

XVII. *Outlines of the Distribution of Arctic Plants.*

By JOS. D. HOOKER, *M.D., F.R.S., &c.*

(With a Map. Plate XXXII.)

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I SHALL endeavour in the following pages to comply, as far as I can, with a desire expressed by several distinguished Arctic voyagers, that I should draw up an account of the affinities and distribution of the flowering plants of the North Polar Regions. The method I have followed has been, first to ascertain the names and localities of all plants which appear on good evidence to have been found north of the arctic circle in each continent; then to divide the polar zone longitudinally into areas characterized by differences in their vegetation; then to trace the distribution of the arctic plants, and of their varieties and very closely allied forms, into the temperate and alpine regions of both hemispheres. Having tabulated these data, I have endeavoured to show how far their present distribution may be accounted for by slow changes of climate during and since the glacial period.

The arctic flora forms a circumpolar belt of 10° to 14° latitude, north of the arctic circle. There is no abrupt break or change in the vegetation anywhere along this belt, except in the meridian of Baffin's Bay, whose opposite shores present a sudden change from an almost purely European flora on its east coast, to one with a large admixture of American plants on its west.

The number of flowering plants which have been collected within the arctic circle is 762 (Monocot. 214; Dicot. 548). In the present state of cryptogamic botany it is impossible to estimate accurately the number of flowerless plants found within the same area, or to define their geographical limits; but the following figures give the best approximate idea I have obtained:—

Filices 28	Characeæ 2	Fungi 200?
Lycopodiaceæ 7	Musci 250	Algæ 100
Equisetaceæ 8	Hepaticæ 80	Lichenes 250
Total Cryptogams 925		
,, Phænogams 762		
<hr style="width: 20%; margin: auto;"/> 1687		

Regarded as a whole, the arctic flora is decidedly Scandinavian; for Arctic Scandinavia, or Lapland, though a very small tract of land, contains by far the richest arctic flora, amounting to three-fourths of the whole; moreover upwards of three-fifths of the species, and almost all the genera, of Arctic Asia and America are likewise Lapponian, leaving far too small a percentage of other forms to admit of the Arctic Asiatic and American floras being ranked as anything more than subdivisions, which I shall here call districts, of one general arctic flora.

Proceeding eastwards from Baffin's Bay, there is, first, the Greenland district, whose flora

is almost exclusively Laponian, having an extremely slight admixture of American or Asiatic types: this forms the western boundary of the purely European flora. Secondly, the Arctic European district, extending eastward to the Obi river, beyond the Ural range, including Nova Zembla and Spitzbergen; Greenland would also be included in it, were it not for its large area and geographical position. Thirdly, the transition from the comparatively rich European district to the extremely poor Asiatic one is very gradual; as is that from the Asiatic to the richer fourth or West American district, which extends from Behring's Straits to the Mackenzie River. Fifthly, the transition from the West to the East American district is even less marked; for the lapse of European and West American species is trifling, and the appearance of East American ones is equally so: the transition in vegetation from this district, again, to that of Greenland is, as I have stated above, comparatively very abrupt.

The general uniformity of the arctic flora, and the special differences between its subdivisions may be thus estimated: the arctic Phænogamic flora consists of 762 species; of these, 616 are Arctic European, many of which prevail throughout the polar area, being distributed in the following proportions through its different longitudes:—

Arctic Europe . . .	616	Scandinavian forms	586	Asiatic and American	30=1 : 19·57
„ Asia	233	„ „	189	„	44=1 : 4·2
„ W. America	364	„ „	254	„	110=1 : 2·3
„ E. America	379	„ „	269	„	110=1 : 2·4
„ Greenland .	207	„ „	195	„	12=1 : 16·2

This table places in a most striking point of view the anomalous condition of Greenland, which, though so favourably situated for harbouring an Arctic American vegetation, and so unfavourably for an Arctic European one, presents little trace of the botanical features of the great continent to which it geographically belongs, and an almost absolute identity with those of Europe. Moreover, the peculiarities of the Greenland flora are not confined to these; for a detailed examination shows that it differs from all other parts of the arctic regions in wanting many extremely common Scandinavian plants which advance far north in all the other polar districts, and that the general poverty of its flora in species is more due to an abstraction of arctic types than to a deficiency of temperature. This is proved by an examination of the temperate portion of the Greenland peninsula, which adds very few plants to the entire flora, as compared with a similar area south of any other arctic region; and these few are chiefly arctic plants and almost without exception Arctic Scandinavian species.

There is nothing in the physical features of the arctic regions, their oceanic or aerial currents, their geographical relations, nor their temperature, which, in my opinion, at all accounts for the exceptional character of the Greenland flora; nor do I see how it can be explained, except by assuming that extensive changes of climate, and of land and sea, have exerted great influence, first in directing the migration of the Scandinavian species over the whole polar zone, and afterwards in introducing the Asiatic and American species with which the Scandinavian are so largely associated in all the arctic districts except those of Europe and Greenland. It is inconceivable to me that so many Scan-

dinavian plants should, under existing conditions of sea, land, and temperature, have not only found their way westward to Greenland, by migration across the Atlantic, but should have stopped short on its west coast, and not crossed to America; or that so many American types should terminate as abruptly on the west coast of Baffin's Bay, and not cross to Greenland and Europe; or that Greenland should contain actually much fewer species of European plants than have found their way eastwards from Lapland by Asia into Western and Eastern Arctic America; or that the Scandinavian vegetation should in every longitude have migrated across the tropics of Asia and America, whilst those typical plants of these continents which have found their way into the arctic regions, have there remained restricted to their own meridians.

It appears to me difficult to account for these facts, unless we admit Mr. Darwin's* hypotheses, first, that the existing Scandinavian flora is of great antiquity, and that previous to the glacial epoch it was more uniformly distributed over the polar zone than it is now; secondly, that during the advent of the glacial period this Scandinavian vegetation was driven southward in every longitude, and even across the tropics into the south temperate zone; and that on the succeeding warmth of the present epoch, those species that survived both ascended the mountains of the warmer zones, and also returned northward, accompanied by aborigines of the countries they had invaded during their southern migration. Mr. Darwin shows how aptly such an explanation meets the difficulty of accounting for the restriction of so many American and Asiatic arctic types to their own peculiar longitudinal zones, and for what is a far greater difficulty, the representation of the same arctic genera by most closely allied species in different longitudes. To this representation, and the complexity of its character, I shall have to allude when indicating the sources of difficulties I have encountered, whether in limiting the polar species, or in determining to what southern forms many are most directly referable. Mr. Darwin's hypothesis accounts for many varieties of one plant being found in various alpine and arctic regions of the globe, by the competition into which their common ancestor was brought with the aborigines of the countries it invaded: different races survived the struggle for life in different longitudes; and these races again, afterwards converging on the zone from which their ancestor started, present there a plexus of closely allied but more or less distinct varieties or even species, whose geographical limits overlap, and whose members very probably occasionally breed together.

Nor is the application of this hypothesis limited to this inquiry; for it offers a possible explanation of a general conclusion at which I had previously arrived † and shall have again to discuss here—viz. that the Scandinavian flora is present in every latitude of the globe, and is the only one that is so; and it also helps to explain another class of most interesting and anomalous facts in arctic distribution, at which I have now arrived from an examination of the vegetation of the several polar districts, and especially of that of Greenland.

* This theory of a southern migration of northern types being due to the cold epochs preceding and during the glacial, originated, I believe, with the late Edward Forbes; the extended one, of their transtropical migration, is Mr. Darwin's, and is discussed by him in his 'Origin of Species,' chap. xi.

† *Introductio ad Floram Tasmaniae*, p. ciii.

A glance at the appended chart shows how this theory bears upon the Greenland flora, explaining the identity of its existing vegetation with that of Lapland, and accounting for its paucity of species, for the rarity of American species, of peculiar species, and of marked varieties of European species. If it be granted that the polar area was once occupied by the Scandinavian flora, and that the cold of the glacial epoch did drive this vegetation southwards, it is evident that the Greenland individuals, from being confined to a peninsula, would be exposed to very different conditions to those of the great continents. In Greenland many species would, as it were, be driven into the sea, that is, exterminated; and the survivors would be confined to the southern portion of the peninsula, and not being there brought into competition with other types, there could be no struggle for life amongst their progeny, and consequently no selection of better-adapted varieties. On the return of heat, these survivors would simply travel northwards, unaccompanied by the plants of any other country.

In Arctic America and Asia, on the other hand, where there was a free southern extension and dilatation of land for the same Scandinavian plants to occupy, these would multiply enormously in individuals, branching off into varieties and subspecies, and occupy a larger area the further south they were driven; and none need be altogether lost in the southern migration over plains, though many would in the struggle that ensued when they reached the mountains of those continents and were brought into competition with the alpine plants, which the same cold had caused to descend to the plains. Hence, on the return of warmth, many more Scandinavian species would return to Arctic America and Asia than survived in Greenland; some would be changed in form, because only the favoured varieties could have survived the struggle; some of the Alpine Siberian and Rocky Mountain species would accompany them to the arctic zone; while many arctic species would ascend those mountains, accompanying the alpine species in their reascent.

Again, as the same species may have been destroyed in most longitudes, or at most elevations, but not at all, we should expect to find some of those Arctic Scandinavian plants of Greenland which have not returned to Arctic America still lurking in remote alpine corners of that great continent; and we may account for *Draba aurea* being confined to Greenland and the Rocky Mountains, *Potentilla tridentata* to Greenland and Labrador, and *Arenaria Grænländica* to Greenland and the White Mountains of New Hampshire, by supposing that these were originally Scandinavian plants, which on the return of warmth were exterminated on the plains of the American continent, but found a refuge on its mountains, where they now exist.

It appears, therefore, to be no slight confirmation of the general truth of Mr. Darwin's hypothesis, that, besides harmonizing with the distribution of arctic plants within and beyond the polar zone, it can also be made, without straining, to account for that distribution and for many anomalies of the Greenland flora, viz., 1, its identity with the Lapponian; 2, its paucity of species; 3, the fewness of temperate plants in temperate Greenland, and the still fewer plants that area adds to the entire flora of Greenland; 4, the rarity of both Asiatic and American species or types in Greenland; and 5, the presence of a few of the rarest Greenland and Scandinavian species in enormously remote alpine localities of West America and the United States.

On the Local Distribution of Plants within the Arctic Circle.

The greatest number of plants occurring in any given arctic district is found in the European, where 616 flowering plants have been collected from the verge of the circle to Spitzbergen. From this region vegetation rapidly diminishes in proceeding eastwards and westwards, especially the latter. Thus, in Arctic Asia only 233 flowering plants have been collected; in Arctic Greenland, 207 species; in the American continent east of the Mackenzie River, 379 species; and in the area westwards from that river to Behring's Straits, 364 species.

A glance at the annual and monthly isothermal lines shows that there is little relation between the temperature and vegetation of the areas they intersect, beyond the general feature of the scantiness of the Siberian flora being accompanied by a great southern bend of the annual isotherm of 32° in Asia, and the greatest northern bend of the same isotherm occurring in the longitude of west Lapland, which contains the richest flora. On the other hand, the same isotherm bends northwards in passing from Eastern America to Greenland, the vegetation of which is the scantier of the two; and passes to the northward of Iceland, which is much poorer in species than those parts of Lapland to the southward of which it passes.

The June isothermals, as indicating the most effective temperatures in the arctic regions (where all vegetation is torpid for nine months, and excessively stimulated during the three others), might have been expected to indicate better the positions of the most luxuriant vegetation: but neither is this the case; for the June isothermal of 41° , which lies within the arctic zone in Asia, where the vegetation is scanty in the extreme, descends to 54° N. lat. in the meridian of Behring's Straits, where the flora is comparatively luxuriant; and the June isothermal of 32° , which traverses Greenland north of Disco, passes to the north both of Spitzbergen and the Parry Islands. In fact, it is neither the mean annual, nor the summer (flowering), nor the autumn (fruiting) temperature that determines the abundance or scarcity of the vegetation in each district, but these combined with the ocean temperature and consequent prevalence of humidity, its geographical position, and its former conditions both climatal and geographical. The relations between the isothermals and floras in each longitude being therefore special, and not general, I shall consider them further when defining the different arctic floras.

The northern limits to which vegetation extends varies in every longitude; and its extreme limits are still unknown; it may, indeed, reach to the pole itself. Phænogamic plants, however, are probably nowhere found far north of lat. 81° . 70 flowering plants are found in Spitzbergen; and Sabine and Ross collected 9 on Walden Island, towards its northern extreme, but none on Ross's Islet, 15 miles further to the north. Sutherland, a very careful and intelligent collector, found 23 at Melville Bay and Wolstenholme and Whale Sounds, in the extreme north of Baffin's Bay (lat. 76° , 77° N.). Parry, James Ross, Sabine, Beechey, and others, together found 60 species on Melville Island, and Lyall 50 on the islands north of Barrow Straits and Lancaster Sound. About 80 have been detected on the west shores of Baffin's Bay and Davis's Straits, between Pond Bay and Home Bay. To the north of Eastern Asia, again, Seemann collected only 4 species on

Herald Island, lat. $71\frac{1}{2}^{\circ}$ N., the northernmost point attained in that longitude. On the west coast of Greenland, Scoresby and Sabine found only 50 between the parallels of 70° and 75° N.; whilst 150 inhabit the east coast, between the same parallels.

The differences between the vegetations of the various polar areas seem to be to a considerable extent constant up to the extreme limits of vegetation in each. Thus *Ranunculus glacialis* and *Saxifraga flagellaris*, which are all but absent in West Greenland*, advance to the extreme north in East Greenland and Spitzbergen. *Caltha palustris*, *Astragalus alpinus*, *Oxytropis Uralensis* and *nigrescens*, *Parrya arctica*, *Sieversia Rossii*, *Nardosmia corymbosa*, *Senecio palustris*, *Deschampsia cæspitosa*, *Saxifraga hieraciifolia* and *Hirculus*, all of which are absent in West Greenland, advance to Lancaster Sound and the polar American islands, a very few miles to the westward of Greenland.

On the other hand, *Lychnis alpina*, *Arabis alpina*, *Stellaria cerastioides*, *Potentilla tridentata*, *Cassiopeia hypnoides*, *Phyllococe taxifolia*, *Veronica alpina*, *Thymus Serpyllum*, *Luzula spicata*, and *Phleum alpinum*, all advance north of 70° in West Greenland, but are wholly unknown in any part of Arctic Eastern America or the polar islands.

The most arctic plants of general distribution that are found far north in all the arctic areas are the following; all inhabit the Parry Islands, or Spitzbergen, or both:—

<i>Ranunculus nivalis</i> .	<i>Sedum Rhodiola</i> .
— auricomus.	<i>Chrysosplenium alternifolium</i> .
— pygmæus.	<i>Saxifraga oppositifolia</i> .
<i>Papaver nudicaule</i> .	— cæspitosa.
<i>Cochlearia officinalis</i> .	— cernua.
<i>Braya alpina</i> .	— rivularis.
<i>Cardamine bellidifolia</i> .	— nivalis.
— pratensis.	— stellaris.
<i>Draba alpina</i> .	— flagellaris.
— androsacea.	— <i>Hirculus</i> (East Greenland only).
— hirta.	<i>Antennaria alpina</i> .
— muricella.	<i>Erigeron alpinus</i> .
— incana.	<i>Taraxacum Dens-leonis</i> .
— rupestris.	<i>Cassiopeia tetragona</i> .
<i>Cochlearia anglica</i> .	<i>Pedicularis hirsuta</i> .
— officinalis.	— sudetica.
<i>Silene acaulis</i> .	<i>Oxyria reniformis</i> .
<i>Lychnis apetala</i> .	<i>Polygonum viviparum</i> .
<i>Arenaria verna</i> .	<i>Empetrum nigrum</i> .
— arctica.	<i>Salix herbacea</i> .
<i>Stellaria longipes</i> .	— reticulata.
<i>Cerastium alpinum</i> .	<i>Luzula arcuata</i> .
<i>Potentilla nivea</i> .	<i>Juncus biglumis</i> .
— frigida.	<i>Carex fuliginosa</i> (not yet found in Arctic
<i>Dryas octopetala</i> .	Asia, but no doubt there).
<i>Epilobium latifolium</i> .	— aquatilis (do.).

* Both were found by Kane's Expedition, but by no previous one.

