Ducrosia* (*Zozimæ*, sp. D. C.); *Ainsworthia* (*Hasselquistia cordata* L.); *Trigonosciadium* from Mesopotamia, near *Heracleum*; *Synelcosciadium* (*Heracl. Carmeli* Lab.); *Polylophium*, (Thapsiæ) from Persia; *Smyrniopsis* near *Smyrnum*; *Meliocarpus* near *Prangos*; *Turgeniopsis* (*Turgenia feniculacea* Fzl.); *Lisæa*

(*Turgeniæ*, sp. D. C.); *Rhabdosciadium*, one of the Scandinicæ from Persia; *Thecocarpus*, from the same place and from the same division; *Osmosciadium*, one of the *Coriandreae*, from Cappadocia.

C. Koch's travels to the Caucasus (*Reise durch Russland nach dem Kaukasischen Isthmus in den J. 1836-8. Bd. i, ii. Stuttgart, 1842-3*) contains reports upon the autumnal vegetation of Ossetia and Imiretia, as also upon the vernal flora of Russian Armenia; the author's investigations were subsequently interrupted by protracted illness, but he finally resumed them in a second journey. In the military road of the Caucasus, Koch represents the prairies of Kabarda, near Uruch, as very luxuriant and abundant in plants; herbs and the Grasses grow here in such luxuriance, that a man can readily conceal himself without lying down (i, p. 250). The Gramineæ are mostly the same as the meadow-grasses of central Europe, whilst among the shrubs many Caucasian species are met with; they are diffused by the rivers over these surfaces which are situated opposite to the high mountain chain. By this circumstance and the development of the vegetation in the height of summer, when the Russian heaths are burnt up, the meadows of Kabarda differ essentially from the steppes, with which C. Koch has compared them. In fact, judging from certain kinds of plants, the steppe climate still prevails here; this is shown by the *Artemisiæ*, *Cynaraceæ*, and *Astragalaceæ*; but the influence of the neighbouring mountains modifies the character of the vegetation as determined by the climate. The plants of the steppes are destroyed in the summer by the drought, whilst Kabarda is well watered from the Caucasus.

C. Koch remained during October in Ossetia, in the middle of the high Caucasus, and the offsets connecting it towards the south with the Armenian highlands, and then travelled in Imiretia until the end of the year, certainly too late a period to allow of the botanical character of the country being completely ascertained. The reports

are partly limited to lists of the localities of the autumnal plants which he was then able to collect. The alpine flora, even at elevations of 7—8000' was but slightly represented by its characteristic forms (ii, p. 69); these high mountains are altogether more sterile than the Alps, which the author attributes primarily to the rarity of glaciers in the Caucasus, as if the alpine meadows of the Tyrol were only fertilized by melting ice. He then goes so far as to assert (p. 91), that the disintegrated soil of Ossetia, the steep rocks and precipitous defiles of this alpine district, are not adapted to the production of humus, and that this is the cause of the total absence of a luxuriant vegetation there. But the author is not clear upon this point, and does not separate general from local conditions; for he speaks at the same time of clay-slate plateaux, but little supplied with water and destitute of woods, extending between the defiles and valleys to the ridge and lateral offsets of the Caucasus. Upon this form of mountain and peculiarity of soil the alpine poverty of Ossetia appears to depend; that it also prevails over the well-wooded slopes of the northern Caucasus is not probable. But Ossetia shares this deficiency of alpine vegetable forms with the mountains of the south of Europe, where alpine pastures abounding in species are but rarely developed, and where this phenomenon is occasioned by the deficiency of water upon narrow crests and summits. Ossetia does not possess the fine forests of the northern promontories of the Caucasus. Even in the true forest region there is a perceptible deficiency of wood, and frequently the soil is scarcely covered with a scanty underwood: e. g. at Zrchinwall (p. 55) consisting of *Corylus*, *Cornus mascula*, *Paliurus*, *Crategus*, *Prunus insititia*, and *Juniperus*. The traveller only met with wooded slopes at Dschedschora, in the district of Gudaro, (p. 82); here deciduous trees predominated, and the Coniferæ present were *Pinus abies*, *picea*, and *orientalis*, *Taxus*, and *Juniperus communis*. The deciduous forests consisted of the oak, beech, maple, lime, and alder (*Quercus*

*iberica* Stev. and *Robur* (?), *Carpinus orientalis*, *Fagus*, *Acer platanoides*, *Tilia parvifolia*, *Alnus denticulata* C. A. M.); the underwood of *Euonymus latifolius*, *Rhamnus frangula* and *cathartica*, *Staphylea pinnata*, *Viburnum orientale*, *Argyrolobium lotoides*, and *Lonicera cærulea*.

The Imiretian slopes of the Caucasus in the upper valley of Rion (p. 129) are more abundantly wooded; above the vine mountains of the latter, mixed forests of deciduous trees ascend to a considerable height; in addition to the trees above mentioned, the chesnut, various fruit trees, and poplars were found at Oni, as also among the shrubs, *Ilex*, *Azalea pontica*, and *Rhododendron Caucasicum*, *Rhus Cotinus*, together with *Smilax excelsa*. At Glola, wild fruit-trees, especially *Pyrus communis*, and *Prunus avium*, extended to beyond 5000'. A region of subalpine shrubs, of which *Arctostaphylos* and *Azalea pontica* ascend together high up at the glacier of Rion, immediately succeeds the deciduous forests; and with them, subalpine herbaceous perennials, as *Aconitum nasutum* Fisch., *Pyrethrum macrophyllum*, *Doronicum Caucasicum*, &c. Lower down in the valley of Rion, Koch describes a fine primitive forest at Kutais (p. 166), consisting of magnificent trunks of *Carpinus orientalis*, oaks, and high tops of the chesnut and plane-trees projected singly; in thickets, luxuriant lianes of the grape-vine, *Smilax*, and ivy, upon the branches of which the mistletoe grew, and from which *Usneæ* were suspended.

The journey from Tiflis to Eriwan through Georgia and Russian Armenia was made during the months of April and May, in 1837, and yielded a rich booty. The forests of Somchetien differ from those of Imiretia, in the more regular growth of the trees, and in the absence of evergreen shrubs and lianes (p. 350). They consist of *Quercus iberica* and *pedunculata*, *Carpinus Betulus* and *orientalis*, *Acer platanoides* and *pseudoplatanus*; with isolated examples of *Ulmus excelsa* Bork., *Fagus*, and *Acer tartaricum*. The soil of these forests consists of a thick layer of humus, and this black earth produces the

beautiful mountain pastures which alternate with the former. The traveller soon ascended the high mountain chain between Kur and Araxes, forming the boundary between Georgia and Armenia (this he calls the lower Caucasus, Gldenstedt and Klaproth call it the promontory of Ararat), which, according to Parrot's measurement, ascends to an elevation of 12,780'. But vegetation was still backward in this region, for even in the Armenian highlands, few of the herbaceous plants and Grasses which, with a thorny underwood of *Tragacanth*, cover the bare heights, were in flower (p. 386). However, on going from Alags, near the valley of Araxes, to Eriwan, Koch was amply compensated by the banks of the Kasach (p. 397). The climate is so dry, that even in May the soil is parched and barren, whilst in the more elevated regions vegetation has scarcely commenced. But by artificial irrigation, the cultivation of the soil may be effected even during the hot and dry months, the fields and orchards surrounding the villages then resemble oases in a stony desert. Fruit trees were planted generally, especially peach trees and apricots; besides these there was a natural arboreal vegetation along the Kasach valley, consisting of *Elagnus* and *Populus*, with *Prunus incana*, and *Tamarix*. In Eriwan, especially, the greatest attention is paid to the cultivation of fruits and the vine, and the traveller had never met with more beautiful gardens than he saw there.

Schrenck continued his travels in Soongarei in 1843, and has already made known the plants he found in that year (Bulletin Ptersbourg, iii, pp. 106-10, 209-12, 305-9). They belong to the following genera: *Ranunculus* (2 sp.), *Stubendorfia*, nov. gen. Crucifer., *Isatis*, *Geranium*, *Zygophyllum*, *Haplophyllum*, *Euphorbia* (2 sp.), *Sophora*, *Oxytropis*, *Astragalus*, *Seseli*, *Lomatopodium*, nov. gen. Umbelliferae, *Carum*, *Artemisia* (2 sp.), *Chamaeron* near *Henricea*, *Saussurea*, *Cousinea* (4 sp.), *Plagiobasis*, nov. gen. near the preceding, *Jurinea*, *Serratula*, *Echinops*, *Echinosperrum*, *Eremostachys*, *Arthrophytum*, nov. gen.

*Chenopod.*, *Pterococcus*, *Statice*, *Populus*, *Ephedra*, *Allium*, *Typha*, and *Triticum* (2 sp.)

Middendorf has commenced the arrangement of the results of his journey through the north of Siberia, which was mentioned in the preceding annual report (Bulletin Pétersbourg, iii, pp. 150 et seq.) The Tundres of the Taimyr country, i. e. the peninsula situated between the lower Jenisei and the Katanga, contain in their diluvial loam, in addition to the mammalia of the diluvium, large masses of wood either in a bituminous state, such as is found in the peat moors, or converted into peat. In such of these tracts, however, as were beyond the tree limit, the stems were only met with lying horizontally, and were compared by Middendorf to the floating timber of the arctic coast, and from which, by the rising of the land, they may have gradually attained the interior. The trees appear to be of the same kinds as those in the forests of New Siberia and the fluvial valleys of Siberia, consisting principally of the beech and larch; they have not yet, however, been examined microscopically, hence these statements require confirmation. The climate of the Taimyr country appeared to be less cold than might have been expected: from the 6th of June to the 8th of August there was no frost there; constant fogs and storms (especially in summer, so that in May, June, and half of July, the altitude of the sun could only be taken three times,) indicated great irregularities in the distribution of heat in the atmosphere. The high surface of the country, which rises to an elevation of 1000', was perfectly free from snow in the summer; even in the winter, storms sweep the snow into the lowest parts, frequently leaving the heights bare. In the middle of July, Middendorf saw at Taimyr 1500 square miles (Eng.) free from snow, in a few narrow valleys only was any still remaining. The lakes only freeze to a depth of eight feet; the layer of snow then protects them from any deeper penetration of the frost. As regards the botanical results, we must wait for further reports, on account of the want of accurate determinations of the plants.

The thermometric observations made by Stchoukine, from 1830-1844 at Irkutsk (1330 English feet above the level of the sea), give (the months being reckoned as lunar) the following average of temperature :

January . . .	— 19°·9 c.	July . . .	18°·5 c.
February . . .	— 13°·6 c.	August . . .	+ 13°·75 c.
March . . .	— 3°·25 c.	September . . .	+ 6°·75 c.
April . . .	+ 5°·75 c.	October . . .	— 3°·75 c.
May . . .	+ 12°·25 c.	November . . .	— 14°·25 c.
June . . .	+ 17°·6 c.	December . . .	— 19°·9 c.

Mean temp. = + 0°·01 c.

Maximum = + 35° (once in 1843, 39°·5 c.)

Minimum = — 35°

Turczaninow's "Flora of the Baikal Regions" (see the Annual Report for 1842) has been continued, and has now reached the end of the Umbelliferæ (Bulletin de la Soc. de Moscou, 1843-44). The following families have thus far been treated of: 3 Rhamneæ, 94 Leguminosæ, 69 Rosaceæ, 5 Onagrariæ, 6 Halorageæ, 1 of the Cera-tophyllæ, 1 of the Lythriariæ, 2 Tamariscineæ, 1 of the Portulacæ, 8 Crassulacæ, 1 *Nitraria*, 9 Grossulariæ, 19 Saxifrageæ, 48 Umbelliferæ, with the recently separated genera *Physolophium* (*Angelica saxatilis* Turcz.) and *Czernævia* (*Conioselinum Czernævia* F. M.) Altogether 542 Polypetalous plants have now been fully treated of.

Kittlitz's work contains some very interesting illustrations of the characters of the vegetation of Kamtschatka ; his botanical sketches of the countries, which were made during the well-known voyage of the younger Mertens round the world, and described in the text with a perfect comprehension of the physiognomical characteristics, form one of the most valuable contributions to botanical geography made during the past year (Vierundzwanzig Vegetations-Ansichten von Küstenländern und Inseln des stillen Oceans, aufgenommen in den Jahren 1827-9 durch F. H. v. Kittlitz. Siegen und Wiesbaden, 1844-5, 4to). As we cannot omit making a full report upon this work,

we shall preserve as far as possible the excellent language of the text which accompanies the copper-plates; they afford a sample of the author's power of observation.

The physiognomy of Central and Northern Europe agrees with that of Kamtschatka much more completely than we should anticipate, considering the great difference between their longitudes: the number of European plants is very considerable (p. 53). The peninsula is divided into an eastern and western half by its mountain-chain. In the former, rise the conical volcanic mountains, of which the Kliutschewsk, according to Erman, is 14,800' in height, or as Kittlitz expresses himself, they rival the Peak of Teneriffe in height, and excel all other volcanoes in the perfection of their conical form. They alternate with long mountain-chains whose rugged tops are covered with snow, whilst the remainder of the district is adorned with the growth of noble forests and pasture. On the west side, however, the coast is low and marshy, passing towards the interior into a broad plain of fertile land, the soil of which is watered by numerous streams, and is covered partly with woods, partly with luxuriant grassy plains in their original and natural state. For the purpose of carrying out this sketch completely in detail, the author has given five tables, which indicate the botanical character of the forests and grassy plains in the summer months (July to September).

*Grass Plain at Awatscha*, therefore in the neighbourhood of Peter-Paul's harbour (plate XVII). This picture represents a luxuriant woody prairie, abounding in plants, and containing scattered groups of shrubs, and the open surface of which is inclosed by a wood of birch (*Betula Ermani*). This birch is the principal forest tree of the country; it somewhat resembles the oak in the knotty and flexuous growth of its stem, and differs moreover from *Betula alba* in its bark, which is gray and much torn, whilst the leaves agree with those of the common birch. A thicket of alders and willows denotes the vicinity of the stream; some of these are shrubby, others

tall in growth, resembling that of the poplar, and with these woody plants the gregarious *Spiræa Kamtschatika* (Schalameynik), a plant which throughout the summer characterises Kamtschatka above all other countries, and here repeats the *Panax*-form of the north-west of America in a physiognomical point of view: "A plant of wonderfully rapid growth, which in a few weeks acquires a height of more than 10 feet, whilst in the autumn it disappears still more quickly, without leaving a trace, for a single frosty night is sufficient to cut it off to the ground." Above the large, crenate leaves, the stems display in July their white bunches of flowers, which subsequently acquire a gray tint. Single plants of a very tall *Heraclium* (*H. Panaces*?) grow among the *Spiræas*, from the juice of which the natives prepare sugar. The grass covering these prairies attains an astonishing height; at first, indeed, it is overshadowed by shrubs of *Cratægus* and *Salix*, with thick stems, which project here and there, but these at a later period scarcely extend above the rapidly developed culms of the grass. The same applies to the herbaceous perennials, which are mixed in large numbers with the Grasses, and of which the following are mentioned: 2 *Sanguisorbæ*, *Angelica*, *Epilobium angustifolium*, *Senecio cannabifolius*, *Cacalia hastata*, 2 lilies with large orange flowers (one with stems of the height of a man, probably *L. Kamtschatkense* Lour.), and *Fritillaria Kamtschatkensis*, the latter under the name of Sarannah. Of these, *Senecio* and *Epilobium* are the principal ones which contribute to the physiognomy of the land. The former, although as high as a man, is laden with flowers, and frequently colours the surface of the meadows of a pure yellow colour, whilst the latter produces a splendid red. The Sarannah, which is everywhere met with in short grass, yields in its tubers an excellent article of food, which, although difficult to dig up, often supplies the place of bread.

Plate XVIII leads us to the *Forest on the Upper Kamtschatka river*, which, lying in a valley running lon-

gitudinally towards the east, traverses plains that are extensive towards the north, and almost everywhere wooded. Here, but here only, a different kind of birch constitutes the predominant forest tree, which the author regards as one of the European species, and denominates *Betula alba* (*B. pubescens* of Erman). It is so distinctly separated geographically in the neighbourhood of the river from *B. Ermani*, that on the road from Ganal to Puschtschina, whilst from the coast to this place the latter only is met with, the white birch suddenly begins to form the forests as soon as the upper course of the Kamtschatka river is reached. Together with the birch, we here find drawn a group of tall balsam poplars as straight as a line; this tree by itself forms large woods in the middle of Kamtschatka. The underwood and shrubs consist principally of *Spirææ*, next of *Lonicera*, *Cratægus*, *Prunus*, and *Salix*. In the glades, in the midst of scanty grass, a dark blue *Iris* grows; it is everywhere common, forming an incomparable ornament to the country, and is succeeded at a later period by several Synantheraceous perennials with beautiful flowers, as *Aster*, *Achillea*, and *Sonchus Sibiricus*.

*Forests of Central Kamtschatka* (pl. XIX, XX). A strip of land extends across the middle of the peninsula, from the west towards Cape Kronotzkoi; it is wooded with Coniferæ, no trace of which exists in the other districts. The forests consist of two kinds of fir-trees, the larger of which resembles the Canadian larch, the other has the growth of our red pine, with which it is probably identical: here also the birch and the aspen are associated with them. As the pine-forests of Kamtschatka differ from those of the north-west of America in their dryness, so also the underwood merely consists of a thicket, 3 feet high, composed of *Roses* and *Loniceræ*, and beneath them again a large number of bacciferous plants are concealed, *Vaccinia*, *Rubi*, and *Empetrum*, exactly as occurs under similar conditions in Scandinavia, so much so, that even the species mentioned of these genera are identical with

them. Among the edible fruits, *Rubus arcticus* has the most agreeable taste; the elongated dark blue berries of a *Lonicera* come next, their taste is not inferior to that of the finest cherries, and they are prepared with milk or Sarannah to form a favorite article of food with the natives. The Kamtschatka river is constantly changing the course of its valley, and hence, like the rivers of Russia, its banks are steep (Jar) on the side excavated by the current, whilst sandbanks (Pessok) are deposited by the water on the opposite side. On the former, the old pine-forest extends down to the river, and by the falling in of the banks is carried away as floating timber; on the latter, different woody plants have settled, the period of formation of which is later than that of the former: first, thickets of willows, then larger deciduous trees, willows, alders, and poplars appear to follow. The difference in the foliage commonly expresses a difference not of the age of the trees, but of the period at which the district became wooded.

*Mountain-Forests of the Eastern Coast* (pl. XXI), extending over its steep declivities. These forests, which are also composed of *Betula Ermani*, and sometimes contain tall trees of *Salix*, appear far lighter than those in the fluvial valleys; but the thickets of underwood and shrubs extending between the trees are proportionately thicker, and contain a larger number of plants. This character is evident, even at a level of 500', and extends high up the mountain. But at a greater elevation, the birch trees gradually diminish in number, preserving the same state of growth, until at last they disappear, and give place entirely to the shrubs, just as the latter are displaced by the alpine flora, according to the same law. These thickets of shrubs are in general impenetrable to man, and represent the pine-region in Kamtschatka. They consist of *Pyrus sambucifolia* Cham., *Alnus incana*, and a pine which is probably a variety of *Pinus Cembra*, and is called Kedrownik. The former of these shrubs predominates in the lower regions, and disappears at an elevation of 1000'. The Kedrownik grows even in the

vicinity of the coast, but appears to be most widely diffused between 1000' and 2000'. Its nuts are nutritious, and are eaten, as is also the fruit of *Pyrus sambucifolia*. The most extensive thickets consist of the northern alder, which also grows in the lower regions, in common with two others, but between 2000' and 3000' exists alone, limited by the alpine flora, bare stones, and eternal snow. On all the high mountains of Kamtschatka there exists a region in which it exclusively covers the soil. Its upper limit had been previously determined correctly by Erman to be 2890', i. e. more than 2000' beneath the snow-line (5000'); but *Salix arctica* (4974'), *Parrya Ermani*, and *Saxifragi Merckii* ascend as high as the latter.

*Grass Plain in the West of Kamtschatka*, on the Bolschaja-Reka (pl. XXII). The south-western slope of the peninsula is comparatively poor in pictorial beauty and botanical variety; the forest-growth is less than in the east, the morasses are more extensive, and bushes of willow predominate almost everywhere with the peat-moors. The landscape, which was taken in September, is remarkable from the astonishing height of two withering Umbelliferous plants, which give a most peculiar character to the grass plains of the west. They probably belong to the genera *Angelica* and *Heracleum*; their strong stems appear more than fifteen feet high; thus, growing in numbers, they project far beyond the Grasses and other herbaceous plants. We next have a tall gregarious *Urtica*, 10' high, and from which the natives prepare a valuable yarn. The remaining plants agree generally with those of the grass plains in the east.

The Algæ of Kamtschatka are described and figured in the splendid illustrated work of Postels and Ruprecht; they were also collected in the expedition of the younger Mertens (*Illustrationes algarum in itinere nauarchi Lütke collectarum*. Petropoli, 1840, fol.)

Zuccarini has published a very valuable sketch of the Flora of Japan (*Notizen über die Flora von Japan und die bisher hierüber vorliegenden wissenschaftlichen Lei-*

stungen : in the Münchener gelehrte Anzeigen für 1841 and 1844, id. pp. 430 et seq.)

It must first be remarked, in regard to the notice given in the Annual Report for 1843, of the progress of the author's *Flora Japonica*, that this work has indeed experienced an interruption, but that by the completion of the part which treats of the *Coniferae*, the number of this order found in Japan has been increased, far beyond that previously given, i. e. to 30, which are distributed through 14 genera. Zuccarini's present work contains a catalogue of all the genera as yet known in Japan, with the number of species in each family. The latter amount in all to about 1650 species; but as Zuccarini estimates the number of the Japanese plants contained in the herbaria of the Netherlands at 2400 species, the statistics must ultimately be altered in proportion as the still remaining families in V. Siebold's work are worked out. With the proportional numbers of the genera and families this will not be so much the case; hence Zuccarini's sketch acquires a permanent value. He enumerates the following as the most remarkable general results of his investigation: 1. The large number of families of plants represented in Japan, of which, according to Endlicher's system, there are 172. 2. The large number of genera in proportion to the species, for 621 are already mentioned in the catalogue, and probably 700 are contained in the herbaria (it must, however, be remarked, that Zuccarini has included the Chinese genera found in Beechey's voyage, as also those from the Bonin Islands). 3. The limitation of endemic genera to a single species, corresponding to the monotypes of the Canary Isles; a condition which applies to the greater part of the new genera from Japan, whilst the remainder contain at present only two, or, at the most, four or five species, and some monotypes also of North America and India, and the European *Humulus*, possess in Japan a second, but only a second species. 4. The very large number of woody plants in so high a latitude, both from woody families belonging

to the temperate as well as the tropic zone, from the latter of which representatives of the Palms, Pandaneæ, Lauraceæ, Ternstroemiaceæ, &c., together with numerous bamboos, are here in part diffused further towards the north than in other meridians of the northern hemisphere. 5. The endemic character of the flora of Japan, which is not connected, like Siberia, with that of Europe, having but very few species in common with Europe. We have not space, unfortunately, to enter more minutely upon the consideration of the components of the catalogue of the genera; we shall, therefore, merely confine ourselves to the mention of those families which are remarkable from the number of species they contain, and to the enumeration of some of the characteristic botanical forms of Japan. The predominating families are: Synantheraceæ (124), Graminaceæ (90), Rosaceæ (90), Leguminosæ (72), Liliaceæ, in the extended sense (60, of these 25 are Smilacaceæ), Cyperaceæ (48), Labiatae (47), Ranunculaceæ (42), Umbelliferae (40), Amentaceæ (38), Orchidaceæ (35, principally of North American and European genera), Ericaceæ (36, of North American genera), Coniferae (30), Urticaceæ in the extended sense (about 30), Cruciferae (30). Characteristic forms (excluding several tropical representatives): Melastomas (4), Zanthoxyleæ (6), Aurantiaceæ (10), Ternstroemiaceæ (19), an *Opuntia*, the source of which is, however, doubtful, Magnoliaceæ (10), one of the Proteaceæ (*Helicia* Z.), Lauraceæ (18), Palmae (4), Musaceæ (4 *Musæ*), Scitamineæ (7), the Hæmadorous *Aletris*, Dioscoreæ (5), 1 *Phillydrum*, Commelyneæ (5), *Eriocaulon* (4), and *Cycas* (1).

Zuccarini and v. Siebold have described some new genera of Japanese plants in the memoirs of the Academy of Bavaria (*Plantarum quas in Japonia collegit de Siebold genera nova*. Fasc. 1, l. c. iii, pp. 719-49). List of these genera: *Pityrosperma* (a Ranunculaceous plant with 3 species, one of which is *Actæa Japonica* Thunb.); *Pteridophyllum* (connecting link between *Hypocoum* and *Fumaria*); *Eucapnos* (*Diclytra spectabilis* D. C.); *Trochostigma*, with 5 sp. (probably the type of a new family

allied to the Ternstroemiaceæ); *Corchoropsis* (one of the Tiliaceæ); *Tripetaleia* (doubtfully placed among the Oleaceæ); *Stephanandra* (affinity also doubtful, probably belonging to the Rosaceæ); *Ceraseidos* (one of the apetalous Amygdalaceæ plants); *Platyccaria* (one of the Juglandææ); *Schizocodon* (Polemoniaceæ); *Conandron* (allied to *Ramondia*); *Phyllostachys* (Bambuseæ). According to the author, the bamboo-stems of commerce, as also the pepper-canes as they are called, are obtained from the Bambuseæ, which are common in Japan, and of which there are 15; they seldom, however, flower, and therefore the species are but imperfectly known.

Royle has drawn up some remarks upon the vegetation of Afghanistan, Cashmere, and Thibet, from the truly very inconsiderable collections of Vigne (Travels in Cashmere, Ladak, Iskardo, &c., by G. T. Vigne, 2d edit. London, 1844, 8vo, Appendix). However, these fragmentary reports are of interest, on account of Royle's intimate acquaintance with the botanical character of the Himalayan mountains, the use he has made of other sources, and the general plan of his investigation. Thus he starts with the question of what constitutes the northern and western boundaries of the indigenous plants of the Indian plains. He considers it as an established fact, that the western boundary of the Indian flora along the Indus is formed by the Soliman mountains, and, in fact, the influence of the monsoon and summer-rains, upon which the vegetation of the tropical plains is dependent, disappears entirely in the district of this meridional chain, on the line from Kelat to Peshawar. Royle is especially indebted for the observations upon the western localities of Indian plants to the traveller Falconer, who is now his successor in the Botanic Garden at Saharunpore. The latter found *Butea frondosa* even on the Jhelum, the most westerly of the Punjab rivers; the Chenopodeæ of northern India accompanied it as far as Peshawar. Above Attock, on the Indus, the characteristic plants of the British Himalaya again recurred.

Even from Attock, according to Elphinstone (Cabul, p. 130), the tropical rains extend northwards as far as Hindu-Rusch, without the high flats of Afghanistan being moistened by them; for Surat would there form its western boundary, at which place, in summer, whilst e. g. rain still falls in Pukkely, the sky is overcast for a month only, and merely occasional showers fall. Thus the double harvests of the Indian year, which are occasioned by the rainy season, cannot be obtained west of Jellalabad (Irvine, Journal of As. Soc. of Bengal). Hence between Jellalabad and Gundamuc, on the road to Cabul, the periods of development of the vegetation are suddenly changed. "In Gundamuc," writes Burnes, "the willows flowered at the end of February. On the 11th of March the first spring flower appeared; it was a sweet-smelling Iris. The apricots began to unfold their buds on the 1st of April; the wheat here was three inches above the ground, whilst in Jellalabad it was already cut." But when we take into consideration the elevation of the soil above the Indus and its tributary streams, it appears clear that the tropical conditions of the vegetation only extend so far west in the valleys. In fact, Royle does not allude to the important question, to what elevation the mountain-slopes which limit these fluviatile valleys on every side are reached by tropical rains; but as regards Cashmere, a valley lying far to the east of Peshawar, we know that the atmospheric precipitations of the spring cease to occur at that period at which the rainy season commences in the Indian plains and the low valleys of the Himalaya. Thus it appears, from all the descriptions, that the more elevated regions in the neighbourhood of Attock and Peshawar are not subjected to the monsoon. This explains Elphinstone's statement, that a number of English plants thrive in the gardens at Cohaut, where plum and peach trees were in flower at the end of February, and where weeping willows, plane, and apple trees were thriving upon European meadow plains. From these reports, it is probable that the entire district west and north of the

Jhelum, or of the salt-chain, which is intersected by innumerable offsets of the Himalaya and Soliman mountains, with the exception of the lower fluviatile valleys, is free from all those Indian vegetable forms which, up to the foot of these mountains, are extended in an uninterrupted distribution over the Punjab.

But Royle's investigation passes over unnoticed a still more important aspect of the question regarding the boundaries of the Indian flora. Hitherto we have only treated of tropical forms of vegetation, to the growth of which the rainy season is unfavorable; but in addition to these, India possesses in the Himalaya and the monsoon region that mountain vegetation also, in which the European type is repeated. Here the question arises whether the areal limits of the latter are the same as those of the former, with which, in fact, they partly grow in common on the western chain of the British Himalaya, without, however, being favoured in the same degree, during their period of vegetation, by the tropical rain. The knowledge of this remarkable coexistence of the productions of two climates, for which we are also principally indebted to Royle's former investigations, has not induced him to devote his attention to the question of whether there are not forests of Himalayan trees in other regions which do not shade tropical plants in the rainy season. However, the simultaneous publication of Jacquemont's Journal at Cashmere has thrown some light upon this obscure point (*Voyage dans l'Inde*, vol. iii, p. 169). The traveller describes his journey from the Punjab to Cashmere over the Pirpanjol, the Himalayan Pass, which Royle, relying upon Bernier's descriptions, had formerly marked as a sharply-defined limit of the vegetation of the Indian flora, which assertion he now himself withdraws pretty openly. During the ascent, the pomegranate and olive trees disappeared at an elevation of 16—1700m., and soon after, *Pinus longifolia* also. A region of oaks, *Pinus attenuata*, and firs was next met with, which, on the northern slope of the chain, extended above the level of

the Pass (2681m.), whilst on this side it terminated below the alpine meadows. The alpine vegetation presented merely local differences from that of the British Himalaya; its spring-plants were in flower at the commencement of May. On the north side, therefore, Jacquemont first met with the same trees he had left on the southern slope, and further down, in the district of the valley of Cashmere, he arrived at forests of an *Æsculus* of the same species as that indigenous to the British Himalaya. The older opinions concerning the Pirpanjol, which Royle disseminated, are contradicted by these Reports. But as there is no tropical region in the valley of Cashmere, we have here also a proof that the diffusion of the Himalayan plants is not limited by the boundaries of the monsoon. The tropical forms of India may be wanting in Cashmere—and there is no evidence to show that they exist there—and yet the forest trees may appear the very same, and the character of the vegetation for the most part identical with that of the British Himalaya; in fact, the greater number of species may be common to both of them. The natives of the Pirpanjol say that it is always raining there (p. 225); hence this Pass may form one of the points of the boundary, as far as which tropical forms accompany the wooded slopes of the Himalaya. When thus considered, all the known facts are connected under a common point of view, but they are by no means sufficient for determining the absolute sphere of diffusion of all the Indian plants. Although Royle has rendered it probable that this area does not extend west of the monsoon-limit, yet the line at which the Himalayan plants cease, towards the north, is either totally unknown to us, as is the case beyond Cashmere, or merely indicated by uncertain evidence.