Eriophorum capitatum.	Colpodium latifolium.
— polystachyum.	Poa flexuosa.
Alopecurus alpinus.	— pratensis.
Deyeuxia Lapponica.	— nemoralis.
Deschampsia cæspitosa (East Greenland only).	Festuca ovina.
Phippsia algida.	

Of the above, *Saxifraga oppositifolia* is probably the most ubiquitous, and may be considered the commonest and most arctic flowering plant.

The following are also inhabitants of all the five arctic areas, but do not usually attain such high latitudes as the foregoing :—

Ranunculus Lapponicus.	Polemonium cæruleum, and vars. (East Greenland only.)
Draba rupestris.	Pedicularis Lapponica.
Viola palustris.	Armeria vulgaris.
Honkeneya peploides.	Betula nana.
Epilobium angustifolium.	Salix lanata.
— alpinum.	— glauca.
Hippuris vulgaris.	— alpestris.
Artemisia borealis.	Luzula campestris.
Vaccinium uliginosum.	Carex vesicaria.
— Vitis-idæa.	Eriophorum vaginatum.
Ledum palustre.	Atropis maritima.
Pyrola rotundifolia.	

The absence of *Gentiana* and *Primula* in these lists is very unaccountable, seeing how abundant and very alpine they are on the Alps and Himalaya, and *Gentiana* on the South American Cordilleras also.

The few remaining plants, which are all very northern, and almost or wholly confined to the arctic zone, are the following. † indicates those species absolutely peculiar; †† the only peculiar genus.

Ranunculus Pallasii.	Sieversia glacialis.
— hyperboreus.	Rubus arcticus.
Trollius Asiaticus.	Parnassia Kotzebuei.
Corydalis glauca.	Saxifraga Eschscholtzii.
Cardamine purpurea.	— serpyllifolia.
Turritis mollis.	†— Richardsoni.
Cochlearia sisymbrioides.	Cænolophium Fischeri.
Hesperis Pallasii.	†Nardosmia glacialis.
†Braya pilosa.	Artemisia Richardsoniana.
Eutrema Edwardsii.	— glomerata.
Parrya arctica.	†— androsacea.
†— arenicola.	Erigeron compositus.
Odontarrhena Fischeriana.	Chrysanthemum arcticum.
Sagina nivalis.	Pyrethrum bipinnatum.
Stellaria dicranoides.	†Saussurea subsinuata.
Oxytropis nigrescens.	Campanula uniflora.
Sieversia Rossii.	Gentiana arctophila.

Gentiana aurea.	Carex nardina.
Eutoca Franklinii.	— glareosa.
Pedicularis flammea.	— rariflora.
†Douglasia arctica.	Hierochloe pauciflora.
†Monolepis Asiatica.	Deschampsia atropurpurea.
Betula fruticosa.	Phippsia algida.
Salix speciosa.	Dupontia Fisheri.
†— glacialis.	Colpodium pendulinum.
— phlebophylla.	— fulvum.
— arctica.	— latifolium.
Orchis cruenta.	††Pleuropogon Sabini.
Platanthera hyperborea.	†Festuca Richardsoni.

On the Distribution of Arctic Flowering Plants in various Regions of the Globe.

There is but one distinct genus confined to the arctic regions, the monotypic and local *Pleuropogon Sabini*; and there are but seven other peculiarly arctic species, together with one with which I am wholly unacquainted, viz. *Monolepis Asiatica*. The remaining 762 species are all of them found south of the circle; and of these all but 150 advance south of the parallel of 40° N. lat., either in the Mediterranean basin, Northern India, the United States, Oregon, or California; about 50 are natives of the mountainous regions of the tropics; and just 105 inhabit the south temperate zone.

The proportion of species which have migrated southwards in the Old and New World also bear a fair relation to the facilities for migration presented by the different continents. Thus,

Of 616 Arctic European species, 496 inhabit the Alps, and 450 cross them; 126 cross the Mediterranean; 26 inhabit South Africa.	Of 233 Arctic Asiatic species, 210 reach the Altai, Soongaria, &c. ; 106 reach the Himalaya ; 0 are found on the tropical mountains of Asia ; 5 inhabit Australia and New Zealand.
Of 379 Arctic East American, 203 inhabit the United States (of which 21 are confined to the mountains). 34 inhabit tropical American mountains. 50 inhabit temperate south America.	Of 346 Arctic West American species, 274 are north temperate ; 24 on tropical mountains; 37 in south temperate zone.

These tables present in a very striking point of view the fact of the Scandinavian flora being the most widely distributed over the globe. The Mediterranean, South African, Malayan, Australian, and all the floras of the New World have narrow ranges compared with the Scandinavian, and none of them form a prominent feature in any other continent than their own; but the Scandinavian not only girdles the globe in the arctic circle, and dominates over all others in the north temperate zone of the Old World, but intrudes conspicuously into every other temperate flora, whether in the northern or southern hemisphere, or on the Alps of tropical countries.

The severest test to which this observation could be put is that supplied by the Arctic

Scandinavian forms; for these belong to the remotest corner of the Scandinavian area, and should of all plants be the most impatient of temperate, warm, and tropical climates. The following will, approximately, express the result :—

Total Arctic Scandinavian forms	586	Cross Alps, &c.	480
In North United States and Canada, &c.	360	Reach South Africa	20
In Tropical America	40	Himalaya, &c.	300
In Temperate South America	70	Tropical Asia	20
In Alps of Middle Europe, Pyrenees, &c.	490	Australia, &c.	60

In one respect this migration is most direct in the American meridian, where more arctic species reach the highest southern latitudes. This I have accounted for (*Flora Antarctica*, p. 230) by the continuous chain of the Andes having favoured their southern dispersion.

But the greatest number of arctic plants are located in Central Europe, no fewer than 530 out of 762 inhabiting the Alps and Central and Southern Europe, of which 480 cross the Alps to the Mediterranean basin. Here, however, their further spread is apparently suddenly arrested; for though many doubtless are to be found in the Alps of Abyssinia and the western Atlas, these are few compared with what are found further east in Asia; and fewer still have found their way to South Africa.

The most continuous extension of Scandinavian forms is in the direction of the greatest continental extension; namely, that from the North Cape in Lapland to Tasmania*; for no less than 350 Scandinavian plants have been found in the Himalaya, and 53 in Australia and New Zealand; whereas there are scarcely any Himalayan and no Australian or Antarctic forms in Arctic Europe. Now that Mr. Darwin's hypotheses are so far accepted by many botanists, in that these concede many species of each genus to have had in most cases a common origin, it may be well to tabulate the generic distribution of arctic plants as I have done the specific; and this places the prevalence of the Scandinavian types of vegetation in a much stronger light :—

Scandinavian Arctic Genera in Europe	280	Cross Alps (approximately)	260
Found in North United States (approximately)	270	Found in South Africa (approximately)	110
,, Tropical American Mountains ,,	100	,, Himalaya, &c. ,,	270
,, Temperate South America ,,	120	,, Tropical Asia ,,	80
,, Alps	280	,, Australia, &c. ,,	100

The most remarkable anomaly is the absence of *Primula* in Tropical America, that genus being found in Extra-tropical South America; and its absence in the whole southern temperate zone of the Old World, except the Alps of Java.

* The line which joins these points passes through Siberia, Eastern China, the Celebes Islands, and Australia, but the glacial migration has no doubt been due south from the arctic and north temperate regions in various longitudes to the Pyrenees, Alps, Carpathians, Caucasus, Asia Minor, Persian and North Indian mountains, &c. The further migration south to the distant and scattered alpine heights of the tropics, and thence to South Australia, Tasmania, and New Zealand, is, in the present state of our knowledge, to me quite unaccounted for. Mr. Darwin assumes for this purpose a cooled condition of the globe that must have been fatal to all such purely tropical vegetation as we are now familiar with.

Thalictrum, *Delphinium*, *Impatiens*, *Prunus*, *Circea*, *Chrysosplenium*, *Parnassia*, *Bupleurum*, *Hieracleum*, *Viburnum*, *Valeriana*, *Artemisia*, *Vaccinium*, *Rhododendron*, *Pedicularis*, and *Salix*, are all arctic genera found on the tropical mountains of Asia (Nilghiri, Ceylon, Java, &c.), but not yet in the south temperate zones of Asia, and very few of them in Temperate South Africa.

There are, however, a considerable number of Scandinavian plants which are not found in the Alps of Middle Europe, though found in the Caucasus, Himalaya, &c.; and conversely there are several Arctic Asiatic and American plants found in the Alps of Central Europe, but nowhere in Arctic Europe. In other words, certain species extend from Arctic America through Central Asia and North India to Central Europe, which do not extend from Arctic America westward to Arctic Europe; and there are certain other species which extend from Arctic Europe to the Caucasus and Central Asia, which do neither exist on the Alps of Central Europe nor extend eastward to Arctic America: thus,

Common to Arctic Europe and Temperate Asia, &c., but not to Alps of Europe.

Ranunculus nivalis.	Cornus suecica.	Naumbergia thyrsiflora.
— hyperboreus.	Galium triflorum.	Primula stricta.
Trollius Asiaticus.	Valeriana capitata.	— Sibirica.
Cardamine bellidifolia.	Nardosmia frigida.	Koenigia Islandica.
Parrya macrocarpa.	— palmata.	Betula alpestris.
— arctica.	Chrysanthemum arcticum.	Salix lanata.
Draba alpina.	Pyrethrum bipinnatum.	— myrtilloides.
— muricella.	Artemisia borealis.	— polaris.
— hirta.	Antennaria alpina.	Picea orientalis.
— rupestris.	Senecio frigidus.	Larix Ledebourii.
Eutrema Edwardsii.	Ligularia Sibirica.	Platanthera obtusata.
Silene turgida.	Aster Sibiricus.	Calypso borealis.
Lychnis apetala.	— Tataricus.	Sparganium natans.
Sagina nivalis.	Mulgedium Sibiricum.	Calla palustris.
Arenaria lateriflora.	Campanula uniflora.	Luzula arcuata.
— arctica.	Cassiopeia hypnoides.	Juncus biglumis.
Stellaria borealis.	Cassandra calyculata.	Carex glareosa.
— humifusa.	Diapensia Lapponica.	— Norwegica.
— longipes.	Rhododendron Lapponicum.	— festiva.
— crassifolia.	Ledum palustre.	— loliacea.
Rubus arcticus.	Gentiana detonsa.	— fuliginosa.
— chamæmorus.	Pleurogyne rotata.	— rariflora.
Rosa blanda.	Myosotis sparsiflora.	— livida.
Saxifraga rivularis.	Eritrichium villosum.	— laxa.
— nivalis.	Gymnandra borealis.	— capillaris.
— flagellaris.	Castilleja pallida.	— salina.
— bronchialis.	Veronica macrostemon.	— vulgaris.
Cenolophium Fischeri.	Pedicularis Lapponica.	— cæspitosa.
Conioselinum Fischeri.	— hirsuta.	— aquatilis.
Ligusticum Scoticum.	— Sudetica.	— globularis.
Chærophyllum bulbosum.	Pinguicula villosa.	Blysmus rufus.

Alopecurus alpinus.	Deyeuxia Langsdorffii.	Colpodium pendulinum.
Deyeuxia deschampsoides.	Hierochloe alpina.	— fulvum.
— Laponica.	Colpodium latifolium.	Dupontia Fisheri.
— strigosa.		

It is curious to remark how many of these boreal European plants, which are absentees in the Alps, have a very wide range, not only extending to the Himalaya and North China, but many of them all over Temperate North America; only one is found in the south temperate zone. In the present state of our knowledge we cannot account for the absence of these in the Alps; either they were not natives of Arctic Europe immediately previous to the glacial period, or if so, and they were then driven south to the Alps, they were afterwards there exterminated; or, lastly, they still inhabit the Alps under disguised forms, which pass for different species. Probably some belong to each of these categories. I need hardly remark that none inhabit Europe south of the Alps, or any part of the African continent.

The list of Arctic American and Asiatic species which do inhabit the Alps of Europe, but not Arctic Europe, is much smaller. Those marked † are Scandinavian, but do not enter the arctic circle.

Anemone patens.	†Spiræa salicifolia.	Alnus viridis.
— alpina.	†Potentilla fruticosa.	Pinus cembra.
— narcissiflora.	Potentilla sericea.	†Sparganium simplex.
†Ranunculus sceleratus.	†Ceratophyllum demersum.	†Typha latifolia.
†Aconitum Napellus.	Bupleurum ranunculoides.	Carex ferruginea.
†Arabis petræa.	†Viburnum Opulus.	— supina.
†Cardamine hirsuta.	Galium rubioides.	— stricta.
Draba stellata.	†— saxatile.	†— pilulifera.
†Thlaspi montanum.	Ptarmica alpina.	†Scirpus triquetter.
†Lepidium ruderales.	Aster alpinus.	Deyeuxia varia.
†Sagina nodosa.	Gentiana prostrata.	Spartina cynosuroides.
†Linum perenne.	Polygonum polymorphum.	†Glyceria fluitans.
Phaca alpina.	Corispermum hyssopifolium.	Hordeum jubatum.
†Astragalus hypoglottis.		

Botanical Districts within the Arctic Circle.

The following are the prominent features, botanical, geographical, and climatal, of the five districts of the arctic zone:—

1. *Arctic Europe.*—The majority of its plants are included in the Lapland and Finland floras; and, owing to the temperature of the Gulf Stream, which washes its coasts, Lapland is by far the richest province in the arctic regions. The mean annual temperature at the polar circle, where it cuts the coast-line, is about 37°, and the June and September temperatures throughout Lapland are 40° and 37° respectively; thus rendering the climate favourable both to flowering and fruiting. Spitzbergen belongs to this flora, as do Nova Zembla and the arctic countries west of the river Obi, which forms its eastern boundary; for the Ural Mountains do not limit the vegetation, any more than do the Rocky Mountains in America. Gmelin observed more than a century ago that the river Obi in lower latitudes indicates the transition longitude from the European to the Asiatic flora.

Even in this small area, however, there are two floras, corresponding to the Arctic Norwegian and Arctic Russian. The latter, commencing at the White Sea, though comparatively excessively poor in species, contains nearly twenty that are not Lapponian, including *Braya rosea*, *Dianthus alpinus* and *Seguieri*, *Spiræa chamædrifolia*, *Saxifraga hieracifolia*, *Hieracleum Sibiricum*, *Ligularia Sibirica*, *Ptarmica alpina*, *Gentiana verna*, *Pleurogyne rotata*, and *Larix Sibirica*.

There are further several Scandinavian plants which cross the arctic circle on the east shores of the White Sea, but do not do so in Lapland, as *Athamanta Libanotis*, *Chrysanthemum Leucanthemum*, *Bidens tripartita*, and others.

Iceland and Greenland also botanically belong to the Arctic Lapland province, but I have here excluded both: the former because it lies to the south of the arctic circle; the latter because both its magnitude, position, and other circumstances, require that it should be treated of separately.

As far as I can ascertain, 616 species ($\left. \begin{array}{l} \text{Monocotyledons} \dots 183 \\ \text{Dicotyledons} \dots\dots 433 \end{array} \right\} = 1:2:3$) enter the arctic circle in this region, of which 70 advance into Spitzbergen; but no phænogamic plant is found in Ross' Islet beyond its northern extremity. The proportion of genera to species 266:616 | 1:2:3. Of these Arctic-European plants, 453 cross the Alps or Pyrenees to the Mediterranean basin, a few occur on the mountains of Tropical Africa (including *Luzula campestris* and *Deschampsia cæspitosa*), and 23 are found in South Africa.

No fewer than 264 species do not enter the arctic circle in any other longitude, and 184 are almost exclusively natives of the Old World, or of this and of Greenland; not being found in any part of North America; 24 are confined to Arctic Europe and Greenland.

The following Arctic European plants are of sporadic occurrence in N. America:—

<i>Ranunculus acris</i> , Rocky Mountains.	<i>Gentiana nivalis</i> , Greenland and Labrador.
<i>Arabis alpina</i> , Greenland and Labrador.	<i>Veronica alpina</i> , Greenland and U. States Mountains.
<i>Lychnis alpina</i> , Greenland and Labrador.	<i>Bartsia alpina</i> , Greenland and Labrador.
<i>Arenaria arctica</i> , Greenland and Rocky Mountains.	<i>Pedicularis palustris</i> , Labrador.
—— <i>verna</i> , Greenland, Arctic Islands, and Rocky Mountains.	<i>Primula farinosa</i> , Labrador.
<i>Alchemilla vulgaris</i> , Greenland and Labrador.	<i>Salix phylicifolia</i> , U. States Mountains.
<i>Gnaphalium sylvaticum</i> , Greenland and Labrador.	—— <i>arbuscula</i> , Greenland and U. States Mountains.
—— <i>supinum</i> , Greenland, Labrador, and U. States Mountains.	<i>Juncus trifidus</i> , Greenland and U. States Mountains.
<i>Vaccinium myrtillus</i> , Rocky Mountains only.	<i>Carex capitata</i> , Greenland and U. States Mountains.
<i>Cassiopeia hypnoides</i> , Greenland, U. States Mountains, and Labrador.	<i>Phleum alpinum</i> , Greenland, U. States Mountains, and Labrador.
<i>Phyllodoce taxifolia</i> , Greenland, U. States Mountains, and Labrador.	<i>Calamagrostis lanceolata</i> , Labrador.

There are besides a considerable number of Arctic European plants, which, in the New World, are confined to Greenland, being nowhere found in East America: these will be enumerated when treating of the Greenland flora.

The plants which are widely distributed in Temperate America or Asia, but almost exclusively Arctic in Europe, are the following:—

<i>Ranunculus Pallasii</i> , Asia and America.	<i>Eritrichium aretioides</i> , Asia and America.
<i>Trollius Asiaticus</i> , Asia.	<i>Gymnandra Pallasii</i> , Asia.
<i>Parrya macrocarpa</i> , Asia and America.	<i>Castilleja pallida</i> , Asia and America.
——— <i>arctica</i> , Asia and America.	<i>Veronica macrostemon</i> , Asia.
<i>Stellaria longipes</i> , Asia and America.	<i>Pedicularis flammea</i> , America.
<i>Potentilla emarginata</i> , America.	<i>Pinguicula villosa</i> , Asia and America.
<i>Epilobium latifolium</i> , Asia and America.	<i>Koenigia islandica</i> , Asia and America.
<i>Sedum quadrifidum</i> , Asia.	<i>Salix polaris</i> , Asia and America.
<i>Saxifraga bronchialis</i> , Asia and America.	<i>Picea orientalis</i> , Asia.
<i>Senecio resedæfolius</i> , Asia and America.	<i>Larix Ledebourii</i> , Asia.
<i>Ligularia Sibirica</i> , Asia.	<i>Platanthera hyperborea</i> , America.
<i>Mulgedium Sibiricum</i> , Asia.	——— <i>obtusata</i> , America.
<i>Cassiopeia tetragona</i> , Asia and America.	<i>Deyeuxia Deschampsiioides</i> , Asia and N.W. America.
<i>Gentiana detonsa</i> , Asia and America.	
<i>Pleurogyne rotata</i> , Asia and America.	<i>Dupontia Fisheri</i> , America.

The works upon which I have mainly depended for the habitats of the Arctic European plants are Wahlenberg's 'Flora Lapponica,' Ledebour's 'Flora Rossica,' Fries' 'Summa Vegetabilium Scandinaviæ,' and 'Mantissæ,' and various admirable treatises by Andersson, Nylander, Hartmann, Lindblöm, Wahlberg, Blytt, C. Martins, Ruprecht, and Schrenk.

For Spitzbergen plants I have depended on Hooker's enumeration of the Spitzbergen collections made during Parry's attempt to reach the north pole, Capt. Sabine's collection made in the same island, and on Lindblöm and Beilschmied's 'Flora von Spitzbergen' (Regensburg, Flora, 1842).

For the southern distribution of the Arctic European plants, I have further consulted Nyman's excellent 'Sylloge,' Ledebour's 'Flora Rossica,' Grisebach's 'Flora Rumelica,' Grenier and Godron's 'Flore de France,' Parlatore's 'Flora Italiana,' Koch's 'Synopsis Floræ Germaniæ,' Munby's 'Catalogue of Algerian Plants,' A. Richard's of those of Abyssinia, Visiani's 'Flora Dalmatica,' Delile's 'Flora Ægyptiaca,' Boissier's noble 'Voyage Botanique dans l'Espagne,' and Tchihatcheff's 'Asia Minor,' besides numerous local floras of the Mediterranean regions, Madeira, the Azores, and Canaries.

2. *Arctic Asia*.—This, which for its extent, contains by far the poorest flora of any on the globe, reaches from the Gulf of Obi eastwards to Behring's Straits, where it merges into the West American. The climate is marked by excessive mean cold; at the Obi the isotherm of 18° cuts the arctic circle in its S.E. course, and at the eastern extremity of the province the isotherm of 20° cuts the same circle, while the centre part of the district is all north of the isotherm of 9°. The whole of the district is hence far north of the isotherm of 32°, which descends to 52° N.L. in its middle longitude. The extremes of temperature are also very great; the June isotherm of 41° ascending eastward through its western half to the Polar Sea, whilst the September isotherm of 41° descends nearly to 60° N.L.; whence the low autumn temperature must present an almost insuperable obstacle to the ripening of seeds within this segment of the polar circle.

The warming influence of the Atlantic currents being felt no further east than the Obi, and the summer desiccation of the vast Asiatic continent, combine to render the climate of this region one of excessive drought as well as cold; whence it is in every way most unfavourable to vegetation of all kinds.

The total number of species hitherto recorded from this area is 233

$$\left(\begin{array}{l} \text{Monocotyledons } 42 \\ \text{Dicotyledons } 191 \end{array} \right) = 1 : 4.5.$$

The proportion of genera to species is 1 : 2. Of the 233 species, 217 inhabit Siberia as far south as the Altai, or Japan, &c.; 104 extend southwards to the Himalaya or mountains of Persia; 4 are found on the mountains of the two Indian peninsulas, and 8 on those of Australia and New Zealand. All but the following 37 are European. Those marked with a † are almost exclusively arctic.

Delphinium Menziesii (West America).	†Nardosmia glacialis (Arctic Asia only).
†Cochlearia sisymbrioides (Boreal ditto).	—— Gmelini.
Hesperis Pallasii (East and West America).	†Artemisia Steveniana (Arctic Asia only).
Odontarrhena Fischeriana.	—— glomerata (West America).
Cardamine macrophylla.	—— biennis (E. and W. America).
†Arenaria macrocarpa (West America).	Osmothamnus fragrans.
—— laricina.	Pedicularis capitata (E. and W. America).
†—— Rossii (Rocky Mountains).	—— euphrasioides (E. and W. America).
Cerastium maximum (West America).	†Monolepis Asiatica (Arctic Asia only).
†Oxytropis nigrescens (Boreal E. and W. America).	Rumex salicifolius (E. and W. America).
Hedysarum Sibiricum.	—— graminifolius.
†Sieversia glacialis (Boreal W. America).	Salix ovalifolia (West America).
Potentilla stipularis.	Abies alba (E. and W. America).
—— fragiformis.	Larix Americana (E. and W. America).
Claytonia lanceolata.	Tofieldia coccinea (E. and W. America).
†Sedum euphorbioides (Arctic Asia only).	Fritillaria Kamtchatkensis (West America).
Saxifraga Escholtzii (Boreal W. America).	Carex concinna (West America).
Saxifraga serpyllifolia (W. America).	Elymus mollis (E. and W. America).
—— punctata (West America).	

Thus out of 37 non-European species, only 12 are confined to Asia, the remaining 25 being American. On the other hand, there are only 22 European species in Arctic Asia which are not also American; which scarcely establishes a nearer relationship between Arctic Asia with Europe than with America.

These are

Dianthus Seguieri.	Leontodon autumnalis.
—— superbus.	Hieracium alpinum.
Silene inflata.	Veronica longifolia.
Arenaria uliginosa.	Pedicularis Sceptrum.
Phaca alpina.	Pinguicula alpina.
Hedysarum obscurum.	Polygonum Sibiricum.
Rubus Idæus.	Salix Lapponum.
Sedum quadrifidum.	—— nigricans.
Gaya simplex.	—— hastata.

Picea orientalis.
Larix Ledebourii.

Cypripedium Calceolus.
Carex ferruginea.

In other words, of the 233 Asiatic species, 196 are common to Asia and Europe, 22 are confined to Asia and Europe, 25 are confined to Asia and America only; and 12 are confined to Asia, of which 3 are peculiar to the arctic circle.

The rarity of Gramineæ and especially of Cyperaceæ in this region is its most exceptional feature; only 21 of the 138 arctic species of these orders having hitherto been detected in it. Cryptogamic plants seem to be even more rare; *Woodsia ilvensis* and *Lastrea fragrans* being the only Filices hitherto enumerated. Further researches along the edge of the arctic circle would doubtless add more Siberian species to this flora, as the examination of the north-east extreme would add American species, and possibly lead to the flora of the country of the Tchutchis being ranked with that of West America.

The works which have yielded me most information regarding this flora, are Ledebour's 'Flora Rossica,' and the valuable memoirs of Bunge, C. A. Meyer, and Trautvetter, on the vegetation of the Taimyr and Boganida rivers; and on the plants of Jenissei river in Von Middendorff's Siberian 'Travels'. For their southern extension Trautvetter and Meyer's 'Flora Ochotensis,' also in Middendorff's 'Travels'; Bunge's enumeration of North China and Mongolian plants; Maximovicz's 'Flora Amurensis;' Asa Gray's paper on the botany of Japan (Mem. Amer. Acad. N.S. vi.); Karlin and Kiriloff's enumeration of Soongarian plants; Regel, Bach, and Herder on the East Siberian and Jakutsk collections of Paullowsky and Von Stubendorff. For the Persian and Indian distribution, I have almost entirely depended on the herbarium at Kew, and on Boissier's and Bunge's numerous works.

3. *Arctic West America.*—The district thus designated is analogous in position, and to a considerable extent in climate, to the Arctic European, but is much colder; as is indicated both by the mean temperature, and by the position of the June isotherm of 41°, which makes an extraordinary bend to the south, nearly to 52° N. L., in the longitude of Behring's Straits.

It extends from Cape Prince of Wales, on the east shore of Behring's Straits, to the estuary of the Mackenzie river, and as a whole it differs from the flora of the province to the eastward of it by its far greater number both of European and Asiatic species, by containing various Altai and Siberian plants which do not reach so high a latitude in more western meridians, and by some temperate plants peculiar to West America. This eastern boundary is, however, quite an artificial one; for a good many eastern plants cross the Mackenzie and advance westwards to Point Barrow, but which do not extend to Kotzebue's Sound; and a small colony of Rocky Mountain plants also spread eastwards and westwards along the shores of the Arctic Sea, which further tend to connect the floras; such are *Aquilegia brevistylis*, *Sisymbrium humile*, *Hutchinsia calycina*, *Heuchera Richardsonii*, *Crepis nana*, *Gentiana arctophila*, *Salix speciosa*; none of which are generally diffused arctic plants, or natives of any other parts of Temperate America but the Rocky Mountains.

The arctic circle at Kotzebue's Sound is crossed by the isotherm of 23°, and at the

longitude of the Mackenzie by that of $12^{\circ} 5'$; whilst the June isotherm of 41° ascends obliquely from S.W. to N.E., from the Aleutian Islands to the mouth of the Mackenzie, and passes south of this province; the June and the September isotherms of 41° and 32° both traverse it obliquely, ascending to the N.E.

The vast extent of the Pacific Ocean and its warm northerly currents greatly modify the climate of West Arctic America, causing dense fogs to prevail, especially throughout the summer months, whilst the currents keep the ice to the north of Behring's Straits. The shallowness of the ocean between America and Asia, north of lat. 60° , together with the identity of the vegetation in the higher latitudes of these continents, suggests the probability of the land having been continuous at no remote epoch.

The number of phænogamic plants hitherto found in Arctic West America is 364

$$\left(\begin{array}{l} \text{Monocotyledons } 76 \\ \text{Dicotyledons } 288 \end{array} \right) = 1 : 3.7.$$

The proportion of genera to species is 1 : 1.7. Of these 364 species, almost all but the littoral and purely arctic species are found in West Temperate North America or in the Rocky Mountains, 26 in the Andes of Tropical or Subtropical America, and 37 in Temperate or Antarctic South America. Comparing this flora with that of Temperate and Arctic Asia, I find that no less than 320 species are found on the north-western shores and islands of that continent, or in Siberia, many extending to the Altai and the Himalaya. A comparison with Eastern Arctic America shows that 281 are common to it, and the following 38 are found in Temperate, but not Arctic East America.

<i>Anemone alpina</i> .	<i>Senecio resedæfolius</i> (Eur., As., Am.).
— <i>Pennsylvanica</i> .	— <i>pseudo-Arnica</i> (Asia and America).
<i>Hutchinsia calycina</i> (Rocky Mountains only and Asia).	<i>Cassandra calyculata</i> (Europe, Asia, America).
<i>Sisymbrium humile</i> (R. M. and As.).	<i>Gentiana arctophila</i> (Rocky Mountains only).
<i>Draba oligosperma</i> (Rocky Mountains only).	— <i>prostrata</i> (Europe, Asia, America).
<i>Lathyrus palustris</i> (Europe, Asia, East and West America).	— <i>tenella</i> (Eur., As., Am.).
<i>Spiræa salicifolia</i> (Eur., As., E. & W. Am.).	<i>Veronica scutellata</i> (Eur., As., Am.).
<i>Potentilla fruticosa</i> (Eur., As., E. & W. Am.).	<i>Pedicularis palustris</i> (Eur., As., Am.).
— <i>Pennsylvanica</i> (Eur., As., E. & W. Am.).	<i>Atriplex patula</i> (Eur., As., Am.).
<i>Comarum palustre</i> (Eur., As., E. & W. Am.).	<i>Corispermum hyssopifolium</i> (Eur., As., Am.).
<i>Montia fontana</i> (Eur., As., & W. Am.).	<i>Corallorhiza innata</i> (Eur., As., Am.).
<i>Saxifraga Sibirica</i> (Asia and Labrador only).	<i>Luzula spadicea</i> (Eur., As., Am.).
— <i>Dahurica</i> (Asia and Rocky Mounts. only).	— <i>spicata</i> (Eur., As., Am.).
— <i>bronchialis</i> (Europe, Asia, & R. Mounts.).	— <i>pilosa</i> (Eur., As., Am.).
<i>Archangelica officinalis</i> (Europe, Asia, America).	<i>Juncus balticus</i> (Eur., As., Am.).
<i>Ligusticum Scoticum</i> (Eur., As., Am.).	<i>Carex lagopina</i> (Eur., As., Am.).
<i>Cornus Suecica</i> (Eur., As., Am.).	— <i>Gmelini</i> (America only).
<i>Galium rubioides</i> (Eur., As., Am.).	— <i>cryptocarpa</i> (Europe, Asia, America).
	— <i>stricta</i> (Europe, America).
	<i>Hierochloa borealis</i> (Europe, Asia, and America).

These, it will be seen, are for the most part north temperate plants, common in many parts of the globe, and which are only excluded from Eastern Arctic America by the greater rigour of its climate.

The best marked European and Asiatic species that are not found further east in Temperate or Arctic America are the following :

Anemone narcissiflora.	Spiræa chamædrifolia.	Atriplex littoralis.
Ranunculus Pallasii.	Pyrethrum bipinnatum.	Pinus cembra.
Aconitum Napellus.	Gentiana prostrata.	Carex Norwegica.
Parrya macrocarpa.	Eritrichium aretioides.	Deyeuxia strigosa.
Dianthus alpinus.	Pedicularis verticillata.	— Langsdorffii.
Cerastium vulgatum.	Primula nivalis.	Colpodium fulvum.

Hence it appears that of the 364 species found in Arctic West America, 319 inhabit East America (arctic or temperate, or both), and 320 are natives of the Old World—a difference hardly sufficient to establish a closer affinity of this flora with one continent rather than with the other.

The species peculiar to this tract of land are :—

Braya pilosa:	Artemisia androsacea.	Salix glacialis.
Saxifraga Richardsoni.	Saussurea subsinuata.	

The rarity of monocotyledons, and especially of the glumaceous orders, is almost as marked a feature of this as of the Asiatic flora : of the 138 arctic species of *Glumaceæ* only 54 are natives of West Arctic America.