Royle's statements regarding the flora of the elevated plains of Afghanistan are very general; but where Griffith is his authority, the fragmentary notices derived from his letters are substantiated by the catalogue of a series of Afghanistan genera, the seeds of which were also transmitted by Griffith. They are nearly all European forms,

and principally the following: *Aconitum* and *Papaver*; 5 European Cruciferæ and *Tauscheria*; *Silene* and *Arenaria*; *Ruta* and *Peganum*; *Euphorbia* and *Phyllanthus*; several Astragalaceæ and *Caragana*; *Rosa* and *Cratægus*; *Epilobium*; *Prangos pabularia*; several *Carduaceæ* with *Centaurea* and *Cicorium*; *Campanula*; *Heliotropium* and *Onosma*; *Pedicularis*, *Linaria*, *Veronica*, and *Verbascum*; *Hyoscyamus*, *Samolus*, *Plantago*, *Hippophæe*, *Rumex*, and *Polygonum*; *Blitum*; *Iris* and *Tulipa*. Irwine treats fully of the cultivated plants of Cabul (loc. cit.) Wheat, barley, lentils, and peas are sown; they are protected during the winter by a layer of snow, and harvested in June. To the summer crops, which usually require irrigation, belong *Phaseolus radiatus*, *Cicer arietinum*, *Panicum miliaceum* and *Italicum*, maize, and rice; these are sown in May, and harvested in the months of August and September. Besides the European vegetables, *Solanum melongena* and several Cucurbitaceæ are cultivated, which require much manure and water. The meadows yield abundant crops of hay, and contain some excellent species of trefoil: one of these is denominated *Trifolium giganteum*; *Medicago sativa* is also widely diffused. The fruit trees of Cabul are celebrated: in addition to the fruits of central and eastern Europe, those of *Elæagnus* (Sinjet and Sinjilla) and *Edgeworthia buxifolia*, one of the Theophrasteæ, are mentioned.

Falconer discovered, in Cashmere, the plant yielding the Costus of the ancients, a substance which still forms an article of commerce in India, under the name of Koost or Koot. It is obtained from the aromatic root of a new alpine species of *Carlina* (*Aucklandia*), which Falconer has accurately described (Linnæan Trans., xix, p. 23). He has also proposed there (p. 101) the Asclepiadaceous genus *Campelepes*, from Peshawar. Falconer's so-called *Fothergilla*, which forms large bushes in Cashmere, and the wood of which, according to Vigne, is called Chob-i-pan, is a new type of the Persian *Parrotia* (*P. Jacquemontiana* Decs.)

From the elevated valley of Astore, between Cashmere and Thibet, Vigne brought the following plants: *Aconitum heterophyllum*, *Anemone discolor*, *Podophyllum*, *Dianthus*, *Geranium*, *Epilobium*, several Gentians, *Swertia* and *Ophelia Chirata*, *Polemonium cæruleum*, and *Dracocephalum Royleanum*. Here, far above the tree-limit, we find the elevated plain Deosuh, at an altitude of 13,000', the soil of which is rendered verdant by dwarf-willows and alpine herbs, whilst the valley in which the Indus runs in Thibet is bare, a few plants occurring only at the snow-line. Falconer found here a new *Rheum* and two species of *Pyrola*, which, as Royle remarks, are the only Ericaceous plants in Thibet. Vigne's plants from Iskardo agree pretty accurately with the older collections from Kunawar: *Actæa*, some Cruciferæ, *Silene Moorcroftiana*, *Acer microphyllum*, *Myricaria*, *Biebersteinia odora*, *Astragalaceæ*, several *Potentillæ*, *Saxifraga stenophylla*, *Hippophæe* and *Salsola*.

Jacquemont's work on his travels, which has been mentioned above, is now complete, and affords extensive contributions to our knowledge of India in a botanico-geographical point of view, especially the flora of the British Himalayas and those of Thibet (Journal, vol. i-iii. Paris, 1841. Vol. v, Descriptions des Collections. Ib. 1844, 4to. 2 vols. plates). The admirably-kept journal of this traveller, which is printed unaltered, contains, of course in a fragmentary form only, the impressions produced by the character of the vegetation of the Himalayas, and separate regions of India; but in the last section of the work, the more rare and new plants of Jacquemont's herbarium are treated in systematic detail by Cambes-sèdes and Decaisne, and illustrated with 180 plates.

In Lesser Thibet, J. travelled on the road to Ladak, in the valley of Spiti, as far as Danker, where at an elevation of 17,000', at the limit to vegetable life, he found the new Anthemideous genus *Allardia*, a *Nepeta*, and an *Urtica*. The villages in the valley of Spiti, according to Jacquemont, are situated on a higher level than that

formerly stated by Royle, e. g. Nako at 3658 m.; and the cultivation of the Cerealia, which is limited to *Hordeum hexastichon* and *caeleste*, and a *Panicum*, extends here to 3962 m., whilst in the southern Himalaya it only extends to 3048 m. Woody plants are not entirely absent from this elevated valley; even low trees, an indigenous *Juniperus*, and cultivated poplars and willows, are met with. The character of the vegetation, however, lies in the bushes, which was also noticed by Moorcroft. These consist not only of thorny *Astragali*, but also of *Genista*, *Rosa*, *Ephedra*, and *Juniperus*. The absolute limit of elevation of the Phanerogamia west of Bekar was most accurately determined by Jacquemont. Here, in two passes leading from Thibet, Gantong (5486 m.) and Kinbrong (5581 m. according to Gerard's measurement), he left these plants below him. The leguminous shrubs of the valleys of Kunawar and Lesser Thibet were not found on the slopes of this pass, only a few alpine plants, the last of which was met with at Gantong, about 2—300 m. beneath the summit, hence at a level of 5200 m. Here he found two *Potentillæ*, *Corydalis phytocarpa*, the new Caryophyllaceous plant *Periandra cæspitosa*, which resembles in appearance *Silene Acaulis*, with *Allardia* and *Eritrichium Jacquemontii* (Decs. ii, p. 309). Much lower down, the traveller met with a rose, forming the last shrub, and considerably lower still a *Juniperus*. At Kinbrong the vegetation also disappeared 300 m. below the pass, with a *Ranunculus*, *Corydalis*, and *Ligularia nana*; but at a level of 5400 m. Jacquemont saw an isolated green spot in the stony desert-waste. This was the highest evidence of vegetable life which he perceived (ii, p. 298). He estimated the snow-limit here at little less than 6000 m., so that between the last plants and perpetual snow there is an intermediate bare region extending through about 2000'.

As regards Kunawar, that remarkable transition-district between the British Himalaya and Thibet, on the central Sutlej, where the influence of the monsoon on

the seasons ceases, and the dryness of Thibet commences, Jacquemont's botanical observations agree with the more copious reports of Royle. The forests are very inconsiderable, the growth of grass poor, and kept down by Tragacanth-shrubs (*Astragali*), which are distributed as far as here; the alpine flora is also very scanty (ii, p. 269). Jacquemont devotes particular attention to the cultivation of the grape-vine, which is confined to this part of the Himalaya, not extending beyond the limits of the tropical rain (ii, pp. 416 et seq.) Although the grape-vine is cultivated at an elevation of 10,000', this is only the case in the bottom of the valley, not on the mountain-slopes, for it only there receives the reflected rays of the sun, which are necessary to ripen the grapes, and there it is also protected from that radiation of heat which exerts too powerful an effect in cooling the earth on mountains. Moreover, even in the valley of the Sutlej, irrigation is indispensable to this branch of culture; but although the grapes under these circumstances mostly ripen well, they are usually dried in the sun, and used to make raisins, as the wine does not keep long, and even when new was found almost undrinkable by the Frenchman. We find the grape-vine as far upwards as Nako, in the valley of Spiti, and downwards as far as the mouth of the Buspa, where the climatic line above mentioned lies, and where the Sutlej intersects the high southern chains of the Himalayas.

The chains of the Southern Himalayas, which are situated immediately opposite to the plain of the north of India, do not possess any of that variation of soil, by means of which their vegetation might equal the flora of the Alps in variety, notwithstanding the mixture of forms of Tropical and European plants. Plane surfaces are scarcely anywhere found; and as we have already remarked, the broad valleys of Cashmere and Nepal form exceptions to the mountain-character. Perpendicular precipices are also absent. We find everywhere vast inclined plains, and the mountain-stream usually entirely

fills up the bottom of the valley. Jacquemont says (ii, p. 130), "the vegetation which covers the inclined soil is as uniform as this conformation. Variety of localities causes a region to abound in plants, but here all the localities are alike." In the upper regions the forests are generally thin, and belong principally to the valleys. On viewing from a distance one of these immense declivities, on which there are scarcely any forests, we perceive lines of a darker green accompanying the few rivulets which water the mountain-slopes, at great distances apart. Between them the green is uniformly pale, for neither meadows nor mountain-pastures thrive there; but, with the exception of the summits of the rocks, an irregular and unfruitful growth of plants prevails among the blocks and the crumbled portions of rocks. High mountains occur, which, from the valleys to the crests, are covered with this mixture of rocks and plants only. More commonly a thin forest is distributed over a soil of this kind, between 6000' and 7500', consisting either of pine trees on the southern declivities, or the oak, with *Rhododendron arboreum*, on those which are colder. It is only at the foot of the mountains that dense forests, such as those on the Alps, flourish. The elevated forests of the Coniferous region of the Alps are not met with on the Himalayas.

At Massuri, Jacquemont measured the lower limit of the oak forest containing *Rhododendron arboreum*, and estimated it at 1768 m. (ii, p. 52). This measurement is tolerably near that given by Royle, who, in this district, determined the elevation of 5000' to be the level at which the forms of the European forests appear in the place of tropical trees. In his ascent of the Kedarkanta, in the district of the source of the Jumna, Jacquemont also estimated the upper tree-limit at 3500 m. (ii, p. 127). The pine forests (species of *Abies*) terminated here, and were succeeded by a shrubby formation of *Rhododendron* (probably *Rh. lepidotum* Wall.); where this also disappears, the alpine soil is covered with turf, consisting of Grasses

and *Carex*, among which Ranunculaceæ most commonly spring up, with *Iris*, *Corydalis*, and *Phalangium*. The above measurement of the tree-limit appears to deserve the more confidence and to form an indication of climatic conditions, inasmuch as on the Kedarkanta the soil and inclination of the summit were favorable to forest growth.

Towards the end of his extended tours through the East Indian peninsula, Jacquemont's attention was drawn to an important peculiarity in the progress of the vegetation on the eastern coast of the district of the Ganges (iii, p. 550). In Bengal the soil remains green throughout the year, because the water flows off these plains so slowly, that it is retained deep in the soil during the dry season; also because in the winter dense fogs, and in the hot and dry months of spring, transient thunder-showers occur. Thus, when the traveller landed, on the 5th of May, at Calcutta (therefore on the coast), the turf was just as green as at the period of the heaviest precipitations in August. The treeless country of Puna, in the western Ghauts, however, in 1832 remained perfectly arid and parched, even in the latter third of June, just like the soil of the steppes; the surface of earth was without a trace of moisture, and, as it were, glowing in the sun's rays. Yet on the 1st of July the whole country was green, even the barest rocks had become covered with turf with wonderful rapidity. Hence the character of the monsoon flora is much more distinctly stamped here than at Calcutta: but the Bengal coast is anomalous in this respect. In the greater part of India, the vegetation of most of the plants is interrupted for a longer period by the dry season, than in Europe by the winter. The large shrubs, the sugar-cane plantations, and the turf of *Panicææ* wither and dry up in November, and their vegetative life is not again aroused until June or July of the following year. At Puna the rainy season then lasted but little more than three months, and ceased at the beginning of November; but that year threatened to be unproductive, in consequence of too small an amount of rain having fallen.

In the descriptive part of Jacquemont's work, which, arranged in accordance with De Candolle's system, is worked out by Cambessèdes as far as the conclusion of the Rosaceæ, and the remainder by Decaisne, in addition to a large number of new species, the following genera, mostly from the Himalayas are proposed: *Christolea* and *Donepea* (Cruciferæ), *Oligomeris* (Resedaceæ), *Periandra* (vid. sup.), *Anquetilla* (Xanthoxylaceæ) *Leptopus* (near *Phyllanthus*), *Allardia* (v. s.), *Melanoseris* (Cichoraceæ), *Belenia* (Solaneæ), *Dargeria* (Scrophulariaceæ), *Lasiosiphon* (*Gnidia* sp. plures) *Girardinia* (*Urticæ* sp.), and *Diplosiphon* (a remarkable Epigynous and Monocotyledonous water-plant, the natural affinity of which is not determined).

The continuation of Bentham's work upon the Indian and African Leguminosæ, which was noticed in last year's Report, includes about a hundred Genistas, most of them from the Cape (London Journal of Bot. iii, p. 338-65).

The new parts of Korthal's Monographs on the Flora of the Indian Archipelago (Annual Report for 1841), contain the Melastomaceæ, Oaks, and the following genera: *Cratoxylon* and *Tridesmis*, *Hippocratea* and *Salacia*, and *Maranthes*; *Boschia*, nov. gen. (Sterculiaceæ), *Omphocarpus*, n. g. (near *Grewia*), *Paravinia*, n. g., and *Cleisocratera*, n. g. (Rubiaceæ). De Vriese has described a *Casuarina* (*C. Sumatrana* J.) found by Junghuhn in Sumatra in v. d. Hoeven's Tijdschrift (1844, p. 113), also some Javanese plants (id. p. 336-47); the only new plant is an *Æschynanthus*. New contributions by Hasskarl on various families of the Javanese flora are published partly in the same Journal (p. 49, iii; pp. 178-228), and partly in the Ratisbon Flora (1844, pp. 583 et seq.) Montagne has described some new Javanese Mosses (London Journal of Botany, 1844, pp. 632-4). Dozy and Molkenboer have commenced an illustrated work on the Mosses of the Indian Archipelago (*Musci frondosi inediti Archipelagi Indici*, Fasc. I. Lugdun. Batav. 1844). The preliminary diagnostic characters of about 75 new species have been published by

them in the 'Annales des Sciences Naturelles' (1844, ii, p. 297-316); among these are the new genera *Cryptocarpon*, *Endotrichon*, and *Symphysodon*.