The materials for this flora are principally the plants of Chamisso, collected during Kotzebue's voyage, and described by himself and Schlechtendahl ; Lay and Collie's collections, described in Beechey's voyage ; the 'Flora Boreali-Americana ;' and Seemann's plants, described in the 'Botany of the Herald.' Most of the above collections are from Behring's Straits. For the arctic coast flora I am mainly indebted to Richardson's researches, and to Pullen's and other collections enumerated by Seemann in his account of the flora of Western Eskimo Land. For the southern extension of the flora I have had recourse to the 'Flora Boreali-Americana ;' Ledebour's 'Flora Rossica,' which includes the Sitcha plants ; the American floras of Nuttall, Pursh, Torrey, Gray, &c. ; and to the collections of Drs. Lyall and Wood formed in Vancouver's Island and British Columbia ; for the Californian, Mexican, and Cordillera floras generally, to the herbarium at Kew, the works above mentioned, and the various memoirs of Torrey and of Gray on the plants of the American Surveying Expeditions.

4. *Arctic East America (exclusive of Greenland).*—This tract of land is analogous to the Arctic Asiatic in many respects of position and climate, but is very much richer in species. It extends from the estuary of the Mackenzie River to Baffin's Bay, and its flora differs from that of the western part of the continent, both in the characters mentioned in the notice of that province, and in possessing more East American species. The western boundary of this province is an artificial one ; the eastern is very natural, both botanically and geographically ; for Baffin's Bay and Davis' Straits (unlike Behring's Strait) have very deep water and different floras on their opposite shores.

The arctic circle is crossed in the longitude of the Mackenzie River by the isotherm of 12°, which thence trends south-eastward to the middle of Hudson's Bay ; and in the longitude of Davis' Straits it is crossed by the isotherm of 18½°. The June isotherm of 41°

descends obliquely from the shores of the Arctic Sea, near the mouths of the Mackenzie, to the northern parts of Hudson's Bay, south of the arctic circle; and the September isotherm of 41° is everywhere south of the circle. Hence the western parts of this province are very much warmer than the eastern; so much so, that the whole west coast and islands of Baffin's Bay lie north of a southern inflection of the June isotherm of 32° , which passes north of all the other polar islands; the Parry Islands have an analogous temperature of 40° . The warmth of the western portion of this tract is no doubt mainly due to the influence of the Pacific Ocean being felt across the continent of West America; though possibly also to the presence of a comparatively warm polar ocean, or to Atlantic currents crossing the pole between Nova Zembla and Spitzbergen, of which nothing certain is known*. Be this as it may, the comparative luxuriance of the flora of Melville Island is a well-known fact, and one inexplicable by considerations of temperature, if unaccompanied by a humid atmosphere. The whole region is of course far north of the isotherm of 32° , which, in the longitude of its middle district, descends to Lake Winnipeg, in lat. 52° .

That portion of this province which is richest in plants is the tract which intervenes between the Coppermine and Mackenzie Rivers; east of this, vegetation rapidly diminishes, as also to the northward. The flora of the Boothian Peninsula, surrounded as it is with glacial straits, and placed centrally among the arctic islands, is perhaps the poorest of any part of the area; those of Banks' Land and Melville Island to the N.W. being considerably richer, as are those of the shores of Lancaster's Sound and Barrow's Strait, and the shores of Baffin's Bay to the north and east †.

The phænogamic flora of Arctic East America contains 379 species

$$\left. \begin{array}{l} \text{Monocotyledons. } 92 \\ \text{Dicotyledons. } 287 \end{array} \right\} = 1 : 3.1).$$

The proportion of genera to species is 1 : 2.0. Of these 379 species, 323 inhabit Temperate North America, east of the Rocky Mountains; 35 the Cordillera; and 49 Temperate or Antarctic South America. Comparing this flora with that of Europe, I find that 239 (or two-thirds) species are common to the arctic regions of both continents, whilst but little more than one-third of the Arctic European species are Arctic East American. Of 105 non-European species in Arctic East America, 32 are Asiatic; leaving 73 species confined to America, of which the following are furthermore confined to the eastward of the Rocky Mountains and Mackenzie River :—

Corydalis glauca.	Lathyrus ochroleucus.	Vaccinium Canadense.
Sarracenia purpurea.	Rubus triflorus.	Dracocephalum parviflorum.
Viola cucullata.	Prunus Virginiana.	Douglasia arctica.
Silene Pennsylvanica.	Heuchera Richardsoni.	Elæagnus argentea.
Arenaria Michauxii.	Cornus stolonifera.	Urtica dioica.
Polygala Senega.	Grindelia squarrosa.	Salix cordata.

* It is a well-known fact that the temperature always rises rapidly with the north (as well as other) winds over all this Arctic American area.

† Details of these florulas will be found in the volume of the 'Linnean Journal,' under the notice of Dr. Walker's Collections, made during the voyage of the *Fox*.

Populus tremuloides.	Spiranthes gracilis.	Carex oligosperma.
Picea nigra.	Cypripedium acaule.	Pleuropogon Sabini.

Of these *Douglasia* and *Pleuropogon* are the only ones absolutely peculiar to Arctic East America. It is a noticeable fact that not one of them is found in any part of Greenland. Compared with Greenland, the Arctic East American flora is rich; containing, besides those just enumerated, no less than 165 other species not found in Greenland. The following are found on the arctic islands, and many of them on the west coast of Baffin's Bay, but not in West Greenland:—

Caltha palustris.	Parnassia vulgaris.	Pedicularis capitata.
Parrya arctica.	Chrysanthemum arcticum.	—— versicolor.
Merkia physodes.	Artemisia vulgaris.	Androsace septentrionalis.
Stellaria crassifolia.	Senecio frigidus.	—— Chamæjasme.
Astragalus alpinus.	—— palustris.	Salix phlebophylla.
Oxytropis campestris.	—— pulchellus.	Lloydia serotina.
—— Uralensis.	Solidago Virga-aurea.	Hierochloe pauciflora.
—— nigrescens.	Aster salsuginosus.	Deschampsia cæspitosa (East Greenland only).
Sieversia Rossii.	Crepis nana.	Glyceria fluitans.
Saxifraga hieracifolia.	Saussurea alpina.	Pleuropogon Sabini.
—— Virginiensis.	Andromeda polifolia.	Bromus purgans.
—— Hirculus (East Greenland only).	Arctostaphylos alpina.	Elymus mollis.
Valeriana capitata.	Kalmia glauca.	
Nardosmia corymbosa.	Phlox Sibirica.	
	Castilleja pallida.	

There are thus no fewer than 184 of the 379 Arctic East American species (fully half) which are absent in West Greenland, whilst only 105 (much less than one-third) are absent in Europe. This alone would make the limitation of species in the meridian of Baffin's Bay more decided than in any other arctic longitude; and I shall show that it is rendered still more decisive by the number of Arctic Greenland plants that do not cross to Arctic East America.

Of the 379 Arctic East American species only 56 are not found in Temperate East America, of which two are absolutely confined to this area; two others (*Parrya arenicola* and *Festuca Richardsoni*) to Arctic East and West America; 25 are found in Temperate West America, and about 20 are Rocky Mountain species, and not found elsewhere in Temperate America.

For our knowledge of this flora I am principally indebted to the 'Flora Boreali-Americana,' and to Richardson's* botanical appendix to Franklin's first voyage—and his 'Boat Journey through Rupert's Land.' I have also examined the materials upon which the above works were founded, and the collections of almost every subsequent journey and voyage, up to those of Dr. Walker in the 'Fox.' To enumerate the numerous botanical appendices to voyages, and separate opuscles to which these have given rise, from Ross' first voyage to the present time, would be out of place here. I have endeavoured to embody in the

* I am indebted to Sir John Richardson for some corrections to this list, which account for a few discrepancies between his lists of Arctic American plants and my own; these refer chiefly to genera and species introduced into his lists, but here excluded.

essay the information gleaned from all of them. For the southern distribution of these plants in the United States, &c., I have had recourse primarily to Asa Gray's excellent 'Manual of the Botany of the Northern United States,' to Chapman's 'Flora of the S.E. States,' and to the reports on the Botany of various Exploring Expeditions.

5. *Arctic Greenland*.—In area Arctic Greenland exceeds any other arctic district except the Asiatic, but ranks lowest of all in number of contained species. In many respects it is the most remarkable of all the provinces, containing no peculiar species whatever, scarcely any peculiarly American ones, and but a scanty selection of European. A further peculiarity is that the flora of its temperate regions is extremely poor, and adds very few species to the whole flora, and, with few exceptions, only such as are arctic in Europe also. Being the only arctic land that contracts to the southward, forming a peninsula, which terminates in the ocean in a high northern latitude, Greenland offers the key to the explanation of most of the phenomena of arctic vegetation; and as I have already made use of it for this purpose, I shall be more full in my description of its flora than of any other.

The east and west coasts of Greenland differ in many important features; the eastern is the largest in extent, the least indented by deep bays, is perennially encumbered throughout its entire length by icefields and bergs, which are carried south by a branch of the arctic current that sets between Iceland and Greenland; and is hence excessively cold, barren, and almost inaccessible. The west coast, again, is generally more or less free from pack ice from Cape Farewell (lat. 60°) to north of Upernivik in lat. 73°. It is washed by a southerly current, which is said to carry drift timber from the Siberian rivers into its fiords, and enjoys a far milder climate, and consequently has a more luxuriant vegetation. A somewhat similar contrast is exhibited between West Greenland and the opposite shores of Baffin's Bay, against which latter the northerly arctic current from Lancaster Sound drives great masses of polar ice, derived from the regions beyond that estuary, and to which the bergs that float away from the glaciers in the Greenland fiords are also drifted. It is important to bear in mind these features of the two shores of Greenland and of Baffin's Bay and Davis' Straits, because they may in some degree explain their differences of vegetation. There is also another difference between the polar islands and Greenland, inasmuch as the former are for the most part low, without mountains or extensive glaciers; while the latter is exceedingly mountainous, with valleys along the shore terminating in glacier-headed fiords, and the coast is bound by glaciers of prodigious extent from Melville Bay northwards to Smith's Sound.

The isothermal lines in Greenland all follow one course, from S.W. to N.E., running more parallel to one another in this meridian than in any other. The isotherm of 32° passes through the southern extremity of the peninsula, and that of 5° through its north extreme at Smith's Sound. The June isotherm of 41° skirts its east coast, and that of 32° passes north of Disco; the June temperature of Disco is hence as low as that of the north of Spitzbergen, of middle Nova Zembla, and of the extreme north of Asia, and yet Disco contains quadruple their number of plants. The autumn cold is very great; the September isotherm of 32° crossing the arctic circle on the west coast; and to this the scantiness of the flora may to some extent be attributed.

The Arctic Greenland flora contains 206 species, according to Lange's catalogue (in Rincke's 'Greenland'); or 207, according to my materials ($\left. \begin{array}{l} \text{Monocot. } 67 \\ \text{Dicot. } . \quad 140 \end{array} \right\} = 1 : 2.1$): the proportion of genera to species being 1 : 2.

Of these 207 species the following 11 alone are not European :—

<i>Anemone Richardsonii</i> (Asiatic).	<i>Potentilla tridentata</i> (Labrador only).
<i>Turritis mollis</i> (Asiatic).	<i>Saxifraga triscuspidata</i> (Labrador only).
<i>Vesicaria arctica</i> (American only).	<i>Erigeron compositus</i> (American only).
<i>Draba aurea</i> (Rocky Mts. and Labrador only).	<i>Pedicularis euphrasioides</i> (Asia).
<i>Hesperis Pallasii</i> (Asia and America).	<i>Salix arctica</i> (Asia).
<i>Arenaria Grænlandica</i> (Mts. of U. S.).	

On the other hand, no less than 57 Arctic Greenland species are absent in Arctic East America, and the following 36 Arctic Europe and Greenland species are either absent in all parts of Eastern Temperate America, or are extremely local there :—

<i>Arabis alpina</i> (Labrador only).	<i>Phyllodoce taxifolia</i> (do. and White Mountains).
<i>Lychnis alpina</i> (do.).	<i>Gentiana nivalis</i> (Labrador only).
<i>Lychnis dioica</i> (absent).	<i>Thymus serpyllum</i> (absent).
<i>Spergula nivalis</i> (do.).	<i>Veronica alpina</i> (White Mountains only).
<i>Arenaria uliginosa</i> (absent).	— <i>saxatilis</i> (absent).
— <i>ciliata</i> (do.).	<i>Euphrasia officinalis</i> (N. U. States).
<i>Stellaria cerastioides</i> (do.).	<i>Bartsia alpina</i> (Labrador only).
<i>Alchemilla alpina</i> (do.).	<i>Rumex acetosella</i> (absent).
— <i>vulgaris</i> (Labrador only).	<i>Salix Arbuscula</i> (do.).
<i>Sibbaldia procumbens</i> (United States only).	<i>Peristylus albidus</i> (do.).
<i>Rubus saxatilis</i> (absent).	<i>Carex capitata</i> (White Mountains only).
<i>Potentilla verna</i> (Labrador only).	— <i>microglochis</i> (absent).
<i>Sedum villosum</i> (absent).	— <i>microstachya</i> (do.).
<i>Saxifraga Cotyledon</i> (Labrador and Rocky Mountains only).	— <i>pedata</i> (do.).
<i>Galium saxatile</i> (absent).	<i>Elyna caricina</i> (Rocky Mountains only).
<i>Gnaphalium sylvaticum</i> (Labrador only).	<i>Phleum alpinum</i> (Labrador and White Mountains only).
— <i>supinum</i> , <i>L.</i> (do. and White Mountains).	<i>Calamagrostis lanceolata</i> (Labrador only).
<i>Cassiopeia hypnoides</i> (Labrador only).	<i>Deschampsia alpina</i> (absent).

When it is considered how extremely common most of these plants are throughout Europe and Northern Asia, and that some of them inhabit also N.W. America, their absence in Eastern America is even more remarkable than their presence in Greenland.

Another singular feature of both Arctic and Temperate Greenland is its wanting a vast number of Arctic plants which are European, and found also in America. The following is a list of most of these, excluding about 15, which are water-plants, or species whose range is limited. The letter I. placed before a species signifies that it is Icelandic, and I have introduced it to show not only how many are absent from this island also, but how many are present. The letter S. indicates that the species is found in the south temperate or antarctic circle. The asterisk * indicates that the species is arctic both in East America and Europe.