An extremely important systematic and illustrated work, on the Flora of Java, which is now concluded, is that published by Bennett and R. Brown from Horsfield's herbarium (*Plantæ Javanicæ rariores descriptæ inconibusque illustratæ*. Descriptiones et characteres plurimarum elaboravit I. Bennett, observationes structuram, et affinitates præsertim respicientes passim adjicit, Rob. Brown, pt. i, Londini, 1838; pt. ii, 1840; pt. iii, 1844). This work contains 45 plates, and the following new genera: *Sclerachne* and *Polytoa* (Graminaceæ), *Hexameria* (Orchidaceæ), *Cyrtoceras* (Asclepiadaceæ), *Stylodiscus* (*Andrachne trifoliata* Roxb.), *Euchresta* (*Andira Horsfieldii* Lesch.), *Mecopus* and *Phylacium* (Leguminosæ), *Saccopetalum* (Anonaceæ), *Lasiolipsis* (near *Harrisonia* Br.), *Pterocymbium* (Sterculiaceæ), and several types from other countries, which are elucidated in these copious disquisitions.

Junghuhn's diaries of his travels in Java, which have been already alluded to, were indeed first published, with additions, in 1845 (*Topographische und naturwissenschaftliche Reisen durch Java*, von F. Junghuhn, herausgegeben von Nees v. Essenbeck. Magdeburg, 8vo), but for the sake of connecting them with the preceding Annual Report, we think it better to report upon them now. In the western portion of the island, as at Gedé, the traveller found the mountain-ridges covered far and wide on both slopes with Rosamala-forests, i. e. with *Liquid-ambar Altingiana* Bl., the stems of which are recognised even at a distance by their tall straight growth and white colour, and which overshadow a thicket of Scitamineæ, *Melastomæ*, *Rubus*, and other shrubs (p. 165). A rich red soil here covers almost the whole of the trachyte of Gedé. According to several measurements, the region of the Rosamala-forests is situated at a level between 2000' and 4000' (p. 436): this tree, which is confined to the west of Java, occurs

singly as high as 4500', and as low as 1500'. It is one of the most gigantic formations of the vegetable world, and attains on an average a height of 150': the stems when cut down measure 15' in circumference, 12' above the root; their length below the point at which they branch amounts to 90'—100', and the crowns extend to a height of from 50' to 80' beyond this. Cocoa palms would scarcely reach as high as these crowns. Above the Rosamala-forest on Pang-Gerango, came forests of Laurineæ, *Castaneæ*, Oaks, *Schima*, and *Fagraea*, which were far more abundantly filled with climbing plants (e.g. Freycinetias and *Calamus*) and parasites (Orchidaceæ and Ferns); and these again were succeeded by the Podocarpeæ. But even beyond the limits of *Podocarpus* the arboreal form is not wanting here, as is the case on other mountains. On the summit of Pang-Gerango itself, at a level of 9200', *Thibaudia vulgaris* J. and an undetermined dioecious plant, 30 feet in height, with various other trees, form a wood abounding in Mosses, which, however, from its manner of growth, appears to belong to a vigorous growth of mountain pines (p. 452), although, even as far as this, a slender tree-fern, *Cyathæa oligocarpa*, from 15' to 20' high (extending from 5500'—9200'), is met with (see Annual Report for 1841, p. 449). "But," says Junghuhn, "we search in vain throughout the island for another example of such a wood on a mountain-top: all the mountains, far below this altitude, are either bare, being covered with lava and crumbled rocks, or overgrown with grass meadows of *Festuca nubigena* J. or with social Casuarinas." Junghuhn estimated the upper forest-limit on the Tjernai volcano (p. 235) at 7000'; it is formed by *Podocarpus imbricata* Bl., and is immediately succeeded by the subalpine shrubs (see preceding Ann. Report), and this appears to be the general manner in which the forests are distributed throughout the island. The true climatic arboreal limit of Java, which is only attained on the Pang-Gerango, and is here indicated by the mountain-pine formation of the wood on the mountain-top, is thus situated several thousands of feet higher than the apparent

one, which is merely produced by local conditions of soil, and thus Junghuhn, by his ascent of this mountain, has thrown some light upon an anomaly which has hitherto been almost inexplicable, viz. that the tree-limit in Java is so much lower than in the Himalaya, and that in general subalpine Ericaceous shrubs, with the northern alpine genera (e. g. *Ranunculus*, *Viola*, and *Gentiana*), descend there to an equally low level of 7—8000'. Yet the difficulty in explaining these deviations is not, in fact, completely removed by these observations, but merely confined within narrower limits; for although Pang-Ge-rango teaches us, that at 9200' the most luxuriant woods still imitate the crooked stems of the mountain-pine, yet we find in India forests of tall fir trees at a level of more than 10,000'.

At the foot of the mud-volcano Galungung, Junghuhn describes the occurrence of almost impenetrable rush-formations, the marshy surface being thickly covered with *Saccharum Klaga*, 15' in height, around which an *Equisetum* and *Epidendra* are coiled. Above these marshes, on the slope of the mountain, the forest of Urticæ and Magnoliaceæ commences, including all those accessory components which render the attempt to describe tropical forests apparently impossible, even although we should not aspire to represent its copiousness by words and expressions, but merely to seize the distinctions in its mode of development and the conditions under which it occurs.

Just as the Rosamala-forests in the west of Java determine the physiognomy of the mountains, when covered by them, so in the eastern portion of the island do the forest-regions of *Casuarina equisetifolia*, which, however, are not met with below a level of 4000'; hence, although they ascend higher than other forms of trees, they are confined to the more limited space on individual elevated points. No trace of *Casuarinæ* is found west of Merapi, a mountain from which they are almost extirpated, whilst they do not appear to be absent from any of the mountain-tops which ascend on the east of it (p. 372).

Junghuhn gives the following statements regarding the altitudinal limits of some branches of cultivation in Java. Coffee might probably be cultivated as far as a level of 5000', but at present the plantations do not usually extend beyond 3000' or 4000' (p. 234). *Artocarpus integrifolia* and *Arenga saccharifera*—3000', *Duris zibethinus*—2000' (p. 419).

Kittlitz gives two landscapes of districts in Manilla (Plates XXIII, XXIV), which, like all the others, are extremely characteristic, but deficient in sufficient botanical elucidation. Montagne has described the *Algæ* of the Philippine Islands from Cumming's collections (Lond. Journ. of Bot. 1844, pp. 658-62).

### III.—AFRICA.

Of the botanical investigations of the French in Algeria but few notices have yet been published. Durieu met with extensive forests of cedar at Blidah, on the Lesser Atlas (Comptes rendus, vol. v, p. 18). As far as a level of from 7—800m. the mountain-slope was inhabited, and the soil cultivated; the oak then began to be intermixed with the fruit trees, and soon after single majestic cedars, 40 meters in height, were seen. But it was only on the southern declivity that the traveller met with connected forests of this tree, which are cut down annually by the inhabitants; they do not, however, appear to be destroyed as at Mount Lebanon, but are apparently readily reproduced. At Mascara, Durieu found *Callitris quadrivalvis* common, and increasing in frequency thence towards the south (Comptes rendus, vol. v, p. 19). Bory de St. Vincent has described some new species of *Isoëtes*, partly living upon a dry soil, from Algeria (l. c. vol. xviii).

We may now recur to Russeger's travels (Annual Report for 1842), since his work has proceeded to a considerable extent, and commenced the illustration of

the conditions of the climate and soil in a more tangible and definite style than was the case in the first volume, which treated of the East (Reisen in Europa, Asien, und Africa, Bd. 2. Stuttgart, 1843-45. In 1844, appeared the first part of this volume, including Egypt and Nubia, and the first number of the second part, containing Eastern Soudan). The climate of Lower Egypt, as far as Cairo, is that of the Mediterranean—a wet winter (ii, p. 263) and a serene summer. In Cairo we find the rainless zone of the north of Africa. At Cairo, according to the quinquennial average of Clot Bey, there are twelve rainy days in the year, with 0.034m. of rain. The absence of rain, both in Upper Egypt (Cairo to Nubia) and in the Sahara, depends upon constant north winds; hence Egypt is climatically a part of the Sahara.

The swollen state of the Nile, produced by the tropical rainy season, lasts from June to the end of September (i, p. 229). The months of October and November form the period at which the Cerealia are sown in those tracts of ground which are artificially flooded by canals; the harvests occur in February and March. Here, according to the kind of grain, a second crop may be sown in April, and reaped immediately before the irrigation. In other fields, the crop cannot be sown until December or January, and only once reaped, in May.

*Sketch of the most important Branches of Cultivation, arranged according to the usual period at which the Crops are Sown and Reaped.*

SOWN.	HARVEST.
January. Beans (Cerealia).	Sugar-cane.
February. Rice, maize.	Barley, melons.
March. Cotton.	Cerealia, maize.
April. (Cerealia.)	
May.	Figs, dates, grapes (Cerealia).
June.	Beans (Cerealia).
July.	Cotton.
September.	Oranges, olives, rice.
October. Cerealia.	Rice.
November. Cerealia.	Maize.
December. (Cerealia.)	

In the rainless zone of the north of Africa, in consequence of the duration of the polar currents, the great diurnal differences of temperature allow of the formation of dew to a slight extent; it occurs very copiously in the lower valley of the Nile, is formed in Upper Egypt, and appears also to fertilize the oases. Russeger, however, did not meet with any dew in the Desert of Nubia, but in that of Lybia it is common (ii, p. 253). The oases lying to the west of Egypt, according to Russeger, generally obtain their soil-water from the Nile, which flows laterally to them over beds of clay (p. 271). Thus they form a valley which is filled with springs, excavated below the level of the Nile, and parallel to this river. The other oases of the Sahara appear to be produced merely by the formation of dews. Borgu, Darfur, and Kordofan, however, in this sense are not oases, but savannahs, situated within the rainy climate (p. 283).

The tropical rains extend in most years to, at the most,  $18^{\circ}$  N. lat. (i, p. 224), i. e. two degrees north of Chartum, the point at which the two arms of the Nile become confluent. The heavy rains fall there in the summer, and correspond to the south winds which blow at this time, and which prevail below  $15^{\circ}$  N. lat. from April to September, and alternate every six months with the north winds. The northern border of this monsoon-zone, which in the south of the Desert or Soudan produces savannahs, is not accurately determined. A short rainy season may occasionally occur beyond  $18^{\circ}$  N. lat., when the south winds blow as far as this part. However, the dry chamsin of the Desert, which blows from the same direction, and which Russeger regards as a local and electrical phenomenon, must not be confounded with these general south winds which bring rain. Even between  $16^{\circ}$  and  $18^{\circ}$  N. lat. the rainy period is irregular, and in many seasons abbreviated: at Chartum it lasts five months. Russeger assumes the following mean values as marking the north border of the tropical rainy zone throughout Africa:— $21^{\circ}$  N. lat. at the Red Sea,

18° at the Nile, 16° north of Tschad (according to Denham), and 20° in Senegambia (ii, p. 546). He forms a law on the great diurnal differences of temperature between the night and day, even within the rainy zone, which, if generally confirmed, would constitute a characteristic peculiarity of tropical Africa.

The whole of Nubia, as far south as 18° N. lat., except the valley of the Nile and the coast, consists, like Egypt, of rocky and sandy deserts. The heights here extend scarcely 1000' above the plain, on the coast only ascending to 4000', and in Dschebel Olba, according to Wellsted, to 8000'. The coast of the Red Sea is not free from rain; but on the Nubian side, the summer rains produced by the south-west monsoon extend almost as far as the latitude at which the tropical winter rains (as in Lower Egypt) commence. Suakim is situated on the northern border of the full rainy season (19° N. lat.); here, however, it occurs six weeks later (middle of July) than below 17°, and the summer rains are proportionately retarded and abbreviated as far as 21° N. lat., from which latitude northwards the winter rains commence. Although the upper portion of the sea north of Suakim is set in motion throughout the entire year by north winds, yet the African coast of the Arabian Sea is never free throughout the entire year from humid currents of air. This explains how it is that the entire coast line of Nubia is furnished with willows and other trees, whilst the inner country does not contain even oases. During the journey through the Desert, from Korosco to El Muchaireff, which occupied fifty hours, and is usually made to avoid the great bend of the Nile, Russeger only once met with brackish water, and that was in the middle of the journey.

The Nile leaves the zone of tropical rain at the influx of the Atbara, and again comes in contact with it by its bend at Dongola for a short distance. South of the mouth of the Atbara, savannahs begin to alternate with tropical forests, and this is the case throughout

the whole of Soudan: no more deserts are met with, except where the soil is rocky; they gradually pass into savannahs (ii, p. 525). The savannahs, during the rainy season, are overgrown with thick grass; in the other months they resemble a dry stubble-field. The forests consist of *Mimosæ*, and are crowded along the banks of the stream, as in Guiana. Near the rivers the rain district also extends further north; hence, at a considerable distance from them, even beyond the 18th degree, the creeks of the desert encroach upon the savannah.

Throughout the entire district of the Nile, at least as far as the 10th degree south, there are no terrace-like elevations of the soil west of Abyssinia, only immense plains. The terraces of Sennaar, Fazokl, &c., are geographical over-estimates (ii, p. 539). According to Russeger's barometrical measurements, the following places are situated at the annexed altitudes above the Mediterranean: Assuan (Syene), 342', Par.; Korosko, 450'; Abuhammed, 963'; El Muchaireff, 1331'; Chartum, 1431'; Torra, on the White Nile, 1595'; Eleis (13°), 1667'; and the capital of Kordofan, El Obeeid, 2018'. Russeger found the northern limit to the occurrence of *Adansonia*, in the savannahs of Kordofan, to exist below 14° N. lat.

On the coast of Adel, on the road from Tajura to the foot of the mountains of South Abyssinia, according to Harris's report of his travels (The Highlands of Ethiopia. London, 1844, vol. i, p. 412), the entire country was desert, and almost dried up in June, i. e. before the commencement of the rainy season, and the soil entirely uncultivated. When the heavy rains commenced it was stormy and unhealthy; one of the most uninhabitable parts of Africa. The flora was uncommonly poor; the woody plants consisted of shrubs of *Mimosæ* and *Cadaba Indica*, one of the Capparidaceæ; subsequently isolated Palms, *Cucifera Thebaica*, and below 11° N. lat. *Phœnix* were met with. The only other plants found at the end of the dry season were a few Capparidaceæ and Malvaceæ; and

of other botanical groups of the steppes, single forms only, as *Stapelia*, *Pergularia*, and some succulent Euphorbias; but at the river Hawasch the vegetation became social, by the formation of thickets of *Tamarix* or *Balsamodendron Myrrha*, with single Capparidaceous trees (i, p. 416). At the foot of the high mountains of Abyssinia, *Aloe Socotrina* was also met with, and soon after *Tamarix Indica*, with which the desert steppe was overgrown.

Harris read a paper on *Balsamodendron Myrrha* before the Linnæan Society (Ann. Nat. Hist. xiii, p. 220). This important shrub is called by the Danakil tribes, who inhabit the coast of Adel, Kurbeta. Myrrh (Hofali) is the milky juice which escapes from wounds made in it, dried in the air; it is usually collected in January, the period at which the buds unfold, and in March, when the seeds are ripe. *Balsamodendron Opobalsamum* grows on the opposite Arabian coast, at Cape Adem. The Frankincense trees of the mountains of Cape Guardafui, have not been botanically determined.