- Anemone alpina.*
 — *nemorosa.*
 — *narcissiflora.*
 * *Ranunculus Purshii.*
 * I. *Caltha palustris.*
 * *Aconitum Napellus.*
Actæa spicata.
Nuphar luteum.
Nasturtium amphibium.
S. Barbarea præcox.
S. Turritis glabra.
Thlaspi montanum.
Sisymbrium Sophia.
 * I. *Erysimum lanceolatum.*
Arabis hirsuta.
 I. S. *Cardamine hirsuta.*
 * *Parrya arctica.*
 I. *Draba muralis.*
 I. *Subularia aquatica.*
 * I. *Drosera rotundifolia.*
 I. — *longifolia.*
 I. *Viola tricolor.*
 * I. *Arenaria lateriflora.*
 * *Stellaria longifolia.*
 I. — *crassifolia*
Linum perenne.
Geranium Robertianum.
Hypericum 4-angulum.
Oxalis acetosella.
 * *Phaca frigida.*
 * *Astragalus alpinus.*
 * — *hypoglottis.*
 * *Oxytropis campestris.*
 — *Uralensis.*
Lathyrus palustris.
Spiræa salicifolia.
S. Geum urbanum.
 I. — *rivale.*
 * *Rubus arcticus.*
Potentilla fruticosa.
 — *Pennsylvanica.*
 — *argentea.*
 I. S. *Fragaria vesca.*
 I. *Sanguisorba officinalis.*
Rosa cinnamomea.
 — *blanda.*
 * *Circæa alpina.*
 * I. S. *Epilobium tetragonum.*
- * I. S. *Epilobium alsinæfolium.*
S. Lythrum salicaria.
 * *Ribes rubrum.*
 * — *alpinum.*
 * I. *Parnassia palustris.*
Saxifraga Sibirica.
 * — *hieraciifolia.*
 — *bronchialis.*
 * *Bupleurum ranunculoides.*
Conioselinum Fischeri.
Cicuta virosa.
 * I. *Carum carui.*
Adoxa moschatellina.
Viburnum Opulus.
Lonicera cærulea.
 * *Linnaea borealis.*
 * I. *Galium boreale.*
 — *rubroides.*
 I. — *trifidum.*
S. — aparine.
 * *Valeriana capitata.*
 * *Nardosmia frigida.*
 * *Chrysanthemum arcticum.*
 I. *Pyrethrum nodosum.*
 — *bipinnatum.*
 * *Artemisia vulgaris.*
S. Bidens bipartita.
Tanacetum vulgare.
Antennaria Carpatica.
 * *Senecio resedæfolius.*
 * — *frigidus.*
 * — *palustris.*
 * — *campestris.*
 — *aurantiacus.*
 * *Solidago Virgaurea.*
 * *Aster Sibiricus.*
 * — *alpinus.*
S. Erigeron acris.
S. Sonchus arvensis.
 I. *Hieracium boreale.*
 * *Saussurea alpina.*
 I. *Vaccinium myrtillus.*
 * *Andromeda polifolia.*
Cassandra calyculata.
 * I. *Arctostaphylos alpina.*
 * I. *Pyrola secunda.*
 * I. *Gentiana amarella.*
 I. — *tenella.*
- * *Myosotis sylvatica.*
 — *palustris.*
 I. — *arvensis.*
 * *Scutellaria galericulata.*
 I. S. *Prunella vulgaris.*
Glechoma hederaceum.
S. Stachys palustris.
 * *Gymnandra Pallasii.*
 * *Castilleja pallida.*
 I. S. *Veronica officinalis.*
S. — scutellata
 I. S. — *serpyllifolia.*
Melampyrum pratense.
 — *sylvaticum.*
 * I. *Pedicularis palustris.*
 * — *versicolor.*
Scrophularia nodosa.
Utricularia vulgaris.
 * *Pinguicula villosa.*
Glaux maritima.
Trientalis Europæa.
 * *Androsace septentrionalis.*
 * — *Chamæjasme.*
Naumbergia thyrsiflora.
 I. S. *Primula farinosa.*
 I. *Plantago major.*
 — *lanceolata.*
S. Chenopodium album.
 I. S. *Atriplex patula.*
Corispermum hyssopifolium.
 * *Polygonium Bistorta.*
 I. — *amphibium.*
 * *Myrica Gale.*
 I. *Betula alba.*
 I. — *pumila.*
 I. *Alnus incana.*
 I. *Salix pentandra.*
 I. — *myrtilloides.*
 I. *Triglochin maritimum.*
Scheuzeria palustris.
Veratrum album.
 * *Lloydia serotina.*
 * *Allium schænoprasum.*
 * *Smilacina bifolia.*
 * *Platanthera obtusata.*
 * *Calypso borealis.*
Godyera repens.

Cypripedium guttatum.	S. Carex Buxbaumii.	Eriophorum alpinum.
Calla palustris.	I. — limosa.	Rhynchospora alba.
Typha latifolia.	S. — Magellanica.	Alopecurus pratensis.
Narthecium ossifragum.	— ustulata.	I. Milium effusum.
Luzula maxima.	— livida.	S. Phalaris arundinacea.
S. Juncus communis.	I. — pallescens.	I. S. Phragmites communis.
I. — articulatus.	— maritima.	* I. Hierochloe borealis.
I. — bulbosus.	I. — cæspitosa.	* — pauciflora.
— stygius.	I. — acuta.	* I. Catabrosa aquatica.
Carex pauciflora.	— stricta.	* I. S. Glyceria fluitans.
— tenuiflora.	— filiformis.	* I. Atropis distans.
S. — stellulata.	I. S. Eleocharis palustris.	I. Festuca elatior.
I. — chordorrhiza.	S. — acicularis.	S. Bromus ciliaris.
— teretiuscula.	S. Scirpus triquetus.	I. S. Triticum caninum.
— paradoxa.	S. — lacustris.	S. Hordeum jubatum.

Altogether there are absent in Greenland upwards of 230 Arctic European species, which are all of them American plants. The most curious feature of this list is the absence throughout Greenland of the genera *Spiræa*, *Senecio*, *Astragalus*, *Trifolium*, *Phaca*, *Oxytropis*, *Androsace*, *Aster*, *Myosotis*, *Rosa*, *Ribes*, *Thlaspi*, *Sisymbrium*, *Geranium*, &c., and of such ubiquitous arctic species as *Fragaria vesca*, *Caltha palustris**, *Barbarea præcox*. It is remarkable that *Astragalineæ* are also absent from Spitzbergen and Iceland.

Iceland possesses 432 species ($\begin{matrix} \text{Monocot. } 157 \\ \text{Dicot. } \dots 275 \end{matrix}$), amongst which I find about 120 Arctic European plants that do not enter Greenland; whereas only 50 of the European plants that inhabit Greenland are absent in Iceland. The more remarkable desiderata of Iceland are *Astragalineæ*, *Anemone*, *Aconitum*, *Braya*, *Turritis*, *Artemisia*, and *Androsace*; *Alopecurus alpinus*, *Luzula arcuata*, *Hierochloe alpina*, *Rubus chamæomorus*, *Cassiopeia tetragona*, *Arnica montana*, *Antennaria dioica*, and *Chrysosplenium alternifolium*. On the other hand, Iceland contains of arctic genera absent in Greenland; *Caltha* (one of the most common plants about Icelandic dwellings), *Cakile*, *Geranium*, *Trifolium*, *Spiræa*, *Senecio*, and *Orchis*.

But perhaps the most remarkable fact of all connected with the Greenland flora is that its southern and temperate districts, which present a coast of 400 miles, extending south to lat. 60° N.L., do not add more than 74 species to its flora, and these are almost unexceptionably Arctic European plants; and inasmuch as these additional species increase the proportion of Monocotyledons to Dicotyledons of the whole flora, Greenland as a whole is botanically more arctic in vegetation than Arctic Greenland alone is!

The only American forms which Temperate Greenland adds to its flora are, *Ranunculus Cymbalaria*, *Pyrus Americana*, a very trifling variety of the European *Aucuparia*, *Viola Muhlenbergii*, a mere variety of *V. canina*, *Arenaria Grænländica*, a plant elsewhere

* This is the more remarkable because it forms a conspicuous feature in Iceland, and is a frequent native of all the Arctic American coasts and islands.

found only on the White Mountains of New Hampshire, and *Parnassia Kotzebuei*, a species which is scarcely different from *palustris*.

The only plants which are not members of the arctic flora elsewhere, and which are confined in Greenland to the temperate zone, besides the above American plants, are *Blitum glaucum*, *Potamogeton marinus*, *Sparganium minimum*, and *Streptopus amplexifolius*: the rest will all be found in the column of the arctic plant catalogue devoted to Greenland, where S. signifies that the species is found south only of the arctic circle in that country.

On the other hand Temperate Greenland adds very materially to the number of European Arctic species that do not enter Eastern America (Arctic or Temperate), amongst which the most remarkable are

<i>Cerastium viscosum</i> .	<i>Galium palustre</i> .	<i>Betula alpestris</i> .
<i>Vicia cracca</i> .	<i>Leontodon autumnale</i> .	<i>Juncus trifidus</i> .
<i>Rubus saxatilis</i> .	<i>Hieracium murorum</i> .	— squarrosus.
<i>Sedum annuum</i> .	— alpinum.	<i>Anthoxanthum odoratum</i> .
<i>Galium uliginosum</i> .	<i>Gentiana aurea</i> .	<i>Nardus stricta</i> .

Another anomalous feature in the Greenland flora is the presence, on the East Arctic coast, of some species not found on the west, nor in the temperate southern end of the peninsula. These are:—

- Lychnis dioica* (Arctic Europe).
- Saxifraga Hirculus* (abundant in all extreme arctic latitudes but West Greenland).
- Polemonium cæruleum* (all arctic longitudes but West Greenland).
- Deschampsia cæspitosa* (all arctic longitudes, but also absent in Spitzbergen).

For data connected with the Greenland flora, I am mainly indebted to the collections of the various polar voyagers in search of a north-west passage, especially to Drs. Lyall's and Sutherland's; to Lange's catalogue in Rincke's 'Greenland'; and to the notices of Vahl, Greville, Sir William Hooker, &c., on the plants collected by Sabine, Scoresby, Ross, Jameson, Graah, and Vahl, &c.; to Sutherland's appendix to Penny's voyage and Durand's to Kane's voyage.

There is a curious affinity between Greenland and certain localities in America, which concerns chiefly a few of the European plants common to these countries. First, there are in Labrador, or on the Rocky Mountains, or White Mountains of New Hampshire, a certain number of European plants found nowhere else in the American continent. They are:—

<i>Ranunculus acris</i> (Rocky Mountains).	<i>Gentiana nivalis</i> (Labrador).
<i>Arabis alpina</i> (Labrador).	<i>Veronica alpina</i> (White Mountains).
<i>Lychnis alpina</i> (Labrador).	<i>Bartsia alpina</i> (Labrador).
<i>Sibbaldia procumbens</i> (Rocky Mountains).	<i>Salix Arbuscula</i> (White Mountains).
<i>Potentilla verna</i> (Labrador).	<i>Luzula spicata</i> (White Mountains).
<i>Montia fontana</i> (Labrador).	<i>Juncus trifidus</i> (White Mountains).
<i>Gnaphalium sylvaticum</i> (Labrador).	<i>Carex capitata</i> (White Mountains).
— supinum (Labrador & White Mountains).	<i>Kobresia scirpina</i> (Rocky Mountains).
<i>Cassiopeia hypnoides</i> (Labr. & White MOUNTS.).	<i>Phleum alpinum</i> (White Mountains & Labrador).
<i>Phyllodoce taxifolia</i> (Labr. & White MOUNTS.).	<i>Calamagrostis lanceolata</i> (Labrador).

There are also three plants peculiar to Greenland and Labrador, or the White or Rocky Mountains, which have not hitherto been found elsewhere. They are:—

- Draba aurea (Rocky Mountains).
- Arenaria Grænlandica (White Mountains and Labrador).
- Potentilla tridentata (Labrador).

On the Arctic Proportions of Species to Genera, Orders, and Classes.

The observations which have hitherto been made on this subject, are almost exclusively based on data collected on areas too small to yield general results. Especially in determining the influence of temperature in regulating the proportions of the great group of flowering plants, it is of the highest importance to take comprehensive areas, both because of the wider longitudinal dispersion of some orders, especially the Monocotyledons, and the effects of local conditions, such as bog land, which determine the overwhelming preponderance of *Cyperaceæ* in some arctic provinces compared with others.

The proportion of genera to species in the whole arctic phænogamic flora is 323 : 762, or 1 : 2·3. Monocot. $\frac{1}{1} : \frac{2·8}{2·2}$; and that of orders to species 1 : 10·8; in the several provinces as follows:—

	Gen.	Gen. to Sp.	Orders.	Ord. to Sp.
Arctic Europe	277	1 : 2·3	64	1 : 9·6
„ Asia	117	1 : 2·0	38	1 : 6·1
„ West America	172	1 : 2·1	48	1 : 7·6
„ East America	193	1 : 2·5	56	1 : 6·8
„ Greenland	104	1 : 2·0	38	1 : 5·5

Thus Europe presents the most continental character in its arctic flora, and West America the most insular; which may be attributable to the same cause in both; namely, the uniformity or variety of type. In West America we have, as in an oceanic island, a great mixture of types (Asiatic, European, East and West American) and paucity of species; in Europe the contrary. The proportions of species to orders are still more various; but here, again, Europe takes the lead decidedly.

The proportions of genera and orders to species of all Greenland differ but little from those of its arctic regions; whereas the contrast between Arctic Europe and this, together with Norway as far south as 60° N. lat., is very much greater. This is in accordance with the observation I have elsewhere made, that the whole of Greenland is comparatively poorer in species than Arctic Greenland is.

	Gen.	Sp.	Ord.	Sp.	Gen.	Sp.	Ord.	Sp.
Arctic Scandinavia	1	2·3	—	1 : 9·6	Arctic Greenland	1	2·0	— 1 : 5·5
All Scandinavia	1	2·8	—	1 : 11·6	All Greenland	1	2·3	— 1 : 6·6

The proportions of Monocotyledons to Dicotyledons are:—

Arctic Flora	1 : 2·6
Arctic Europe	1 : 2·3
„ Asia	1 : 4·5
„ West America	1 : 3·8
„ East America	1 : 3·1
„ Greenland	1 : 2·1
All Greenland	1 : 2·0

The Proportion of largest Orders to the whole Flora.

	Gram. & Cyp.	Salicin.	Polygon.	Scroph.	Eric. & Vaccin.	Comp.	Saxif.	Ros.	Leg.	Caryop.	Crucif.	Ranun.
Arctic Flora	1 : 5·6	1 : 30·5	1 : 50·2	1 : 27·1	1 : 33·1	1 : 10·0	1 : 26·2	1 : 17·3	1 : 24·6	1 : 15·0	1 : 14·1	1 : 17·7
„ Europe	1 : 5·2	1 : 38·4	1 : 56·0	1 : 23·7	1 : 30·8	1 : 12·3	1 : 34·2	1 : 21·2	1 : 30·8	1 : 15·4	1 : 17·7	1 : 24·6
„ Asia	1 : 10·6	1 : 16·6	1 : 23·3	1 : 16·6	1 : 21·2	1 : 9·6	1 : 15·5	1 : 19·4	1 : 29·1	1 : 14·5	1 : 11·6	1 : 21·2
„ W. America.	1 : 6·7	1 : 24·3	1 : 52·0	1 : 33·0	1 : 22·7	1 : 9·6	1 : 19·1	1 : 16·6	1 : 28·0	1 : 15·9	1 : 18·9	1 : 17·3
„ E. America.	1 : 5·8	1 : 27·0	1 : 76·0	1 : 34·5	1 : 23·7	1 : 10·5	1 : 21·0	1 : 23·7	1 : 27·0	1 : 17·2	1 : 11·9	1 : 18·9
„ Greenland	1 : 3·8	1 : 29·6	1 : 51·7	1 : 23·0	1 : 17·3	1 : 20·7	1 : 17·2	1 : 20·7	0 : 207·0	1 : 10·3	1 : 10·9	1 : 23·0
All Greenland	1 : 3·7	1 : 34·0	1 : 42·7	1 : 24·9	1 : 21·4	1 : 15·0	1 : 27·2	1 : 19·8	1 : 149·6	1 : 12·4	1 : 12·0	1 : 27·2

The great differences between these proportions show how little confidence can be placed in conclusions drawn from local floras. *Ericææ* is the only order which is more numerous proportionally to other plants in every province than in the entire arctic flora, and *Cruciferaæ* is the only one that approaches it in this respect; and *Leguminosæ* is the only one which is less numerous proportionally in them all. East and West America agree most closely of any two provinces; then (excluding *Leguminosæ*) all Greenland and Europe; next Arctic Greenland and all Greenland.

The greatest differences are between Arctic Europe and Asia, and Arctic Asia and West America; they are less between Arctic Greenland and Asia (excluding *Leguminosæ*); they are great between Arctic Greenland and East America; and as great between all Greenland and Arctic America.

The proportion formerly deduced by Brown, &c., for the high arctic regions was a much smaller one; the Monocotyledons being in comparison with the Dicotyledons 1 : 5; and this still holds for some isolated, very arctic localities, as North-east Greenland; whereas Spitzbergen presents the same proportion as all the arctic regions, 1 : 2·7; the Parry Islands 1 : 2·3; the west coast of Baffin's Bay, from Pond's Bay to Home Bay, 1 : 3·3; and the extreme arctic plants mentioned at p. 257., 1 : 3. Of the prevalent arctic plants mentioned at p. 256, the proportion is 1 : 3·4.

I have dwelt more at length on these numerical proportions than their slight importance seems to require; my object being to show how little mutual dependence there is amongst the arctic florulas. Each has profited but little through contiguity with its co-terminous districts; though all bear the impress of being members of one northern flora.

On Grouping the Forms, Varieties, and Species of Arctic Plants for purposes of Comparative Study.

Considering the limited extent of the arctic zone, the poverty of its flora, which is almost confined to 14° of latitude in the longitudes most favourable to vegetation, and to only 10° in the Asiatic area, and the number of able botanists who have studied it, it might be supposed that the preliminary task of identifying the species, and tracing their distribution within and beyond the arctic circle would have been short and simple; but this is not the case; for owing to the number of local floras, voyages, travels, and scientific periodicals that have to be consulted, to the variability of the species, and the consequent difficulty of settling their limits, and to the impossibility of reconciling the divergent

opinions of my predecessors regarding them, I have found this a very tedious and unsatisfactory operation.

Of all these sources of doubt and error, the most perplexing has been the well-known variability of polar plants; and in the existing state of the controversy upon Mr. Darwin's hypothesis, it requires to be treated circumspectly. In several genera, I have not only had to decide whether to unite for purposes of distribution dubious or spurious arctic species, but also how far I should go in examining and uniting cognate forms from other countries, which, if included, would materially affect the distribution of the species. These questions became in many instances so numerous and complicated, that I have often resorted to the plan of treating several very closely allied species and varieties as one aggregate or collective species. This appears at first sight to be an evasive course; but as it offered the only satisfactory method of solving the difficulty, I was obliged, after many futile attempts to find a better, to resort to it, and hence I feel called upon to enter more fully into my reasons for doing so; premising that all my attempts to treat each variety, form, and subspecies as a distinct plant, involved the discussion of a multitude of details from which any generalization was hopeless; the results in every case defeated the object of this paper.

Of the plants found north of the arctic circle, very few are absolutely or almost exclusively confined to frigid latitudes (only about 50 out of 762 are so); the remainder, as far as their southern dispersion is concerned, may be referred to two classes; one consisting of plants widely diffused over the plains of Northern Europe, Asia, and America, of which there are upwards of 500; the other of plants more or less confined to the Alps of these countries, and still more southern regions, of which there are only about 200. *Glyceria fluitans*, *Atropis maritima*, and *Senecio campestris* are good examples of the first, as being high arctic and boreal but not alpine; while most of the species of *Saxifraga*, *Draba*, and *Androsace*, are examples of the second*. Both these classes abound in species, the limitation of which within the arctic circle, and the identification of whose varieties with those of plants of more southern countries, present great difficulties.

Those plants of the temperate plains which enter the arctic regions are often species of large, widely dispersed, and variable genera, most or all of whose species are very difficult of limitation; as *Ranunculus*, of which the arctic species *auricomus*, *aquatilis*, and *acris*, are each the centre of a nœud of allied temperate species or varieties, as to whose limits no two botanists are agreed; and the same applies to the species of *Viola*, *Stellaria*, *Arenaria*, and *Hieracium*. This has often led to the grouping of names of plants considered as synonymous by some authors, varieties by others, and good species by a third class. Furthermore, such genera are often represented in the temperate regions of two or more continents (and some of them in the south temperate zone also) by closely allied groups of intimately related species. This always complicates matters extremely; for an arctic species, being generally in a reduced or stunted state, may be equally similar to alpine or reduced forms of what in two or more of these geographically sundered groups

* Conversely the only arctic genus unknown in the Alps of the middle temperate zone is *Pleuropogon*, and the only alpine genera containing several species which inhabit the highest Alps of the north temperate zone, but not the polar regions, are *Soldanella* in Europe, *Swertia* in Europe and the Himalaya, &c.

may rank as good species, and its affinities and distribution be consequently open to doubt. Thus under the arctic *Stellaria longipes* are included five other arctic forms (*læta*, *Edwardsii*, *peduncularis*, *hebecalyx* and *ciliatosepala*); but amongst these forms some specimens approach closely the American *S. longifolia*, Muhl, or slight varieties of it; while others resemble the European *S. Friesiana*, Ser., others *S. graminea*, others certain Tasmanian forms, and others, again, Chilian. My own impression is, that some of these may prove but slight modifications of one common, very widely dispersed plant, between all whose varieties no constant definable characters will eventually be found; but in the present state of science I have abstained from including any of them, because to prove this or disprove it, the whole genus wants a far longer and closer study than it has yet received or than I can give it. *Arenaria verna* and its forms offer a very parallel case, and these I have included more largely, because I have the published opinion of many botanists to bear me out in doing so. *Viola epipsila*, *palustris* and *blanda*, are thus included, though they are more constant and have to a considerable extent different distributions; because I have found no differences of any moment between their normal forms, because such as exist seem to me to be too slight to attach specific value to; and because, though well distinguished by Scandinavian botanists, they have not been so carefully collected and studied in other parts of the arctic zone. *Viola canina*, *Fragaria vesca*, and *Sanguisorbia officinalis*, afford other examples: all these arctic plants affect the temperate plains rather than the mountains of the northern hemisphere.

Turning to those arctic plants that chiefly affect the Alps of the temperate or tropical zones, their limitation is quite as difficult; alpine plants being as proverbially variable as arctic. Many alpine plants are now considered to be only altered forms of lowland ones; and this affects the estimated distribution of every arctic species that is identified with an alpine one. As an example, *Saxifraga exilis* is a very slight variety of *S. cernua*; both are arctic and alpine plants, but *S. cernua* is considered by some botanists to be an alpine form of the lowland *S. granulata*, whose limits and distribution are very difficult to settle; because it apparently passes into several oriental forms, which have been distinguished as species. In this case I have not included *S. granulata* with *S. cernua*; because the latter is everywhere easily distinguished as a well-marked plant, having a restricted range both in area and in elevation, which *S. granulata* does not share. At the same time I am in favour of a hypothesis that would give these a common origin previous to the glacial epoch.

Other reasons for adopting the system of including very closely allied species are the following:—When species have been founded in error; this generally arises from their authors having imperfect specimens, or too limited a series of them; various species founded by Brown on the first Arctic American collections come under this category, as do Adams' Arctic Siberian species; the genera *Ranunculus*, *Draba*, *Arenaria*, and *Potentilla*, offer many examples: when the species, besides belonging to very variable genera, are apparently identical both in the herbarium and according to their descriptions, and present the same or a continuous distribution; of this *Trientalis*, *Senecio*, *Aster*, *Eriogeron*, *Mertensia*, *Sedum*, *Claytonia*, *Turritis*, and many others, afford examples.

It may be asked what useful scientific results can be obtained from the study of a

flora whose specific limits are in so vague a condition? the answer is, that though much is uncertain, all is not so; and that if the species thus treated conjointly really express affinities far closer than those which exist between those treated separately, a certain amount of definite information, useful for my purpose, is obtained; and it is a matter of secondary importance to me whether the plants in question are to be considered species or varieties. Again, if, with many botanists, we consider these closely allied varieties and species as derived by variation and natural selection from one parent form at a comparatively modern epoch, we may with advantage, for certain purposes, regard the aggregate distribution of the very closely allied species as that of one plant. When sufficient materials shall have been collected from all parts of the arctic and sub-arctic areas, we may institute afresh the inquiry into their specific identity or difference, by selecting examples from physically differing distant areas, and comparing them with others from intermediate localities. An empirical grouping of allied plants for the purposes of distribution may thus lead to a practical solution of difficulties in the classification and synonymy of species.

My thus grouping names must not therefore be regarded as a committal of myself to the opinion that the plants thus grouped are not to be held as distinct species; I simply treat of them under one name, because for the purposes of this essay it appears to me advisable to do so. Every reflecting botanist must acknowledge that there is no more equivalence amongst species than there is amongst genera; and I have elsewhere* endeavoured to show that, for all purposes of classification, species must be treated as groups analogous to genera, differing in the number of distinguishable forms they include, and of individuals to which these forms have given origin, and in the amount of affinity both between forms and individuals. My main object is to show the affinities of the polar plants, and I can best do this by keeping the specific idea comprehensive. It is always easier to indicate differences than to detect resemblances, and if I were to adopt extreme views of specific difference, I should make some of the polar areas appear to be botanically very dissimilar from others with which they are really most intimately allied, and from which I believe them to have derived almost all their species. A glance at my catalogue will show that, had I ranked as different species the few Greenland forms of European plants (called generally by the trivial name *Grænländica*), I should have made that flora appear not only more different from the European than it really is, but from the American also; and that the differences thus introduced would be of opposite values, and hence deceptive, in every case when the European species (of which the *Grænländica* is often not even a variety or distinct form) was not also common to America.

I wish it then to be clearly understood that the catalogue here appended is intended to include every species hitherto found within the arctic circle, together with those most closely allied forms which I believe to have branched off from one common parent within a comparatively recent geological epoch, and that immediately previous to the glacial period or since then. Further, I desire it to be understood that I claim no originality in bringing these closely allied forms together; from the appended notes, it will be seen that there is scarcely one of them that has not been treated as a synonym,

* Essay on the Australian Flora; introductory to the Flora Tasmanica, p. v. &c.

variety, subspecies, form, or *lusus*, by one or more very able and experienced botanists, some of them by many. Furthermore, it is curious to observe how much the botanists of each country do to a considerable extent agree amongst themselves as to the specific identity or difference of the same forms—the Scandinavian agreeing with Fries, the German with Koch, and the American with Hooker's 'Flora Boreali-Americana'; also to observe, that in all these cases the authors I quote are independent observers, and not copyers or followers. I think this fact indicates that the same plant presents a different aspect (probably obliterated in drying) in each country. This observation is consonant with what we know of the tendency of all species to run into local varieties in isolated areas, which varieties are often appreciable to the eye or to the touch, but are not expressible by words.

Of the 762 species enumerated, I have compared arctic or boreal specimens of all but a few which I have indicated in the appended notes, and in most cases I have compared specimens from all the southern areas indicated; but I do not pretend to have made such a critical study of all the grouped species, or of all those belonging to difficult genera (as *Draba*, *Poa*, &c.), as to enable me to say that I have given all their distribution, or satisfied myself of all their affinities and differences. There are, on the contrary, fully 60 genera out of the 323 arctic ones enumerated, each of which requires careful monographing, and months of study before the limits, systematic and geographical, of its common European species can be ascertained. In two of the largest and most difficult of these I have been indebted to others; namely, to Dr. Boott, who has revised my list of *Carices*, and to Dr. Andersson of Stockholm, who has drawn up that of the *Salices*: each has extensively modified the conclusions of his predecessors in arctic botany; quite as much or more so than I have done in any genus, and I have every confidence in their judgment. Colonel Munro has twice revised the list of grasses with a like result. In these important genera, therefore, the groups express the opinions of these acute botanists as to the limits of the species.

With regard to the probable completeness of our knowledge of the flowering plants of the arctic zone, I think it is pretty certain that there are few or no new species to be discovered. The collectors in the numerous voyages undertaken since 1847 in search of the Franklin expedition have not added one species to the flora of the Arctic American islands, and but one to that of Arctic Greenland. The Lapponian region is, of course, as well known as any on the globe; but further east, and especially in Arctic Siberia, much remains to be done; not perhaps in the discovery of new plants, but in ascertaining the southern limits of various Siberian ones that probably cross the arctic circle. Of Arctic Continental America the same may be said.

The method which I adopted in finally arranging the materials for geographical purposes was the following. I took Wahlenberg's 'Flora Lapponica,' Fries' 'Summa Vegetabilium Scandinaviæ,' Ledebour's 'Flora Rossica,' Hooker's 'Flora Boreali-Americana,' and Lange's 'Plants of East Greenland,' which together embrace in outline almost everything we know of arctic botany, geographical, systematic and descriptive. I put together from these all the matter they contained, and arranged it both botanically and geographically into a 'Systema,' which I studied with an Admiralty north circumpolar chart; and by this means arrived at a general idea of the position and extent of the centres of

vegetation within the polar circle. I then again went through the catalogue with the herbarium, with every work treating on arctic plants that was accessible to me, and lastly revised it, verifying the habitats, comparing specimens from each province, adding new localities from more recent floras, catalogues, and voyages; tracing the extra-arctic distribution of the species, and noting all points requiring further investigation.

Tabulated View of Arctic Flowering Plants and Ferns, with their Distribution.

In the appended table of the distribution of arctic plants I have included every species which I know or believe has been found to extend north of $66\frac{1}{2}^{\circ}$ N. lat. Of these, some few may but just cross the polar circle, and hence be scarcely entitled to the term arctic; but, on the other hand, there are no doubt temperate species which are entitled to be so considered, but which have not yet been recorded from so high a latitude. This remark applies especially to Arctic Siberia, and possibly also in a less degree to Arctic America, where however Richardson's* conscientious researches, conducted with the view of tracing the polar limits of plants, along the valleys of the great rivers Coppermine and Mackenzie, must have left little of importance to be added or corrected. A cross in a column indicates that the species is naturalized.

The columns showing the distribution of each species are so arranged and filled up as to express in the most simple manner the rather complicated directions of migration of each species or group of species. The leading idea, it will be observed, is to demonstrate the influence exerted by the glacial epoch, and the columns selected and letters introduced are intended to express the apparent results of this influence on each species, such letters indicating physical obstacles to migrations which the species has or has not overcome. I have hence avoided all further complication than appeared to me necessary to illustrate the conclusions I have arrived at. It would have been easy to have expressed in greater detail the southern and eastern distribution of the species, subspecies, and varieties in the European column for instance; but I could not have done so in like manner for the same plants in the Asiatic, nor for any but a few species in the West American columns.

When the species, subspecies, or varieties grouped under one in these columns shall have been disentangled in other countries as they have been in Scandinavia, and when their exact geographical limits also shall be ascertained as accurately in other countries as they have been in Scandinavia, then the time will have arrived for a history of the origin as well as the direction of migration of arctic plants throughout the circle and elsewhere. Meanwhile, as before explained, this essay pretends to no more than laying the foundations of this inquiry on a satisfactory basis.

The globe is divided into five principal areas; or rather the species are traced in five directions, as follows:—

I. ARCTIC DISTRIBUTION.—1. *Arctic European*, from Lapland eastward to the Gulf of Obi. An S. in this column indicates that the plant attains the extreme northern limits of phænogamic vegetation in this district—viz., Spitzbergen. 2. *Arctic Asia*, from the Obi to Behring's Straits. 3. *Arctic Western America*, from Behring's Straits eastward to the Mackenzie River. 4. *Arctic Eastern America*, from the Mackenzie to Baffin's Bay. An M. in this column signifies that the plant extends to the islands north of Lancaster Sound, and to the Parry Islands, including Melville Island, the best explored of them. 5. *Arctic Greenland*. An S. in this column implies that the species has been found south only of the arctic circle in Greenland; and E. that it is found on the east coast only, the only explored portions of which lie to the north of lat. 70° .

II. NORTH AND CENTRAL EUROPEAN AND NORTH ASIATIC DISTRIBUTION.—From the arctic circle

* Sir John Richardson has had the kindness to revise the list of arctic plants appended to the 2nd vol. of his 'Boat Voyage through Rupert's Land,' &c.; and I have his authority for excluding any genera and species which appear there, and which are not included in my catalogue.

to the Alps and Pyrenees, Carpathians, Balkan, and Tauria (inclusive) in Europe, and to the Caucasus, Altai and Soongaria (inclusive) in Asia. 1. *Europe to the Alps*. Here A. implies that the plant inhabits the Alps, or Pyrenees, or Caucasus; and N. that it is a more northern plant, not advancing south of Germany or Central Russia, in many cases not south of Scandinavia. 2. *Asia to the Altai, Soongaria and Dahuria*; the eastern limit of this zone is supposed to be the Jablonoi range, and the western, the Obi River. 3. *Eastern Asia*, from Behring's Straits to the south of Japan, including Mantchuria, Kamtschatka, the peninsula of Ochotsk, North China, and the neighbouring islands of Japan. This district presents a transition zone between the Asiatic and American floras, and were it better explored might possibly be incorporated with the latter, in the higher latitudes at any rate.

III. AMERICAN DISTRIBUTION.—1. *North-west America* includes the band of country from the Rocky Mountains to the Pacific. This is for the most part a very mountainous area, presenting two floras,—the Columbian, which extends south to the Oregon; and the Californian, which extends north to that river, and inland to a considerably higher but still unknown latitude. Being unable to define the limits of these two floras, I have not indicated to which the arctic plants belong, but here, as in the following column, an R. indicates that the species inhabits the Rocky Mountains. 2. *North-east America*. This includes all temperate North America, from the Rocky Mountains to the Atlantic. In this column the letter C. indicates that the species is Canadian, but does not enter the United States; L. that it is confined to Labrador, R. to the Rocky Mountains, and W. that in the United States it has been only found on the White Mountains of New Hampshire, or on other high mountains of the Eastern States. 3. *Tropical America*. With few exceptions the arctic plants found in this province are confined to the temperate and alpine regions of the Cordillera from Mexico to Peru inclusive. M. signifies that it has been found in, but not south of, Mexico. 4. Includes Extra-tropical South America and its islands.