Harris's botanical reports upon Shoa are very unsatisfactory (The Highlands, &c. ii, pp. 395 et seq.) The pine of North Abyssinia is replaced in Shoa by the Det, a *Juniperus*, 160' in height, with a stem from 4' to 5' in diameter, and with the growth of a cypress. Forest trees are also mentioned: *Taxus* (Sigba), *Ficus* (Schoala), and *F. Sycomorus* (Worka); moreover, Ruppel's Lobeliaceous tree, *Rhynchoptalum montanum* (Jibera), is common at Aukofer, the stem of which is 15' in height, and bears a crown of large leaves. Shrubs: an *Erica* (Asta) and *Polygonum frutescens* (Umboatoo) distributed generally. *Celastrus edulis* (Choat) is cultivated commonly, and resembles tea in its action and taste (ii, p. 423).

Harris's meteorological observations, which were made from August to December in 1841, and from January to July in 1842, in Aukofer, the capital of Shoa, are of more importance. This place is situated below 9° 35'

N. lat., 8200' above the level of the sea, and upon an open, cultivated flat. The climatic values are as follow :

	Mean Temperature.	Number of Rainy Days.	Quarter of the Wind.
January . . .	11° 1 C.	—	East
February . . .	12° 5 "	7	East and South
March . . .	14° "	4	East
April . . .	12° 9 "	14 (storms?)	East
May . . .	15° 4 "	4	East
June . . .	16° 7 "	8	East
July . . .	14° 5 "	28	Changeable
August . . .	13° 2 "	26	Changeable
September . . .	13° "	13	North and East
October . . .	11° 2 "	4	North and East
November . . .	11° "	4	North and East
December . . .	11° "	—	East

Mean temperature, 13° 1 C. ; Maximum, 20° 6 ; Minimum, 5° C.

In Koolo (4° N. lat.), south of Enarea, on the confines of the pigmy Doco-negro tribes, according to the reports of the natives, the rainy season lasts from May to February with but slight intermission (iii, p. 64). To the north-west of this part, below the 5th degree of north latitude, the country of Susa is situated, high up on the prolongation of the Abyssinian mountains, and there, as at Shoa, the rainy season lasts only three months ; but it must be colder there, for the mountains appeared to reach the sky, and were covered with perpetual snow. This is the district in which Bruce supposed the White Nile to arise.

Hochstetter has described some new Grasses found in Nubia and Abyssinia, from Kotschy and Schimper's herbarium, and after making some critical remarks upon the results obtained by Raffeneau, Endlicher, and himself in this branch of the Flora, proposes the following new African genera (Ratisbon flora, 1844): *Chasmanthera*, a Menispermaceous plant from Abyssinia ; *Paulo-Wilhelmia* (Dombeyaceæ), from Nubia ; also from Abyssinia, the Umbelliferæ, *Agrochoris*, *Haplosciadium*, and *Gymnosciadium* ; *Discopodium* (Solanaceæ) ; *Hymenostigma*, and

*Acidanthera* (Iridaceæ); and *Clinostylis* (Liliaceæ). Fresenius has written notices of some Abyssinian plants (Bot. Zeitung, 1844, pp. 353-7). Fenzl has announced a work upon Kotschy's collections from Africa, and in it has enumerated a series of new forms, but without giving any descriptions (Ratisbon Flora, 1844, pp. 309-12).

A valuable notice of the plants collected by Krauss in the most southern regions of the Cape Colony, and in Natal, with a report on his travels, and a botanico-geographical introduction, has been published by the author (Ratisbon Flora, 1844, p. 46). He accurately describes the large elevated forests, which are limited to a small area, considering the extent of the whole colony, and extend along the south coast between Gauritz and the Kromme river and the foot of the Onteniqua mountains. According to his account, Drège's representation, contained in E. Meyer's work, of the generally poor character of the forests of the Cape, is not perfectly correct. At least in this district there exists a quantity of timber collected into woods, which Krauss characterises as impenetrable thickets. He mentions some gigantic stems of *Podocarpus*, which four men cannot span; moreover *Crocoxydon excelsum* (Safranhout), *Ocotea bullata* (Stinkhout), *Curtisea faginea* (Hassagaihout), and *Elædendron Capense*—trees, the large, densely leafy crowns of which are elevated far above the thicket beneath, and covered with numerous climbing plants. Underwood, e. g. *Burchellia*, *Gardenia*, *Canthium*, *Plectronia*, *Tecoma*, *Grewia*, *Sparmannia*, and *Rubus*. Lianes: *Cissus*, *Clematis*, *Cynoctonum*, and *Secamone*; Ferns in the deeply-shaded parts. After a tedious ascent, and laborious struggle through the chaos of bushes, is finally reached a thin wood, the trees become smaller and smaller, and their limit is soon attained. They are succeeded by shrubs of Synantheraceæ, Thymeleaceæ, Bruniaceæ, Proteaceæ, and Ericaceæ.

Krauss confirms the statement that the river Camtos constitutes a distinct limit of vegetation. This stream

might form the boundary between the flora of the Cape, and of the Caffre country; for here certain types of tropical Natal commence, whilst the Proteaceæ, Ericaceæ, Selaginæ, &c., diminish. The shrub-formations in Algoa Bay are taller and thicker than in the western districts; they serve as places of concealment for large Pachydermata. Characteristic forms of plants: Celastrineæ, *Euphorbia Canariensis*, *Strelitza*, *Zamia*, *Tamus*, *Pelargonium*, &c. This remarkable difference between the eastern and western provinces of the Cape Colony, which Bunbury also (London Journal of Botany, 1844, pp. 230-63) mentions and enlarges upon more in detail, is by no means to be so simply explained as the tropical peculiarities of the flora of Natal. At Graham's Town in Albany, Bunbury only found 13 plants in the extensive surrounding country, and these occur also at the Cape. Ericaceæ and Proteaceæ are rare, arborescent Euphorbias common, and the Restiaceæ replaced by Grasses. Extending along the Great Fish River, we find the wildest thickets of shrubs with arborescent Euphorbias, *Strelitzia*, and *Zamia horrida*; these are more impenetrable, and from the presence of spinous trees, more inaccessible than the natural Brazilian forests: they merely form the abode of large Pachydermata and border-robbers of the Caffre race. Tropical families of plants, single species of which only occur at the Cape, become numerous in Albany, especially Acanthaceæ, Apocynæ, Bignoniaceæ, Rubiaceæ, and Capparidaceæ. These and other similar facts evidently indicate an approximation to the flora of Natal, although by no means to the extent these two authors suppose, viz. that the vegetation of Albany and Natal gradually run into each other. As long as the intermediate districts of the Caffre country are so little known, this must remain hypothetical, but is rendered extremely improbable by climatic laws. A resemblance of certain families and forms is by no means a resemblance of species and their combination into formations. But the increase of tropical forms in Albany is even considerably more mysterious than the

contrast between Albany and the west of the colony. In explaining the latter, we must bear in mind the narrow district throughout which the Cape plants are distributed, the tropical forms appear to indicate climatic influences which do not exist; for Albany is, if anything, unusually dry in comparison with the other regions of the colony, except the district of the Gareep. Rain, says Bunbury (p. 247), is rare and uncertain; when precipitations do occur, it is only the case during south or south-east sea winds. The climate is indeed considered very healthy, yet it is subjected to great and sudden changes of temperature, with stormy and dry winds from the west and north. Hence Albany does not exhibit any trace of that periodical rainy season, which at Port Natal, as the most southern point ( $30^{\circ}$  S. lat.) of the regular tropical seasons, gives rise to the trade-wind character of the flora, and yet, in so dry a climate, the mode of formation of the plants is more similar to that of the trade-wind flora, than at the Cape, where in the winter regular precipitations occur almost as in the south of Europe. We must, therefore, in Albany, admit the occurrence of one of those botanico-geographical facts, where even a tropical constituent of the vegetation appears to be dependent not only upon climatic conditions, but historical or geological events.

According to Krauss, Natal is well watered by numerous rivers, which arise in the coast-chain Quathlamba; these mountains are nearly 10,000' high, and run through the coast-country of the new colony in every direction. The vegetation springs up in September, and during the months of October, November, and December, corresponding with the atmospheric precipitations, attains the greatest splendour. During this moist season, the thermometer varies between  $19^{\circ}$  and  $31^{\circ}$  c. Vegetable life is suddenly arrested as early as January, the grass plains appearing dark yellow, and the forests flowerless and uniformly green. Rain seldom falls from January to March; the air during this period is hot and oppressive, and the temperature between  $26^{\circ}$  and  $32^{\circ}$  5 c. The

same appears to be the case with the two following months, which Krauss did not spend in Natal; July and August are fine, the days hot (as high as  $31^{\circ}$ ), but cool in the morning and evening; the thermometer, however, seldom falling so low as  $15^{\circ}$  c. A changeable, windy, and disagreeable period begins in September—the precursor of the rain. From these statements, the course of the seasons is the same as in the East Indies, except that the rainy season of three months occurs during the spring in the southern hemisphere, i. e. three months later than in the former.

Sketch of the predominating botanical formations :

1. Coast or forest region.

a. Forests of Rhizophoræ in the mud between the ebb and flow of the tide (Mengerhout of the colonists). *Bruguiera Gymnorrhiza*, *Rhizophora mucronata*, *Avicennia tomentosa*.

b. Dense, tropical, mixed forests, which can only be traversed by the paths formed by the elephants and buffaloes. Among the trees several belong to the new genera published by Hochstetter, with *Ficus*, *Tabernæmontana*, *Zygia*, *Milletia*, *Phoenix reclinata*, &c. Underwood, Lianes, and the other components of tropical forests are copiously developed.

c. Grass plains with various shrubs.—*Musa*.

2. Hilly region, with beautiful pasture land, constituting the flower of the colony. The woods consist of Acacias. The Aloe and tall-stemmed Euphorbias resemble those in Karro. The highly nutritious grass, which consists principally of Andropoginæ, contains numerous shrubs, especially tropical forms of Leguminosæ, Scrophulariaceæ, Labiatæ, Acanthaceæ, and *Gnidia Kraussiana*.

3. Mountainous region. The above-mentioned extensive grass plains are succeeded upwards by a woody belt of *Podocarpus*, with numerous Ferns, and above this mountain-meadows of Cyperaceæ, with Orchidaceæ, *Ixia*, *Hypoxis*, and *Watsonia*, are distributed. The largest

number of the representatives of the botanical forms of the Cape occur in this region; but hitherto only two Proteaceæ, one *Aspalathus*, two Geraniaceæ, one *Muraltia*, one *Maternia*, and one *Barosma*, have been found in Natal, and not a single species of *Erica*, *Phyllica*, *Selago*, *Oxalis*, *Zygophylleæ*, &c.

The summary of Krauss's Herbaria contains the diagnoses of several new species from Natal, and some from the Cape colony, published under the authority of those naturalists who have worked out the collections for the traveller. Among them the following new genera are proposed: By Bischoff, *Sphærothylax* (Podostomeæ); by Meissner, *Bunburya* (Rubiaceæ); by C. H. Schultz, *Monopappus* (Helichryseæ); and *Antrospermum* (Arctotideæ). Kunze has described some new Ferns from the Cape and Natal (Linnæa, 1844, pp. 113-24).

Bojer has continued his descriptions of new species of plants from the Mauritius and Madagascar (Troisième Rapport de la Soc. de St. Maurice); on this occasion they refer to the Anonaceæ, Menispermaceæ, Capparidaceæ, and Leguminosæ. Gardner has made a brief report upon some excursions in the Mauritius (London Journal of Bot., 1844, pp. 481-85).

#### IV.—ISLANDS OF THE ATLANTIC OCEAN.

Seubert has published a copious Flora of the Azores, in which his former memoir, which has been noticed in this work, is satisfactorily carried out, and brought to systematic perfection (Flora Azorica, Bonnæ, 1844, 4to). Of about 400 plants from the Azores, upon which his observations are made, fifty sp. are endemic, twenty-three sp. belong also to the Canarian Archipelago, five sp. to the continent of Africa, and six sp. to that of America; the remainder occur also in Europe. Of the endemic species, seven are Synantheraceæ, as many Cyperaceæ, and five Graminaceæ. Immediately after the

appearance of the Flora Azorica, Watson published a list of the plants which he collected in the Azores (Lond. Journ. of Botany, 1844, pp. 582-617); and thus increased the number of the Phanerogamia of these islands, which have as yet been made known, to about sixty species. As the plants belonging to the south of Europe found there are of less interest, we shall confine ourselves to his contributions to our knowledge of the endemic flora. He has admitted the following of Seubert's species into this category: *Plantago Azorica* Hochst. as a variety of *P. lanceolata*, and *Juncus lucidus* Hochst. as a synonyme of *J. tenuis* W.; also *Luzula purpureo-splendens* S., according to an older syn. *L. purpurea* Watson; and *Bellis Azorica* as a distinct genus, denominated *Seubertia*. Lastly, he has described five new endemic forms: *Hypericum decipiens* (*H. perforatum* S.?), *Petroselinum trifoliatum*, *Campanula Vidalii*, *Myosotis Azorica*, and *Euphrasia Azorica* (*E. grandiflora* Hochst.?) *Vaccinium cylindraceum* Sm. appears different to him from *V. Maderense* Lk.; but *Erica Azorica* Hochst. only a var. of *E. Scoparia*. The following may be mentioned as interesting discoveries of the plants of Madeira, and other adjacent floras in the Azores: *Melanoselinum decipiens* Hoffm., *Tolpis macrorrhiza* D. C., *Mirabilis divaricata* Lour., and *Persea Indica* Spr.

Seventy-five parts of the work of Webb and Berthollet on the Canary Islands are out. They carry the systematic part as far as the Synantheraceæ.

Reid has communicated some reports upon the cedar of the Bermuda Archipelago (Lond. Journ. of Bot., 1844, p. 266, and 1843, p. 1). The inhabitants erroneously consider this Coniferous plant (*Juniperus Bermudiana*) to be the same as the Virginian cedar (*Juniperus Virginiana*). Even the climate of these islands is very different from that of the opposite coasts of the American continent, as water never freezes in the Bermudas. The most magnificent oranges are produced there, being protected from the winds of the Atlantic by the large forests

of these cedars, which cover all the uncultivated regions. This tree is also called the pencil cedar, although the wood does not appear to be used at present in the manufacture of lead-pencils in England. It is much prized for ship-building. Reid thinks that the Bermuda cedar does not occur in the hot climate of the West Indies, but it is very common on the mountains of Jamaica.

#### V.—AMERICA.

The plants collected by Simpson and Dease, in their voyage of discovery on the arctic coast of America, have been named by Sir W. Hooker (Narrative of the Discoveries on the North Coast of America, by T. Simpson. London, 1843, 8vo, Appendix). These plants had, however, been previously found in Franklin's travels in the same region, and admitted into Hooker's Flora of British America, with the single exception of *Salix nivalis* Hooker, which was discovered by Drummond on the Rocky Mountains, and occurs also on the coast below 71° N. lat., west of Mackenzie.

A coast-landscape of Unalashka, by Kittlitz (pl. IV), represents luxuriant meadows, in which various subalpine shrubs, forming most luxuriant thickets of plants, are intermixed with strong turf composed of Cyperaceæ: amongst the former are *Aconitum*, *Heracleum*, *Epilobium*, and especially *Lupinus*. The dwarf shrubs, also, of the alpine region, *Salices* and *Rhododendron Kamtschaticum*, extend on these islands, which are situated beyond the tree-limit, into the vicinity of the sea. Two views of the island of Sitcha, the forests of which they represent (pl. II and III), may serve as contrasts. They give a distinct representation of the mixed foliage of the Canadian larch (*Pinus Canadensis*) and a species of pine (*P. Mertensiana*), the growth of *Panax horridum*, the palmate auricled leaves of which are sometimes crowded together upon a turfy kind of brushwood, at others upon shrubby

stems, consisting of the *Vaccinia* and *Rubi*, forming the underwood, and other botanical forms, with which Bongard's sketch has made us acquainted.

After an interval of two years, the third part of the second volume of Torrey and Asa Gray's 'Flora of North America,' containing the completion of the Synanthraceæ, has appeared. A. Braun has described the *Equiseta* and *Charæ* of North America (Silliman's Journal of Science, vol. xlvi). Mac Nab read before the Edinburgh Botanical Society a botanical journal, which he had kept at Hudson (Ann. Nat. Hist., xiv, pp. 223-25).

Asa Gray has continued the report upon his botanical journey in the south of Alleghany (London Journ. of Bot. 1844, pp. 230-42). On the summit of the Roan, in Tennessee, the altitude of which is 6000', *Rhododendron Catawbiense* forms a fertile subalpine shrubby formation, the turf of which consists of *Carex Pennsylvanica* and other species of this genus, with *Aira flexuosa* and *Juncus tenuis*. Beneath the shrubs, *Lilium*, *Veratrum*, *Potentilla*, *Geum*, some Ranunculaceæ, Umbelliferæ, Saxifrageæ, and *Solidago*, with *Rudbeckia*, *Liatris*, &c., are mentioned. The remaining woody plants, in addition to the Rhododoreæ and Rosaceæ, mentioned in the Annual Report for 1842, consisted of *Pyrus arbutifolia*, *Cratægus punctata*, *Ribes rotundifolium*, *Diervilla trifida*, *Vaccinium Constablæi* n. sp., and *Alnus crispa*. *Pinus Fraseri* is the tree which extends to the greatest altitude; it occurs near the summit in a dwarf and crooked form. At the end, A. Gray describes the new genus *Shortia* (*galacifolia*) from specimens in fruit in the herbarium of Michaux, who discovered it on the mountains of Carolina. It has not since been found, and its flowers are unknown. This remarkable plant unites the habit of *Pyrola uniflora* with the leaves of *Galax*. Nuttall described another genus (*Simmondia*) from S. Diego, in Upper California, as a new type of the Garryaceæ (l. c. p. 400, t. 16). The collections of Hinds (Ann. Rep. for 1842) have afforded the matter for an important systematic illustrated

work, which Bentham is working out, and the traveller elucidating by botanico-geographical remarks (The Botany of the Voyage of H.M.S. Sulphur. Edited and superintended by R. Brinsley Hinds. The botanical descriptions by G. Bentham. London, 1844, 4to). Five parts are now published. The representation of the character of the vegetation of California given in this work has a decided preference over the earlier ones, upon which we have previously reported. The flora of California resolves itself into two districts, a northern one, extending from the Columbia river to S. Diego ( $33^{\circ}$  N. lat.), and a southern one, from here to the vicinity of the tropic, where the tropical forms of plants commence: the former corresponds to about the limits of Upper, and the latter to those of Lower California. South of Columbia ( $46^{\circ}$ ), where the forests of *Abies* terminate, the deciduous forests gradually continue to disappear: above S. Francisco ( $38^{\circ}$ ), there are no large forests, and altogether but few trees. In sailing, in Upper California, up the S. Francisco from the coast, a broad alluvial plain presents itself; it is open, and here and there sparingly wooded with oak trees like a natural park: the river flows through it, and floods it in the moist season. Bentham determined the trees to be, *Quercus agrifolia* and *Hindsii* and *Oreodaphne californica*; *Fraxinus latifolia* and *Æsculus californica* are also found there, and *Salices*, with *Platanus californica*, grow upon the banks of the river. At S. Pedro, the flora of Lower California prevails, and extends as far as the Magdalene Bay ( $24^{\circ}$   $38'$ ), where the most northern mangrove forests are found. Between these two points, the soil at different landing-places was either covered with low shrubs, which frequently fill the air with agreeable odours, or (in October and November) bare, like the steppes, and ornamented between the isolated portions of underwood with herbaceous plants with very beautiful flowers. Here the Synantheraceæ predominate, in the most varied forms and colours; in fact, they constitute more than the fourth part of Hinds's collection. Next to these,

the Euphorbiaceæ, Polygonaceæ, and Onagrariæ are more abundant than the remaining families: the entire Californian herbarium, however, only includes about 200 sp. The arid and frequently sandy soil is physiognomically characterised by different *Cacti*, 2 of which are distributed exactly as far as S. Pedro, and accurately define the extent of the flora. At Magdalene Bay, other tropical forms also begin to appear with the mangrove forests in considerable numbers, which are mixed in the text with the steppe-plants of Lower California, but which must of course be distinguished geographically from them. The Euphorbia-shrubs only are common to both the districts of the peninsula; nevertheless, the species which predominate within and without the tropic are different. Magdalene Bay appears to form a well-defined floral limit northwards. Together with Cape Lucas, it yielded one half of the plants contained in Hinds's Californian herbarium. But whether this tropical southern point of the peninsula forms a distinct and third botanical district, or should be considered as belonging to that of the western coast of Mexico, remains at present undecided, inasmuch as most of the plants collected here have not yet been described. The following are the families of the latter collection which contain the largest number of species: Synantheraceæ ( $\frac{1}{5}$ ), Euphorbiaceæ ( $\frac{1}{5}$ ), Leguminosæ ( $\frac{1}{10}$ ), Graminaceæ, Solanaceæ, Malvaceæ, and Nyctagineæ. New genera from California, by Bentham: *Stegnosperma* (Phytolaccaceæ), *Serophytum* and *Eremocarpus* (Euphorbiaceæ), *Helogyne*, *Perityle*, *Coreocarpus*, *Acoma*, *Amauria* (Synantheraceæ), *Eriodictyum* (Hydroleaceæ). F. D. Bennett in a short time collected some 70 sp. on the tropical south point of California; they have not yet been made known (Narrative of a Whaling Voyage. London, 1840, vol. ii, p. 18). He saw there columnar *Cacti*, from 15'—20' in height, and speaks of the luxuriance of the forests and of numerous succulent and bulbous plants.

Martens and Galeotti have continued their papers on

the flora of Mexico (Bullet. de l'Acad. de Bruxelles, 1844, vol. xi, part 2, pp. 61, 185, 319; 1845, vol. xii, p. 129): they contain 74 Labiatae, with the new genus *Dekinia*, 39 Verbenaceae, 9 Cordiaceae, 30 Boraginaceae, and 63 Solanaceae. The Ferns (170 sp.) and Lycopodiaceae (12 sp.) are treated of by them in detail (Mémoires de l'Acad. de Bruxelles, 1842), and are illustrated by copper-plates. Kunze has described the Ferns and the allied families collected by Leibold in Mexico (128 sp.) (Linnæa, 1844, pp. 303-52). V. Schlechtendal's continuation of his 'Contributions to the Flora of Mexico' contain the Sapindaceae, a new Dioscoreaceous plant, and *Hydrotaenia* (l. c. pp. 48, 112, 224). Bateman has published a splendid illustrated work on the Orchidaceae of Guatemala and Mexico, with 40 plates (Orchidaceae of Guatemala and Mexico. London, 1843, imp. fol.)

Galeotti, in his 'Memoir on the Mexican Ferns,' has also investigated their distribution in the regions which he has assumed, and commenced a similar work in connexion with Richard, in which the Orchidaceae of Mexico, where, according to Richard's judgment, the forms of this family are more abundant than in any other country in the world, are treated monographically, from a collection of 500 species (i. e.  $\frac{1}{3}$  of all that are known), and the geographical distribution of which is given (Comptes rendus, vol. xviii, pp. 497-503) in a preliminary paper. The regions assumed by Galeotti in these two papers include the greater part of Mexico, without, however, as was the case with Liebmann's 'Characteristics of Oribaza,' their being supported by a sufficient number of special investigations. We cannot judge of the value of Galeotti's botanical division of the country until, as it is undoubtedly his intention to do, a special work is published on the botanico-geographical relations of all the Mexican families of plants. The altitudes given do not always agree with those of Liebmann, nay, in some cases, they do not agree with each other: how far this is due to inaccurate observation, and how far to local variation in

the limits of the plants, cannot be satisfactorily determined. In the following sketch of Galeotti's regions, the local displacements are added within brackets to the altitudes given.

1. Hot regions. 0'—3000' (2500'). Vegetation from December to May (end of October to June) languid: most of the trees leafless.

*a.* Eastern coast with forests of Rhizophoras. Mean temperature = 95° c.

*b.* Moist mixed forests, not, however, containing many Ferns (R. chaude tempérée des ravins). Mean temperature, 25°—19° c.

*c.* Coast forest of the Pacific, 25°—19°.

2. Temperate regions.

*a.* Eastern slope. 3000'—6000' (5500', 7000'). This region differs from the coast in its great humidity and evergreen foliage. It contains tree-ferns, *Liquid-ambar*, evergreen oaks (à feuilles luisantes), and numerous Orchidaceæ. Mean temperature = 19° to 15°. In Oaxaca, this region is less distinctly separated from the others: the pine trees here descend as low as 3000', whilst Myrtaceæ, *Melastomæ*, &c., are found even at an elevation of 7000'. The soil is calcareous, and Galeotti found there only 21 Ferns, whilst on the volcanic soil of Vera Cruz, he found 77 species at the same level.

*b.* Western slope. 3000' (1000') to 6500'. Mean temperature = 20° to 15°. To it a large part of Oaxaca, of Mechoracan, and Xalisco belong. Tree-ferns are not found there, and in fact few Ferns, but a large number of oaks, with numerous Orchidaceæ growing parasitically upon the bark, and some Palms.

*c.* Plateau, and the slopes adjacent to it, mean temperature = 20° to 15° (21° to 18°). The internal slopes of Mexico differ in every case, botanically speaking, from those situated externally, and inclined towards the two oceans. Their dry climate, for the most part, excludes the vegetation of Ferns and Orchidaceæ. These elevated surfaces are characterised by the large number of *Cacti*:

spiny *Mimosæ* and unparasitic Bromeliaceæ are common. The latter, with *Agave*, are frequently the only plants occurring on the calcareous soil; or on other kinds of mountains, the surface is extensively covered with *Prosopis dulcis* and *Mimosæ*. *Bronnia spinosa* is also characteristic.

### 3. Régions froides.

a. Eastern slope. The determinations of the altitudes of the upper stages of vegetation, e. g. at Oribaza, are in part inaccurate; thus, according to Liebmann's investigations, the statement that vegetation ceases at 12,500' or 13,000' is incorrect; this portion of the sketch is therefore passed over. This region has yielded 52 Ferns, most of which grow upon limestone, and also numerous Orchidaceæ (especially between 7500' and 8000').

b. Western slope and high mountains of the plateau. Botanical characteristics wanting. The upper limit of vegetation is situated, according to Galeotti, on Popocapetl, at 11,500', on the Pic of Toluca, at 13,000'.

c. Most elevated surfaces of the plateau. No botanical characteristics.

The second and larger section of Hinds's and Bentham's work (v. s.), which is, however, not yet perfectly completed, includes the west coast of America from S. Blas (21° 32' N. lat.), to Guayaquil (2° 30' S. lat.) On this long coast-line the flora is adapted to a moist tropical climate, and the shore covered with a dense forest; but the plants north and south of Panama are not the same. Nor are the seasons contemporaneous; the tropical rains commence at Guayaquil in the beginning of the year; towards the north, they gradually occur later, so that at S. Blas they commence at the end of June. They divide the year into two periods of vegetation; the Bay of Choco alone forms an exception, for there atmospheric precipitations last from ten to eleven months, producing a vegetation which is constantly green, and abounding in flowers. The forests of Guayaquil appear to be comparatively poor in forms, because the rainy season there, and with it the

luxuriant growth of the plants, in the vicinity of the Garua, only lasts for a short period. Of the characteristic tropical forms, some are absent, or rarely found; as Epiphytes, all the Monocotyledons, and the Ferns. North of Guayaquil the desert tracts again recur, in which the coast-stream at Salango ( $2^{\circ}$  S. lat.) clothes a spot of land, like an island, with tropical trees; but as soon as the equator is passed northwards on this coast the vegetation acquires variety and strength. The Orchidaceæ and other Epiphytes then become more common; the number of forest forms rapidly increases in the same proportion as the duration of the rainy season augments, as far as the Bay of Choco ( $3^{\circ}$ — $7^{\circ}$  N. lat.), where the vegetation of the western coast is most copiously developed; but the solstitial point is also reached at the same time. In this climate, the boundary of which is on this side of the equator, but which is still equatorial, the western coast contains its only Tree-ferns, and even here the *Cacti*, the characteristic plants of the trade-wind flora of America, are absent. At Panama ( $9^{\circ}$  N. lat.) we again find a proportionate change of the two tropical seasons, hence no Tree-ferns nor Scitamineæ are met with there, but arborescent *Cacti* and other succulent plants. Most of the new species of the collection described by Bentham are from this south region of the western trade-wind coast ( $9^{\circ}$  N. lat. to  $3^{\circ}$  S. lat.) North of Panama the influx of Mexican types is perceptible; Heliantheæ become numerous; the forests of mahogany at Realejo are also succeeded above by a region of *Pinus occidentalis*, and the oak is found even 1500' above Acapulco. 654 species of the rich collection have already been described in the parts at present published, which extend from the Polypetalæ to the Scrophulariaceæ. Families containing most species: Capparidaceæ (10), Malvaceæ (31), Byttneriaceæ (11), Sapindaceæ (12), Leguminosæ (125), Melastomaceæ (23), Rubiaceæ (39), Synantheraceæ (95), Apocynaceæ (13), Bignoniaceæ (17), Convolvulaceæ (39), Boraginaceæ (23), Solanææ (25), and Scrophulariaceæ (at present 17). Considering the

large number of new species, the number of undescribed genera is not great: *Triplandron* (Guttiferæ), *Pentagonia* (Rubiaceæ), *Oxyppappus* (Synantheraceæ), *Stemmadenia*, 3 sp. (Apocynaceæ), *Diastema* (Gesneriaceæ), *Thinogetum* (Solaneæ), and *Leptoglossis* (Scrophulariaceæ).

Purdie, a collector for the Kew Gardens, has reported upon his travels in the West Indies (Lond. Journ. of Bot., 1844, pp. 501-33). Among others he ascended the peak of the Blue Mountains, in Jamaica, where the forests of the summit consist of *Podocarpus coriacea* (Yacca). In other respects these, as also Moritz's Botanical Letters from Cumana and Caracas (Bot. Zeit., 1844, pp. 173, 195, 431), merely give notices of the plants collected.