IV. SOUTH EUROPE AND AFRICA.—1. *Europe south of the Alps, Asia Minor, the Canary Islands, and Africa north of the tropic*. In this column are included the plants of the Spanish and Italian peninsulas, Dalmatia, &c., Greece, and both Turkeys. Of these countries, Asiatic Turkey, or Asia Minor, should perhaps have been ranked in the Asiatic column with Persia, &c.; but it contains so very many European plants that are not found further east, that I have included it here. The letter A. in this column indicates that the plant actually crosses the Mediterranean to North Africa, and is found in Algeria, Egypt, the Canary Islands, or the mountains of Abyssinia*. 2. *South Africa*, from the Cape of Good Hope to the tropic.

V. CENTRAL AND SOUTH ASIATIC DISTRIBUTION.—1. *Persia, Tibet, and the Himalaya Mountains*. In this column the letter H. indicates that the species inhabits the Himalaya or Tibet. 2. *Tropical Asia*. This includes all India south of the Himalaya, and especially the Khasia mountains of Eastern Bengal, the mountains of both peninsulas of India, of Ceylon, and of Java. 3. The last column is confined to Australia, New Zealand, and the antarctic islands to their south.

The map that accompanies this paper is reduced from the latest Admiralty chart of the north polar regions (that of 1860), by permission of Captain Washington, R.N., Hydrographer of the Admiralty. The isothermal lines are taken from Professor Dove's work 'On the Temperature of the Globe,' translated by Major-General Sabine, and printed by the British Association for the Advancement of Science in 1853. I have selected what appeared to me the seven most instructive isotherms; namely, the annuals of $0^{\circ} 5'$ Fahr., 5° and 32° ; the two June isotherms of 32° and 41° , and the two September isotherms of 32° and 41° ; these two months answering respectively to the flowering and fruiting seasons within the arctic circle.

* So few Arctic European plants have been found in Tropical Africa, that I have not devoted a column to it. About twenty, however, have been identified either by Achille Richard, by the namers of the Schimper's and Kotschy's plants, or by myself in the Hookerian Herbarium. Even on Clarence Peak, a mountain on the isolated island of Fernando Po, 10,600 feet high, arctic plants have been found by Mann, the collector for Kew, *Deschampsia cæspitosa*, *Luzula campestris*, *Galium aparine*, and *Limosella aquatica*, together with two other boreal species, *Sanicula Europæa* and *Brachypodium sylvaticum*.

TABULAR VIEW OF THE DISTRIBUTION OF ARCTIC PLANTS.

DICOTYLEDONES.	I. Arctic.					II. N. Europ. and Asiatic.			III. American.				IV.		V.		
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America,	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ. N. Afric. Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
I. Ranunculaceae.																	
<i>THALICTRUM dioicum, L.</i>	..	..	1	1	..	..	..	..	1	1	..	..	..	..	..	..	..
<i>alpinum, L. (alp.)</i>	1	1	1	..	1	A	1	1	1	C	..	..	1	..	H	..	..
<i>minus, L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	1	H	..	..
<i>Kemense, Fr.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>flavum, L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	..	..	..
<i>rariflorum, Fr.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>strictum, Led.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>ANEMONE patens, L.</i>	..	..	1	1	..	A	1	1	1	1	..	..	1	..	..	..	..
<i>Nuttalliana, DC.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>parviflora, Mich.</i>	..	..	1	1	..	..	..	..	..	1	..	..	..	..	1	..	..
<i>Richardsoni, Hk.</i>	..	..	1	1	1	..	1	1	1	C	..	..	..	..	..	..	..
<i>Vahlil, Horn.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>alpina, L. (alp.)</i>	..	..	1	..	..	A	..	..	1	1	..	..	1	..	..	..	..
<i>nemorosa, L.</i>	1	..	..	..	..	A	1	1	1	1	..	..	1	..	..	..	..
<i>ranunculoides, L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	1	..	..
<i>vernalis, L.</i>	1	..	..	..	..	A	..	..	..	..	..	..	..	..	..	..	..
<i>decapetala, L.</i>	..	..	1	1	..	..	..	..	1	1	..	1	..	..	..	..	..
<i>multifida, Poir.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Pennsylvanica, L.</i>	..	..	1	1	..	..	1	1	1	1	..	..	..	..	..	..	..
<i>narcissiflora, L. (alp.)</i>	..	..	1	..	..	A	1	1	1	..	..	..	1	..	H	..	..
<i>RANUNCULUS aquatilis, L.</i>	1	..	1	1	1	A	1	1	1	1	1	1	A	1	H	..	1
<i>confervoides, Fr.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Pallasii, Schl.</i>	1	1	1	..	..	..	1	1	1	L	..	..	..	..	..	..	..
<i>glacialis, L. (alp.)</i>	1S	..	..	..	1	A	..	1	1	..	..	..	1	..	..	..	..
<i>Chamissonis, Schl.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Flammula, L.</i>	1	..	1	1	S	A	1	1	1	1	..	..	A	..	1	..	..
<i>reptans, L.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Cymbalaria, Psh. (alp.)</i>	..	..	..	1	S	..	1	1	1	1	1	1	..	..	H	..	..
<i>auricomus, L.</i>	1	1	1	M	1	A	1	1	1	1	..	..	1	..	H	..	..
<i>affinis, Br.</i>	..	..	..	1	..	A	1	1	..	1	..	×	1	×	H	1	..
<i>sceleratus, L.</i>	..	..	..	1	..	A	1	1	..	1	..	×	1	×	H	1	..
<i>Purshii, Rich.</i>	..	..	1	1	..	N	1	1	1	1	..	..	..	..	1	..	..
<i>nivalis, L. (alp.)</i>	1S	1	1	M	1	N	1	1	1	1	..	..	..	..	H	..	..
<i>frigidus, DC.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Eschscholtzii, Schl.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>sulphureus, Sol.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>repens, L.</i>	1	..	..	..	..	A	1	1	1	1	..	..	A	..	1	..	..
<i>polyanthemus, L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..	1	..	..
<i>nemorosus, DC.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>acris, L.</i>	1	1	..	..	S	A	1	1	1	1	..	..	1	..	1	..	×
<i>glabriusculus, Rupr.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Lapponicus, L. (alp.)</i>	1	1	1	1	1	N	1	1	1	C	..	..	..	..	..	..	..
<i>hyperboreus, Rottb. (alp.)</i>	1	1	..	..	1	N	1	1	1	R	..	..	..	..	H	..	..
<i>pygmaeus, Wahl.</i>	1S	1	1	M	1	A	1	1	1	R	..	..	..	..	?	..	..
<i>Sabinii, Br.</i>	..	..	..	..	..	..	..	..	1	C	..	..	..	..	..	..	..
<i>hispidus, Mich.</i>	..	..	..	1	..	..	..	..	1	C	..	..	..	..	..	..	..
<i>Pennsylvanicus, L.</i>	..	..	1	1	..	..	..	..	1	1	..	..	..	..	..	..	..
<i>Ficaria, L.</i>	1	..	..	..	..	A	..	..	1	..	..	..	A	..	1	..	..
<i>CALTHA palustris, L.</i>	1	1	1	M	..	A	1	1	1	1	..	..	1	..	H	..	..
<i>natans, Pall.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>radicans, Forst.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>arctica, Br.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

DICOTYLEDONES.	I. Arctic.					II. N. Europ. and Asiatic.			III. American.			IV.		V.			
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. F. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europe, N. Africa, Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand
Ranunculaceæ (continued).																	
DELPHINIUM <i>Menziesii</i> , DC.	1	1	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..
<i>Middendorffii</i> , Trautv.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>elatatum</i> , L. (<i>alp.</i>)	1	..	..	..	..	A	1	1	..	R	..	..	1	..	1	..	..
<i>intermedium</i> , Ait.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ACONITUM <i>Napellus</i> , L.	..	..	1	..	..	A	1	1	1	..	..	..	1	..	H	..	..
<i>lycoctonum</i> , L.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	H	..	..
COPTIS <i>trifolia</i> , Sal. (<i>alp.</i>)	..	1	..	..	S	N	1	1	1	1	..	..	..	..	..	..	..
AQUILEGIA <i>canadensis</i> , L.	..	..	..	1	..	..	1	1	1	1	..	..	..	..	..	..	..
<i>formosa</i> , Fisch.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>brevistylis</i> , Hook.	..	..	..	1	..	..	..	..	..	CR	..	..	..	..	..	..	..
ACTÆA <i>spicata</i> , L.	1	..	..	..	..	A	1	1	1	1	..	..	1	..	H	..	..
<i>rubra</i> , Willd.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>arguta</i> , Nutt.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>alba</i> , Big.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TROLLIUS <i>Europæus</i> , L.	1	..	..	..	..	A	..	..	..	..	..	..	1	..	..	..	..
<i>Asiaticus</i> , L.	1	..	..	..	..	N	1	1	..	..	..	..	..	..	..	..	..
II. Papaveraceæ.																	
PAPAVER <i>alpinum</i> , L.	1S	1	1	M	1	A	1	1	1	1	..	..	..	..	H	..	..
<i>nudicaule</i> , auct.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
CORYDALIS <i>glauca</i> , Psh.	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..
<i>pauciflora</i> , Pers.	..	..	1	1	..	..	1	1	1	..	..	..	..	..	..	..	..
<i>fabacea</i> , Ehr.	1	..	..	..	..	A	..	1	..	..	..	..	1	..	..	..	..
CHELIDONIUM <i>majus</i> , L.	1	..	..	..	..	A	1	1	..	..	..	..	A	..	..	..	..
III. Nymphaeaceæ.																	
NYPHÆA <i>alba</i> , L.	1	..	..	..	..	A	1	..	..	..	..	..	A	..	H	..	..
NUPHAR <i>lutea</i> , Sm.	1	..	..	..	..	A	1	1	1	1	..	..	1	..	1	..	..
<i>intermedia</i> , Led.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>pumila</i> , Sm.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Kalmiana</i> , Mich.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
IV. Saraceniaceæ.																	
SARACENTIA <i>purpurea</i> , L.	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..
V. Cruciferaæ.																	
NASTURTIUM <i>palustre</i> , DC.	1	..	1	1	S	A	1	1	1	1	1	1	1	..	H	..	1
<i>amphibium</i> , Br.	1	..	..	..	..	A	1	1	..	1	..	..	1	..	1	..	..
BARBAREA <i>vulgaris</i> , Br.	1	..	..	1	..	A	..	1	1	1	..	1	A	..	H	..	1
<i>præcox</i> , Br.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>stricta</i> , Fr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TURRITIS <i>glabra</i> , L.	1	..	..	..	..	A	1	1	1	1	..	..	1	..	H	..	1
<i>mollis</i> , Hook.	..	..	1	1	1	..	1	..	1	C	..	..	..	..	..	..	..
<i>patula</i> , Gr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>retrofracta</i> , Hk.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Arabis Holböllii</i> , Horn.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ARABIS <i>hirsuta</i> , L.	1	..	..	1	..	A	1	1	1	1	..	..	1	..	..	..	..
<i>alpina</i> , L. (<i>alp.</i>)	1	1	..	..	1	A	..	1	..	L	..	..	1	..	H	..	..
<i>petræa</i> , Lamk. (<i>alp.</i>)	..	1	1	1	1	A	1	1	1	1	..	..	..	..	..	..	..
<i>lyrata</i> , DC.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Sisymbrium humifusum</i> , J. Vahl.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>thaliana</i> , L.	1	..	..	..	..	A	1	..	..	X	..	..	A	..	H	..	..
CARDAMINE <i>bellidifolia</i> , L. (<i>alp.</i>)	1S	1	1	M	1	N	1	1	1	W.L.	..	..	..	..	..	..	..
<i>lenensis</i> , Ad.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>microphylla</i> , Willd.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>hirsuta</i> , L.	..	..	..	1	..	A	..	1	1	1	1	1	1	1	H	1	1
<i>sylvatica</i> , Link.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>amara</i> , L.	1	..	..	..	..	A	1	..	..	..	..	..	1	..	H	..	..

DICOTYLEDONES. Cruciferae (continued).	I. Arctic.					II. N. Europ. and Asiatic.			III. American.			IV.	V.				
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ., N. Afric., Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
CARDAMINE pratensis, L.	1S	1	1	1	1	A	1	1	1	1	..	..	1	..	H	..	1
digitata, Rich.	..	..	1	..	..	..	..	1	1	..	..	..	..	..	H	..	..
purpurea, C. & S.	..	1	..	..	..	..	1	1	..	..	..	..	..	..	H	..	..
macrophylla, Willd.	..	1	..	..	..	..	1	1	..	..	..	..	..	..	H	..	..
PARRYA macrocarpa, Br. (alp.)	1	1	1	..	..	..	1	1	1	..	..	..	..	..	H	..	..
arctica, Br. (alp.)	S	..	..	M	..	..	1	1	..	..	..	..	..	..	H	..	..
arenicola	..	..	1	1	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>Eutrema arenicola</i> , Hk.	..	..	1	1	..	..	..	..	R	C	..	1	..	..	H	..	..
VESICARIA arctica, Rich.	..	..	..	1	1	..	..	..	R	C	..	1	..	..	H	..	..
DRABA alpina, L. (alp.)	1S	1	1	1	1	N	1	1	1	R	..	..	..	..	H	..	..
<i>algida</i> , Ad.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>pilosa</i> , DC.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>aspera</i> , Ad.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>Adamsii</i> , Led.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>glacialis</i> , Ad.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>pauciflora</i> , Br.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>micropetala</i> , Hk.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
? <i>trichella</i> , Fr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>androsacea</i> , Wahl. (alp.)	1S	1	1	M	1	A	1	1	1	R	..	..	1	..	H	..	..
<i>Lapponica</i> , DC., an Willd.?	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>Wahlenbergii</i> , Hartm.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>lactea</i> , Adams.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>nivalis</i> , DC., non Lilj.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>crassifolia</i> , Grah.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
? <i>Martinsiana</i> , J. Gay.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>oligosperma</i> , Hk.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>corymbosa</i> , Br.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>muricella</i> , Wahl. (alp.)	1S	1	1	1	1	N	1	1	1	R	L	..	..	..	H	..	..
<i>nivalis</i> , Lilj., non DC.	..	..	1	1	..	A	1	..	1	..	..	..	..	..	H	..	..
<i>stellata</i> , Jacq., non DC.	..	..	1	1	..	A	1	..	1	..	..	..	..	..	H	..	..
<i>Johannis</i> , Host.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>hirta</i> , L. (alp.)	1S	1	1	1	1	N	1	1	1	1	..	..	..	..	H	..	..
<i>oblongata</i> , Br.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>Dovrensis</i> , Fr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>arctica</i> , Vahl.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>incana</i> , L.	1S	1	1	1	1	A	1	1	1	1	..	1	..	..	H	..	..
<i>contorta</i> , Ehr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>confusa</i> , Ehr. & DC.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>Magellanica</i> , Lam.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
? <i>borealis</i> , DC.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	H	..	..
<i>rupestris</i> , Br. (alp.)	1	1	1	1	1	N	1	..	..	R	..	..	..	..	H	..	..
<i>altaica</i> , Bunge.	..	..	..	..	1	..	..	..	..	RL	..	..	..	..	H	..	..
<i>aurea</i> , Vahl	..	..	..	..	1	..	..	..	..	RL	..	..	..	..	H	..	..
<i>muralis</i> , L.	1	..	..	..	..	A	1	..	..	C	..	..	A	..	1	..	..
COCHLEARIA sisymbrioides, DC.	..	1	..	..	..	..	..	1	1	..	..	..	A	..	1	..	..
<i>Danica</i> , L.	1	..	1	1	1	A	..	..	1	..	..	..	..	..	1	..	..
<i>Anglica</i> , L.	1S	1	1	1	1	N	..	1	1	L	..	..	..	..	1	..	..
<i>oblongifolia</i> , DC.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
<i>fenestrata</i> , Br.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
<i>officinalis</i> , L.	1S	1	1	M	1	A	..	1	1	L	..	..	..	..	1	..	..
<i>Pyrenaica</i> , DC.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
<i>Greenlandica</i> , L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
<i>arctica</i> , Schl.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
<i>Wahlenbergii</i> , Rupr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
<i>Lenensis</i> , Adams.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
<i>Pallasii</i> , T. & G. (alp.)	..	1	1	1	1	..	..	1	1	..	..	..	..	..	1	..	..
<i>Hookeri</i> , Led.; <i>pygmaea</i> , Hook.	..	1	1	1	1	..	..	1	1	..	..	..	..	..	1	..	..
<i>minima</i> , Torr. & Gr.	..	1	1	1	1	..	..	1	1	..	..	..	..	..	1	..	..