Miquel has continued his Contributions to the Flora of Guiana (Linnæa, 1844): some new Capparidaceæ, Sapindaceæ, Malpighiaceæ, Dilleniaceæ, Leguminosæ, Melastomaceæ (*Hartigia*, n. gen.), Memecyleæ, Passifloreæ, Onagrariæ, Cucurbitaceæ, Loranthaceæ, Rubiaceæ, Convolvulaceæ, Cuscutaceæ, Bignoniaceæ (*Callichlamys* = *Bign. latifolia* Rich.), *Avicennia*, Nyctaginaceæ, Polygonaceæ, Piperaceæ (*Nematanthera*, n. gen.), Bromeliaceæ, Musaceæ, Scitamineæ, Hydrocharidaceæ, Commelynaceæ, Xyrideæ, and Aroidæ. Steudel (Ratisbon Flora, 1844): on the Melastomaceæ from Surinam, and various plants in the collections of Hoffmann and Thappler, which are for sale. Robert Schomburgk (Lond. Journ. of Bot., 1844, pp. 621-31): a new Rubiaceous plant, and two Lauraceæ, from British Guiana. Berkeley on *Stereum hydrophorum* (Ann. Nat. Hist., xiv, p. 327).

Richard Schomburgk, who accompanied his brother during his last travels in British Guiana, has described in his letters the botanical characters of the explored regions (Bot. Zeit., 1844-5). We thus obtain an interesting supplement to the previous work of Robert Schomburgk on his travels, in which the botanical determination of the plants was omitted, and which, now that a great part

of the previous herbaria have been described, may be added to the descriptions of the country. The forest at Essequibo, from which *Mora excelsa* projects to an altitude of 160', formed the first opportunity for the traveller to develop his descriptive talent. After having vividly delineated the crowded growth of the trees, the climbing plants and the creeping shrubs, which connect the stems in impenetrable meshes, and the parasites of the fallen trunks, he dwells upon a point with which we are less familiar—the *light of tropical forests*. On the ground the eye would miss the splendour of the flowers of other regions, and detect only Fungi, Ferns, and decaying vegetable structures; for even at noon a subdued light prevails in the forest, since scarcely anywhere is a portion of the sky visible through the closely-interlaced branches; but although the light is subdued beneath so dense a covering of foliage, there is more light than in dark pine forests. V. Kittlitz comes to the same conclusion as to the remarkable and as yet but little studied question, of how plants still thrive so well, and their green organs are able to respire, in shaded parts of the most dense vegetation which the crust of the earth anywhere produces (Vegetations-Ansichten, p. 6). "I was astonished," writes he, "to find so much light beneath the noblest trees, the widely-spread foliage of which scarcely anywhere allowed the sky to be seen. Remaining the same at the most varied times of the day, it could not be ascribed to the perpendicular light of noon, but only to those innumerable undulations of light which, falling from above through the crowded masses of leaves in every direction, being reflected from stem to stem and from branch to branch, finally reach the lower space in the thicket, and there produce a tone of dull lustre peculiar to tropical nature. In fact, what would become of that whole world of plants destined to live in this shade, if nature had not given the huge masses of foliage, which produce it, a *structure and distribution*, which permits it, although reflected a thousand times, still to reach in suf-

ficient power the plants living beneath." This problem may be expressed more definitely as follows. We have to explain why the shadow of obscure deciduous forests in the temperate zone are principally illuminated by transmitted, and in the tropics by reflected light, and why the Coniferous forests are poorer in these two luminous sources, and therefore so frequently deprived of plants growing in the shade. We first think of the *Mimosæ* and forms of Palms, of the compound, and therefore imperfectly shading forms of leaves, which thus contribute powerfully to the light tone of the tropical forests. But trees possessing this character form a part only, not the whole; for those forms with simple leaves, as the laurel- and Bombax-type, preponderate, in variety of form or size of the leaf. And even the form of the leaves of the Lauraceæ, which recurs in so many tropical families, is wanting in that transparent texture to which the light of the half-shaded parts of the northern deciduous forests is owing. But Kittlitz has pointed out another more universal character of the trees of tropical forests, in the arrangement of the leaves, which appears intended to complete the former. In climates where cold or aridity cause the winter-sleep of woody plants, they develop a very much larger number of small branches, which usually form a more connected, although on the whole poorer, stratum of leaves than in the tropics. This, therefore, throws a deeper shadow upon the ground, although it is more transparent; not so deep, however, as in the Coniferous forests, the crowded leaves of which are opaque. On the other hand, it is evident that the uninterrupted heat and moisture of the equatorial climate also ensure a longer duration of the first-formed branches, many of which, in the temperate zone, fall off or remain undeveloped, and must therefore produce fresh ramifications to allow of the necessary number of leaves being formed; these first branches attracting the currents of sap, continue to grow excentrically, and hence leave between their uppermost tufts of leaves, i. e.

the youngest and softest part, more or less broad intervals. Under this double condition of the formation and distribution of the foliage, we may perceive universally in the latter climate "a certain and wholly peculiar permeability"—seen only in its simplest and most developed state in the Palms—even in woody plants, which in other respects but little resemble the latter, and in which the more copious development of the ramifications of the stem produces this prevailing character, inasmuch as they imitate and replace the natural growth of the summit of Palms. "Large masses of very delicate foliage in this manner obtain so light an aspect, that they appear as it were to float in the air; but, even down to the smallest Fern upon the soil, everything exhibits a tendency to an excentric distribution, which does not permit the separate organs to press upon one another, but by the constant crossing of lines in every direction, produces spaces for the transmission of air and light." Here Nature addresses man like the noblest works of mediæval architecture, the pointed arches of which, of Arabian origin, have, it is supposed, borrowed that openness conjoined with gigantic masses and infinite variety of form, from two palm-stems with their penniform leaves in contact.

As the second principal formation of Guiana, R. Schomburgk describes the vegetation on the banks of the streams, at the border of the forest, as made generally known by V. Martius and Pöppig, from the north of Brazil. The underwood surpasses the retreating gigantic stems; a belt of *Cecropias* and bamboos forms the foreground; herbaceous lianes wind around the trees and bushes as in a most luxuriant hedge, on the borders of which beautiful flowering plants augment still more the most abundant variety.

From Essequibo the travellers went to the tributary stream, Rupununi, to arrive at the savannahs on the sea of Amuku, which in these regions cover the ridges of the land almost down to the water-line, and are only separated from the rivers by seams of woods from 100'

to 200' in breadth. The main mass of the vegetation in the savannah consists of scabrous, straggling Gramineæ and Cyperaceæ, from 3' to 4' in height, as *Pariana campestris*, *Chætopora capitata*, *Elionurus ciliaris*, *Sataria composita*, *Mariscus levis*, intermixed with prickly or arborescent underwood of various kinds, as *Curatella Americana*, *Byrsonima*, *Plumieria*, Leguminosæ, Myrtaceæ, some Synantheraceæ, and Malvaceæ. The marshy places are denoted by *Mauritia flexuosa*, with Melastomas, Scitamineæ, Polygaleæ, and *Byttneria scabra*; the surface of the water itself, *Pontederia* and Nymphæaceæ.

Pöppig's illustrated work upon Tropical America is now completed by the 7—10 decades of the third volume (Lipsiæ, 1844, 4to). The 75th to 78th parts of Orbigny's Travels have appeared. Klotzsch has commenced the publication of 'Contributions to the Flora of Tropical America,' from the Museum of Berlin (Linnæa, 1844), comprising at present the vascular Cryptogamic plants and the Jungermanniæ, by C. Müller.

V. Tschudi's zoological work upon Peru contains, in the introduction, an interesting division of the Peruvian Andes, according to their climatal conditions and botanical characters (Untersuchungen über die Fauna Peruana, Lief i. St. Gallen, 1844, 4to). The climatal regions of Peru, the elevated surfaces and valleys of which are produced by the structure of the two Cordilleras, and are not dependent upon the polar altitude, are, according to Tschudi, as follows:

1. Western slope (contains no woods).

a. Coast region (0'—1500'). Mean temperature in the hot season = 27° c.; during the garua = 19°·75. A band of sand, 1620 miles in length, and from 18 to 60 miles in breadth, extending across the rivers, which intersect it many times, subdivides it into two principal formations; for the banks of the river form oases of cultivation in the Peruvian coast-steppe, the barren hilly surfaces of which are covered with fine quicksand, and are devoid of springs and, during the dry seasons, of vegetation. This

hot and dry season lasts from November until the end of April. The garua, a thin mist, which is thickest in August and September, reanimates the steppes from May to October. It only extends 1400' high vertically in the atmosphere. As long as this prevails the steppe is verdant, and sends forth numerous Liliaceous forms into flower. The south winds generally last throughout the entire year; and V. Tschudi considers the formation of the garua as still unexplained. May they not arise, as winterly precipitations, from an admixture of the lower trade-wind with the east winds descending from the Andes, and which, during the summer, are not in a condition to separate the moisture from the coast trade-wind?

b. Internal coast-region (1500'—4000'). This comprises the fan-shaped expansion of the west valleys of the Cordilleras, which, at the time of the garua, is affected with a true rainy season. Mean temp. in the dry season, =  $29^{\circ}25$ ; in the rainy season =  $22^{\circ}75$ . The vegetation is not very luxuriant, but the cultivated tracts are extraordinarily productive. The sugar-cane thrives well even at 3600'. Of fruits, *Anona tripetala* (Chirimoya) and *Passiflora quadrangularis* (Granadilla) are peculiar to this region.

c. Western Sierra (4000'—11,500'), or that slope of the Cordilleras which is gently inclined below, and steep above, with its narrow transverse valleys. The air is dry; the nights are very cold in summer; the prevailing wind is the east. In summer the mean temperature at noon is =  $22^{\circ}4$ , at night =  $10^{\circ}$ ; in winter, the mean diurnal temperature is =  $19^{\circ}$ . This is the region of the tropical Cerealia, and that in which the potato thrives readily and in profusion. *Oxalis tuberosa* (Oca) commences in it. The *Cacti* are among the characteristic plants of this slope, which contains but little wood.

d. Western Cordillera, comprises the west slope of the Andes above 11,000', and the east declivity of this western crest as far downwards as 14,000'. It forms a wild mountainous tract, containing steep rocky declivities,

valleys expanded into small plains, and numerous alpine lakes, and is bounded by glaciers and perpetual snow. Cutting, ice-cold winds from the east and south-east prevail constantly. Mean temp. of the day in summer =  $+11^{\circ}25$ , of the night =  $-7^{\circ}1$ ; in winter, i. e. during the rainy season, of the day =  $+7^{\circ}5$ , of the night =  $+2^{\circ}6$ . The vegetation extends to 15,500', and consists of low *Cacti* and alpine plants.

2. Eastern declivity (two regions containing no forests, two wooded).

a. Puna region (11,000'—14,000'), or the large undulating plateau between the two Cordilleras, and which attains a mean altitude of 12,000'. Sparingly overgrown flats alternate with extensive marshes, lakes, and alpine rivulets. Cold west and south-west winds blow throughout the year, most violently from September to May, with fearful thunderstorms, which occur almost daily during these months. Thus the rainy season commences in the opposite half of the year to any one travelling from the coast to the interior. The sky is clear from May to September, and the nights very cold; the temperature is altogether very variable; it frequently varies within twenty-four hours 22 or 25 degrees; not unfrequently, on these cold heights, we suddenly encounter warm currents of air from the s.s.e., which at times are only from two to three paces in breadth, while in other cases as much as several hundred feet, and which rapidly recur (p. xxiv). Tschudi gives, as approximative mean values of the temperature: Summer (November to April, which period is there incorrectly called the winter), of the night =  $+1^{\circ}5$ , of noon =  $8^{\circ}75$ ; winter (May to October, there incorrectly called summer), of the night =  $-6^{\circ}25$ , of noon =  $12^{\circ}1$ . The vegetation of Puna is poor; *Stipa Ichu* is abundant; Synantheraceæ, Malpighiaceæ, Leguminosæ, Verbenaceæ, Scrophulariaceæ, and Solanææ are mentioned. Barley does not ripen at 13,050'.

b. Eastern Sierra (11,000'—8000'), consists of broad,

open, fluvial valleys, the most thickly populated in Peru, and is separated from that of the Puna by rocky declivities; rainy season, with frequent hail, from October to February. During the winter months (also called summer in the text) dry east winds prevail; night frosts set in after the end of the rainy season, and the Cerealia are harvested. Mean temp. during the rainy season: of the night =  $+ 5^{\circ}.1$ , of the day =  $+ 14^{\circ}.1$ ; during the winter (March to September), of the night =  $- 4^{\circ}.25$ , at noon  $+ 17^{\circ}.1$ . But great local differences occur in the hot bottoms of those valleys which are sheltered from the winds, where fruits of the south of Europe, as peach trees, thrive, sometimes even at an altitude of more than 10,000'; the principal cereal grain appears to be maize. The slope of this region, which, like the former, is destitute of woods, contains a profusion of *Cacti*, and on the banks of the streams only we find woods of *Salix Humboldtiana*, 20' in height; even European fruit trees do not thrive when cultivated. In the valleys, however, this region extends directly into the forest region, from which it is also separated by a second Puna, i. e. by the crest of the central Cordillera.

c. Upper forest region or Ceja-region (from Ceja de la Montagne, i. e. the brow of the mountain) (8000'—5500'), comprises the eastern slope of the internal Cordillera, and its western slope in the north of Peru, with the longitudinal valley of Huallaga. It consists of steep rocks and narrow, wooded mountain-ridges. The climate is humid, cold, and rough, with prevailing south winds. Towards evening dense mists are formed, which during the night rest upon the forests, and which the wind carries away with it from the morning until the serene evening. These mists extend downwards as far as 6500', and often resolve themselves into very heavy showers. The differences in the seasons are not mentioned; the observations upon the temperature are also incomplete. Low trees and shrubs covered with mosses commence even at 9500', and increase in size and strength as we ascend. Cerealia

cannot be cultivated in this region, which is not exposed to the direct rays of the sun; potatoes grow abundantly.

d. Lower forest region (5500'—2000'), is composed of immense forests, savannahs, and marshes. Its humidity is great throughout the year; for even in the dry season (May to September) thunderstorms are common. The true rainy season begins in October, and lasts until March or April. Mean temp. = 30°; when the wind is in the east, the nocturnal temperature sinks to 18°.75. This region forms the commencement of the primæval forests of the Amazon.

Contributions to the Flora of Brazil: Moricand, *Plantes nouvelles ou rares d'Amérique*, livr. 8, Tab. 71-84 (Genève, 1844, 4to); Naudin, *Description de Genres nouveaux de Mélastomacées* (Ann. d. Sc. Nat., 1844, ii, pp. 140-56): *Tulasnea*, *Brachyandra*, *Eriocnema*, *Augustinea*, *Stenodon*, and *Miocarpus*; Fischer and C. A. Meyer, *Asterostigma*, n. g. Aroideæ (Bull. Pétersb. iii, p. 148). Miers, *Triuris* and *Peltophyllum*, forming the new family Triurideæ, allied to the Juncagineæ (Transact. Linn. Soc. xix, pp. 77, 155); Sir W. Hooker and Wilson, Enumeration of the Mosses and Hepaticæ collected in Brazil, by G. Gardner (Lond. Journ. of Bot., 1844, pp. 149-67). K. Müller, Enumeration of the Mosses collected by Gardner in Brazil (Bot. Zeit. 1844, p. 708), gives no description of the new species, so that the preceding publication, which is founded on more complete materials, acquires priority as regards the nomenclature.

Tenore has described a new *Aristolochia*, from Buenos Ayres, which he obtained from Bonpland's collection of seeds, and has taken this opportunity of republishing the diagnosis of some plants derived from the same source, and described in his catalogue of seeds (Rendiconto di Napoli, 1842, pp. 345-8).

Kittlitz's first plate represents the botanical character of the coast of Valparaiso. It gives a view of one of the steppes during the dry season, the bare soil of which appears only to produce *Cacti* and shrubs with stellate

prickles, but in which, during August and September, the most luxuriant grass plains, with their bulbous plants, are found. The following are some of the physiognomically important forms of plants represented in this drawing: the Caves (*Mimosa Cavenia*), the dwarf-pine-like Lithi (*Rhus caustica*); *Cereus Peruvianus*, *Puretia coarctata*, Synantheraceous shrubs, bamboos, &c.

Miers has proposed two genera of Iridaceæ from Chili—*Solenomelus* (*Cruckshankia* ej. ol.) and *Symphostemon* (*Sisyrrinchium odoratissimum* Cav.) (Transact. Linn. Soc. xix, p. 95). Sir W. Hooker has determined the Alerce tree of the south of Chili, which is used as timber for building, to be *Thuja tetragona* (Lond. Journ. Bot., 1844, p. 144). Berkeley has described an edible Fungus from Terra del Fuego; *Cyttaria* n. gen., near *Bulgaria*, also containing a species from Chili (Transact. Linn. Soc., xix, p. 37).

## VI.—AUSTRALIA AND SOUTH-SEA ISLANDS.

F. D. Bennett remarks that westerly winds, corresponding to the monsoon, not infrequently extend eastwards over the Pacific Ocean towards the Society Islands, and especially in February and March are not infrequently taken advantage of, for making voyages in a south-easterly direction; consequently in regions which, in other respects, are completely under the influence of the south-east trade-wind (Whaling Voyage, i, p. 159). The botanical communications, which form an appendix to the account of his voyage, and which treat especially of the cultivated plants of the South Sea Islands, contain, in addition to numerous well-known facts, many names of Polynesian plants.

The illustrations of the Caroline and Marian Islands, and the archipelago of Bonin, are among the most excellent and richest views in Kittlitz's work; but the

systematic determination of the plants figured is entirely wanting—a deficiency caused by the early death of Mertens. The vegetation of tropical forests has, in fact, never been more distinctly represented than in these landscapes, except by Rugendas. The characteristic types of the most important physiognomical forms of tropical foliage are principally found in the following plates: Bamboo form, indicated by *Artocarpus* (pl. X); Banana, form expressed by the *Rhizophoræ* of the mangrove forests (pl. V), and stems of *Ficus* supported by aerial roots (pl. VI); Cycadææ (pl. XI), Palmææ (pl. IX, XVI), Musacææ (pl. VII), *Pandanus* (pl. X, XI, XII, XV), and that of the Tree-ferns (pl. XVI). Of other physiognomical forms, Lianes (pl. VIII, XV), *Freycinetia* (pl. VI), parasitical Ferns (pl. V, VI), Aroideæ (pl. VII), *Agave*, imitated by stemless species of *Pandanus* (pl. XI, XII), herbaceous Ferns (pl. VIII). Pl. XIII represents the savannahs on the Marian Islands; grass plains with *Casuarina*, *Cycas*, and *Pandanus*.

Suttor's paper, read before the Linnæan Society, upon the Forest Trees of New Holland contains, according to the extracts before us, only well-known facts (Ann. Nat. Hist., xiii, p. 217). Drummond's Letters from the Swan River have been continued (Lond. Bot. Journ., 1844, pp. 263, 300). They contain, for the most part, notices of individual plants which were transmitted to Hooker. The extensive herbaria brought by Preiss from the Swan River have been systematically described in detail in a separate work, edited by Lehmann, by a number of scientific men, mostly Germans (Plantæ Preissianæ sive enumeratio plantarum, quas in Australasia occidentali et meridionali—occidentali collegit L. Preiss. Ed. Chr. Lehmann. Vol. i. Hamburgi, 1844-1845, 8vo). The coadjutors were—Bartling, Bunge, Klotzsch, Lehmann, Meissner, Miquel, Nees v. Essenbeck, Putterlick, Schauer, Sonder, Steetz, Steudel, and De Vriese. Summary of the families treated of, with the enumeration of new genera, and those containing most species: 247 Legu-

minose (Meissn.); 63 *Acaciæ*, 10 *Chorozema*, 15 *Gompholobium*, 11 *Jacksonia*, 23 *Daviesia*, 15 *Gastrolobium*, 10 *Bossiaea*, Rosaceæ 1 (N.), Chrysobalanæ 1 (N.); 161 Myrtaceæ (Sch.), 15 *Verticordia*, 14 *Calycotrhia*, *Symphomyrtus* n. gen., 15 *Eucalyptus*, 33 *Melaleuca*, 10 *Beaufortia*, 15 *Calothamnus*; 3 Haloragæ (N.); Onagrariæ 1 (N.); 2 Oxalidæ (Steud.); Lineæ 1 (Bartl.); 6 Geraniaceæ (N.); 2 Zygophyllaceæ (Miq.); 25 Diosmeæ (Bartl.); *Boronia* 15; 12 Euphorbiaceæ (Kl.); *Trachycaryon* (*Croton* sp. Lab.); *Calypptrostigma* (*Croton* sp. Lab.); *Lopadocalyx* n. gen.; 3 Stackhousiaceæ (Bg.); 22 Rhamnæ (Steud.); *Pomaderris* 10; *Cryptandra* 10; 13 Pittosporaceæ (Putterl.); 17 Polygalaceæ; *Comesperma* (Steud.); 15 Tremandraceæ (Steetz); 11 *Tetratea*; *Platythea* n. gen.; 10 Sapindaceæ (Miq.); Olacineæ 1 (Miq.); Hypericineæ 1 (N.); 32 Byttneriaceæ (Steud.); *Thomasia* 19; *Fleischeria* n. gen.; 11 Malvaceæ (Miq.); Phytolaccaceæ 1 (Lehm.); 5 Caryophyllaceæ (Bartl.); 5 Portulacæ (Miq.); *Tetragonella* n. gen.; 2 Mesembryanthemæ (Lehm.); Frankeniaceæ 1 (N.); 20 Droseraceæ (Lehm.); *Drosera* 17; 8 Cruciferæ (Bg.); *Monoploca* (*Lepidii* sp. D. C.); 6 Ranunculaceæ (Steud.); 44 Dilleniaceæ (Steud.); *Hibbertia* 26; *Candollea* 11; 3 Crassulaceæ (N.); Cephalotæ 1 (Lehm.); 8 Loranthaceæ (Miq.); 31 Umbelliferæ (Bg.); *Platysace* n. gen.; *Schœnolana* n. gen.; 99 Epacridaceæ (Sond.); *Astrolooma*, *Brachyloma* n. gen.; *Leucopogon* 47; *Andersonia*, 14; 3 Primulaceæ (N.); 8 Lentibulariæ (Lehm.); 6 Scrophulariaceæ (Bartl.); 5 Solanaceæ (N.); 5 Convulvaceæ (De V.); 5 Boraginaceæ (Lehm.); 8 Myoporinaceæ (Bartl.); 2 Verbenaceæ (Bartl.); Avicenniæ 1 (Miq.); 25 Labiatæ (Bartl.); *Colobandra* 6, n. gen.; *Anisandra* n. gen.; 6 Gentianaceæ (N.); Apocynaceæ 1 (Lehm.); 5 Loganiaceæ (N.); 4 Rubiaceæ (Bartl.); 69 Stylidiæ (Sond.); *Stylidium* 64; *Coleostylis* (*Stylidii* sp. Benth.) *Forsteropsis* n. gen.; 18 Lobeliaceæ (De V.); *Lobelia* 17; *Vlamingia* n. gen.; 59 Goodenovieæ (De V.); *Dampiera* 15; *Scævola* 27; 101 Synantheraceæ (Steetz);

*Eurybia* 11; *Gymnogyne* n. gen.; *Silphiosperma* n. gen.; *Pogonolepis* n. gen.; *Pachysurus* n. gen.; *Chrysodiscus* n. gen.; *Chthonacephalus* n. gen.; *Anisolepis* n. gen.; *Pterochæta* n. gen.; *Siemssenia* n. gen.; *Hyalosperma* n. gen.; *Schænia* (*Helichrysi* sp.); 2 Plantaginaceæ (N.); 208 Proteaceæ (Meissn.), *Petrophila* 21, *Isopogon* 15, *Adenanthos* 10, *Conospermum* 17, *Grevillea* 29, *Hakea* 46, *Banksia* 19, *Dryandra* 22; 16 Thymeleaceæ; *Pimelea* (Meissn.); 7 Laurinaceæ, *Cassyta* (N.); Nyctagineæ 1 (N.); 6 Polygonaceæ (Meissn.); 14 Amarantaceæ (N.); *Trichinium* 19; 14 Chenopodeaceæ (N.): Urticaceæ 1 (N.); 9 Casuarineæ (Miq.); 2 Coniferæ (Miq.); *Actinostrobos* n. gen.; Cycadaceæ 1; *Macrozamia* (Lehm.) Hence at present about 1450 Dicotyledons.

Gunn has addressed some botanical letters from Van Diemen's Land to the editor of the 'London Journal of Botany' (1844, pp. 485-96). He describes an excursion to the western highlands of the island, and gives statements of the localities of rare plants, with a more detailed report upon a new species of *Eucalyptus* (*E. Gunnii*) (Hooker, *fl.*), which in December and January contains a large quantity of a saccharine and fermentable juice, whence it is called by the colonists the cider-tree. As it forms extensive mountain-forests, it will probably hereafter become an important product of Tasmania. Harvey has described some new *Algæ* from Van Diemen's Land (id. pp. 407, 428); amongst them the Rhodomeleaceous plant, *Pollexfenia*, which is also indigenous to the Cape. Contributions to the Flora of New Zealand: Catalogue of a Collection of Plants from New Zealand, by Stephenson, determined by J. D. Hooker (Lond. Journ. Bot., 1844, pp. 411-18)—it contains but few new species; Hepaticæ Novæ Zeelandiæ et Tasmaniae, by J. D. Hooker and Taylor (id. pp. 556-82); Diagnoses of New Zealand Plants, by Raoul, preliminary to his illustrated work, which was published in 1846 (Ann. Sc. Nat., 1844, ii, pp. 113-23), with the new genera: *Ileodictyon* (Fungi), *Pukateria* (Corneaceæ?), and *Tetrapathea* (Passifloreæ).

Colenso's Botanical Diary of his travels during several months through the little known interior of the northern islands of New Zealand (Lond. Journ. Bot. 1844, pp. 4-62) contains numerous localities of, and reports upon, newly-discovered plants which have not yet been made public, but will be described in Dr. Hooker's illustrated work.

The first three parts of the latter work have appeared; they contain a general introduction upon the botanical characters of high latitudes of the southern hemisphere, and also the commencement of a flora of the Auckland Archipelago (The Botany of the Antarctic Voyage of H. M. Discovery Ships Erebus and Terror, under the command of Sir J. Ross; by Jos. Dalt. Hooker. Parts i-iii, London, 1844, 4to.) Being, during the summer, almost always either in high barren latitudes, or on the open sea, Hooker had but little opportunity of collecting other than such plants of the antarctic flora as flowered in the winter or spring. But he considers this defect, which concerns the copiousness of the materials which he collected, as of little consequence, as he was in the favorable position of being able to make use of the botanical results obtained in all the earlier British voyages to the South Pole, but of still less, in consequence of a climatal peculiarity which he developes in the introduction, and regards as the most characteristic feature of the antarctic vegetation. He was surprised on finding at Kerguelen's Land, the same plants in flower which Cook had met with at other seasons, and this result he subsequently found to occur generally. The vast preponderance of water in the high southern latitudes produces an uniformity in the distribution of heat throughout the year, and the more we approach the pole the more distinctly does this appear to increase. The seasons there are not distinguished, as in the north, by their temperature, but by scarcely anything more than the variation in the amount of light; all the months are cold, but the thermometer varies, as in the tropics, within narrow limits. In the

region of floating icebergs, between 55° and 65° S. lat., seldom a day occurred during the summer in which the temperature rose or sunk beyond the limits of 0° c. and —6°·6 c. South winds, with much snow, alternate there with aerial currents from the north, which being loaded with aqueous vapour, incessantly diffuse white fogs of indescribable density over the surface of the ocean. These precipitations are also formed on islands situated in the vicinity of this region, throughout the year, by the admixture of the winds from the land and sea depriving them of their solar climate, and for the most part preventing the change of temperature dependent upon the position of the sun. A climate so inhospitable and uniform excludes any variety in the forms of plants, but confers a luxuriance of growth upon the indigenous plants, of which the arctic regions must necessarily be deprived, because their vegetation is subjected to a prolonged winter-sleep. This is so remarkably the case, that notwithstanding the differences in the climatic conditions, most of the genera and forms of the antarctic agree with those of the arctic flora in the most important points, excluding only the Auckland Islands, which appear to belong to the same primitive formation with New Zealand. But notwithstanding this similarity of the types, the species of the southern district are peculiar; which could not have been expected to be otherwise in the case of islands, not only separated climatically to such an extent, but are also situated beyond the reach of all continents, the oceanic currents of which usually plant the waste shores. Many antarctic species indicate their endemic origin by the limited district through which they are distributed in the region itself. However, the special botanical results of Hooker's voyage, the description of which far excels his former communications in fulness and arrangement of the matter, are reserved for the next Annual Report. The Cryptogamia have also been partly described in the 'London Journal of Botany' for 1844, including 72 Hepaticæ from the Auckland Islands, by

Hooker and Taylor, (p. 366;) 66 sp. more from the Falklands, Cape Horn, and Kerguelen's Land, by the same author, (p. 454;) 73 antarctic *Jungermannia*, by Hooker and Wilson; with the new genera *Lophiodon* and *Hymenodon* (p. 533), and 151 antarctic Lichens, by Hooker and Taylor, (p. 632.)

Dr. Hooker paid particular attention to the distribution of the *Algæ* floating in the high latitudes of the Southern Ocean. (Antarct. Voy., Introdect.) *Macrocystis* and *Urvillea* were found common as far as the northern limit to the floating ice, in one instance they extended to 64° S. lat.; but they usually disappeared much sooner, e. g. south-east of America, below 55° S. lat. But in the latter meridian a new form of *Alga* appeared below 63° S. lat., which although previously found in D'Urville's expedition, has since been described as *Scytothalia Jacquinioti*. Here, near the coast of Palmer's Land, on Cockburn's Island, (64° S. lat.), no Phanerogamous plants were met with, only 20 Cryptogamia. These appear to be the last forms of plants in the direction of the antarctic pole; for even the *Algæ* are absent on that continental coast upon which the active volcano Erebus and the extinct volcano Terror are situated, and where the soil at the level of the sea appeared for the first time entirely deprived of vegetation,—a sight never before witnessed, and from which nature appears to have preserved even the highest latitudes of the north.