DICOTYLEDONES.	I. Arctic.					II. N. Europ. and Asiatic.			III. American.				IV.		V.		
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ. N. Afric. Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
VIII. Caryophyllææ.																	
DIANTHUS alpinus, <i>L. (alp.)</i>	1	..	1	..	..	A	1	1	1	..	..	..	1	..			
repens, <i>Willd.</i>																	
Seguieri, <i>Vill.</i>	1	1	..	..	..	A	1	1	..	..	..	..	1	..	H		
dentosus, <i>Fisch.</i>																	
superbus, <i>L.</i>	1	1	..	..	..	A	1	1	..	..	..	..	1	..	1		
SILENE acaulis, <i>L. (alp.)</i>	1S	1	1	1	1	A	..	..	1	W	..	..	1	..			
inflata, <i>L.</i>	1	1	..	..	..	A	..	1	..	×	..	..	A	..	H		
paucifolia, <i>Led.</i>																	
maritima, <i>L.</i>	1	..	..	..	..	A	..	..	..	..	..	..	1	..			
turgida, <i>MB.</i>	1	..	..	..	..	..	1	..	..	..	..	..	..	..
Tatarica, <i>Pers.</i>	1	..	..	..	..	N	1	..	..	..	..	1	1	..	1		
rupestris, <i>DC.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..			
Pennsylvanica, <i>Mich.</i>	1	..	..	1	..	..	..	..	..	1	..	..	..	..
nutans, <i>DC.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..	1		
LYCHNIS apetala, <i>L. (alp.)</i>	1S	1	1	M	1	N	1	1	1	L	..	1	..	..	H		
affinis, <i>Vahl.</i>																	
triflora, <i>Br.</i>																	
Vahlî, <i>Rüpp.</i>																	
angustiflora, <i>Rupr.</i>																	
Magellanica, <i>Lam.</i>																	
pauciflora, <i>Fisch.</i>																	
dioica, <i>L.</i>	1	..	..	..	E	A	1	..	..	..	..	..	1	..	1		
sylvestris, <i>Schk.</i>																	
pratensis, <i>Rohl.</i>																	
alpina, <i>L. (alp.)</i>	1	1	..	..	1	A	1	..	1	L	..	..	1	..			
Flos-Cuculi, <i>L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..			
SPERGULA arvensis, <i>L.</i>	1	..	..	..	..	A	1	..	1	×	..	..	A	..	..	×
SAGINA procumbens, <i>L.</i>	1	..	..	..	..	S	A	1	..	1	1	..	A	..	H	..	1
nodosa, <i>E. M.</i> .....	..	..	1	1	S	A	1	..	1	1	..	..	..	..
nivalis, <i>Fr.</i>	1	..	..	..	1	N	1	..	..	..	..	..	..	..
cæspitosa, <i>Vahl.</i>																	
intermedia, <i>Fenzl.</i>																	
Linnæi, <i>Presl</i>	1S	..	1	1	1	A	1	..	1	..	1	1	1	..			
saxatilis, <i>Wimm.</i>																	
ARENARIA lateriflora, <i>DC.</i>	1	..	1	1	..	N	1	1	1	1	..	..	..	..
formosa, <i>Fisch. (alp.)</i> .....	..	..	1	1	..	..	1	..	..	..	..	..	..	..
nardifolia, <i>Led.</i>																	
uliginosa, <i>Schl.</i>	1	1	..	..	1	A	..	..	..	..	..	..	..	..
Lapponica, <i>Spr.</i>																	
Alsine stricta, <i>Wahl.</i>																	
Rossii, <i>Br.</i> .....	..	1	1	1	..	..	..	..	..	R	..	..	..	..
Michauxii, <i>Fenzl.</i>	..	..	..	1	..	..	..	..	..	1	..	..	..	..
stricta, <i>Mich.</i>																	
verna, <i>L.</i>	1S	1	1	M	1	A	1	1	1	R	..	..	1	..	1		
propinqua, <i>Rich.</i>																	
hirta, <i>Wormsk.</i>																	
rubella, <i>Br.</i>																	
quadrivalvis, <i>Br.</i>																	
Giesekii, <i>Horn.</i>																	
arctica, <i>Stev. (alp.)</i>	1S	1	1	1	1	N	1	1	1	R	..	..	..	..
Pumilio, <i>Br.</i>																	
biflora, <i>Wahl.</i>																	
serpyllifolia, <i>L.</i>	1	..	..	..	..	A	1	1	..	×	..	..	A	..	H	1	
macrocarpa, <i>Psh. (alp.)</i> .....	..	1	1	..	..	..	1	1	..	..	..	..	..	..
ciliata, <i>L. (alp.)</i>	1S	..	..	..	1	N	..	..	1	..	..	..	1	..			
Norvegica, <i>Gunn.</i>																	
laricina, <i>Crantz (alp.)</i> .....	..	1	..	..	..	..	1	1	..	..	..	..	..	..
ARENARIA Greenlandica, <i>Spr.</i> .....	..	..	..	..	1	..	..	..	..	LW	..	..	..	..

DICOTYLEDONES. Caryophyllæ (continued).	I. Arctic.					II. N. Europ. and Asiatic.			III. American.			IV.	V.				
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ., N. Afric., Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
HONKENEJA peplodes, Ehr.	1	1	1	1	1	A	1	1	1	1	..	..	1				
MERKIA physodes, Fisch.	..	..	1	1	..	..	..	1	1	..	1	..	A	1	H	1	1
LEPAGONIUM salinum, Fr.	1	..	1	1	1	A	1	1	1	1	..	..	..	..	H		
STELLARIA borealis, Big. (alp.)	1	..	1	1	1	N	1	1	1	1	..	..	..	..	H		
crispa, Cham.																	
humifusa, Rottb. (alp.)	1S	..	1	1	1	N	1	1	1	1	..	..	..	..
longipes, Goldie (alp.)	1S	1	1	M	1	..	1	1	1	1	..	..	..	..
peduncularis, Bge.																	
læta, Rich.																	
Edwardsii, Br.																	
hebecalyx, Fenzl.																	
ciliatosepala, Trautv.																	
uliginosa, Murr.	1	..	..	1	1	A	1	1	1	1	..	..	1	..	H	1	1
nemorum, L.	1	..	..	..	..	A	1	..	..	..	1	1	1	..	H	1	1
media, L.	1	..	1	1	1	A	1	1	1	×	1	1	A	1	H	1	1
graminea, L.	1	..	..	..	..	A	1	..	..	..	..	..	1	..	H		
dicranoides, Fenzl	..	..	1	..	..	..	1	1	1	1	..	..	..	..
longifolia, Fries (alp.)	1	..	1	1	..	A	1	1	1	1	1	..	..	..
alpestris, Fr.																	
longifolia, Mühl.																	
cerastioides, L. (alp.)	1	..	..	..	1	A	1	..	..	..	..	..	1	..	1		
crassifolia, Ehr.	1	..	..	1	..	N	1	1	1	..	..	..	1	..			
CERASTIUM alpinum, L. (alp.)	1S	1	1	M	1	A	1	1	1	..	..	..	1	..			
viscosum, L.	1	..	..	..	S	A	1	1	×	×	..	×	A	1	H	×	×
semidecandrum, L.																	
vulgatum, L.	1S	..	1	..	S	A	1	1	1	×	..	×	A	..	H	×	×
Fischerianum, Ser.																	
Behringianum, C. & S.																	
maximum, L. (alp.)	..	1	1	..	..	..	1	1	1	1	..	1	1	..	H		
arvense, L.	1	..	..	..	..	A	1	1	1	1	..	1	1	..	H		
IX. Balsamineæ.																	
IMPATIENS fulva, DC.	..	..	..	1	..	..	..	..	1	1	..	..	..	..
X. Lineæ.																	
LINUM perenne, L.	..	..	1	1	..	A	..	1	1	C	..	..	1	..	1		
catharticum, L.	1	..	..	..	..	A	..	..	..	..	..	..	1	..	1		
XI. Geraniaceæ.																	
GERANIUM sylvaticum, L.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	1		
Robertianum, L.	1	..	..	..	..	A	1	..	..	1	..	1	A	..	1		
XII. Hypericineæ.																	
HYPERICUM perforatum, L.	1	..	..	..	..	A	1	1	..	1	..	..	A	..	H		
quadrangulum, L.	1	..	..	..	..	A	1	..	..	..	..	..	1	..			
XIII. Elatineæ.																	
ELATINE Hydropiper, L.	1	..	..	..	..	A	..	..	..	..	..	..	1	..			
XIV. Tamariscineæ.																	
MYRICARIA Germanica, L. (alp.)	1	..	..	..	..	A	..	..	..	..	..	..	1	..	H		
XV. Oxalidæ.																	
OXALIS Acetosella, L.	1	A	1	1	1	1	A	..	H		
XVI. Polygaleæ.																	
POLYGALA Senega, Willd.	1	1			
vulgaris, L.	1	A	1	..			

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	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ., N. Afric., Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
XIX. Onagraceæ.																	
<i>CIRCEA alpina, L.</i>	1	..	..	..	..	A	1	1	1	1	..	..	1	..	H	..	..
<i>EPILOBIUM angustifolium, L.</i>	1	1	1	1	1	A	1	1	1	1	..	..	1	..	H	..	..
<i>latifolium, L. (alp.)</i>	1	1	1	M	1	..	1	1	1	L	..	..	..	..	H	..	..
<i>montanum, L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	H	..	..
<i>tetragonum, L.</i>	1	..	..	..	..	A	1	1	1	1	?	1	A	?	H	..	1
<i>alpinum, L.</i>	1	1	1	1	1	A	1	1	1	W	..	1	1	..	H	..	..
<i>alsinifolium, Vill.</i>																	
<i>Hornemanni, Reich.</i>																	
<i>organifolium, Lam.</i>																	
<i>palustre, L.</i>	1	1	1	1	S	A	1	1	1	1	..	..	A	..	H	..	..
<i>lineare, Mühl.</i>																	
XX. Haloragææ.																	
<i>CALLITRICHE verna, L.</i>	1	..	1	1	S	A	1	1	1	1	..	1	A	..	H	..	1
<i>autumnalis, L.</i>																	
<i>MYRIOPHYLLUM spicatum, L.</i>	1	..	..	1	..	A	1	1	..	1	..	1	A	..	1	..	..
<i>alterniflorum, DC.</i>	1	..	..	1	S	A	..	1	..	..	..	..	A	..	..	..	..
<i>HIPPURIS vulgaris, L.</i>	1	1	1	1	1	A	1	1	1	1	..	1	1	..	H	..	..
<i>montana, Led.</i>																	
<i>maritima, Hellen.</i>																	
<i>CERATOPHYLLUM demersum, L.</i> . . . . .	..	..	1	1	..	A	1	1	1	1	1	1	A	1	H	1	1
<i>submersum, L.</i>																	
XXI. Lythraceæ.																	
<i>LYTHRUM Salicaria, L.</i>	1	..	..	..	..	A	1	1	..	1	..	1	A	1	1	..	1
XXII. Portulacææ.																	
<i>CLAYTONIA lanceolata, Psh. (alp.)</i> . . . . .	..	1	1	..	..	..	1	1	1	..	..	..	..	..	..	..	..
<i>arctica, Ad.</i>																	
<i>sarmentosa, C. A. M.</i>																	
<i>MONTIA fontana, L.</i>	1	..	1	..	1	A	1	1	1	L	1	1	A	..	..	..	1
<i>rivularis, Gmel.</i>																	
XXIII. Crassulacææ.																	
<i>SEDUM Rhodiola, DC. (alp.)</i>	1S	1	1	1	1	A	1	1	1	C	..	..	1	..	H	..	..
<i>elongatum, Led.</i>																	
<i>villosum, L. (alp.)</i>	1	..	..	..	1	A	..	..	..	..	..	..	1	..	..	..	..
<i>quadrifidum, Pall. (alp.)</i>	1	1	..	..	..	..	1	..	..	..	..	..	..	..	H	..	..
<i>annuum, L.</i>	1	..	..	..	S	A	1	..	..	..	..	..	1	..	1	..	..
<i>acre, L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	A	..	..	..	..
<i>euphorbioides, Schl.</i> . . . . .	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
XXIV. Grossulariææ.																	
<i>RIBES lacustre, Pursh.</i> . . . . .	..	..	1	1	..	..	..	..	1	1	..	..	..	..	..	..	..
<i>rubrum, L.</i>	1	1	1	1	..	A	1	1	1	1	..	..	1	..	H	..	..
<i>propinquum, Turc.</i>																	
<i>alpinum, L.</i>	1	..	..	..	..	A	1	1	..	L	..	..	1	..	..	..	..
<i>nigrum, L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	H	..	..
<i>Hudsonianum, Rich.</i> . . . . .	..	..	1	1	..	..	..	..	1	C	..	..	..	..	..	..	..
XXV. Saxifrageææ.																	
<i>MITELLA nuda, L.</i> . . . . .	..	..	..	1	..	..	1	1	1	1	..	..	..	..	..	..	..
<i>CHRYSOSPLENIUM alternifolium, L.</i>	1S	1	1	M	1	A	1	1	1	C	..	..	1	..	H	..	..
<i>tetrandrum, Lund.</i>																	
<i>PARNASSIA palustris, L.</i>	1	1	1	1	..	A	1	1	1	1	1	..	H
<i>obtusiflora, Rupr.</i>																	
<i>Kotzebuei, C. & S.</i>	1	1	S	1	1	L

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DICOTYLEDONES.																	
Saxifragæ (continued).																	
SAXIFRAGA Cotyledon, <i>L. (alp.)</i>	1	1	A	RC	1	..	1		
<i>Aizoon, Jacq.</i>																	
<i>oppositifolia, L. (alp.)</i>	1S	1	1	M	1	A	1	1	1	C	..	..	1	..	H		
<i>Eschscholtzii, Sternb.</i>.....	..	1	..	..	..	..	..	1	1	..	..	..	..	..	..
<i>biflora, L. (alp.)</i>	1	..	..	..	..	A	..	..	..	..	..	..	1	..	..
<i>cæspitosa, L. (alp.)</i>	1S	1	1	M	1	A	1	1	1	C	1	1	1	..	1		
<i>venosa, Haw.</i>																	
<i>Grœnlandica, L.</i>																	
<i>exarata, Vill.</i>																	
<i>uniflora, Br.</i>																	
<i>muscoides, Wulf.</i>																	
<i>sileniflora, Sternb.</i>																	
<i>Magellanica, Poir.</i>																	
<i>tridactylites, L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	A	..	1		
<i>adscendens, L. (alp.)</i>	1	..	..	..	..	A	..	..	..	R	..	..	1	..	..
<i>controversa, Sternb.</i>																	
<i>cernua, L. (alp.)</i>	1S	1	1	M	1	A	1	1	1	R	..	..	..	..	H		
<i>exilis, DC.</i>																	
<i>Sibirica, L.</i>.....	..	..	1	..	..	..	1	1	..	L	..	..	..	..	H		
<i>granulata, L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	A	..	H		
<i>bulbifera, L.</i>																	
<i>rivularis, L.</i>	1S	1	1	M	1	N	1	1	..	WL							
<i>hyperborea, Br.</i>																	
<i>Richardsoni, Hk.</i>.....	..	..	1	..	..	..	..	..	..	..
<i>nivalis, L. (alp.)</i>	1S	1	1	M	1	N	1	1	1	RL							
<i>coriacea, Ad.</i>																	
<i>Virginienis, Mich.</i>.....	..	..	..	1	..	..	..	..	1	1							
<i>reflexa, Hk.</i>																	
<i>hieraciifolia, W. & K. (alp.)</i>	1S	1	1	1	..	A	1	1	1	..							
<i>Dahurica, Pall. (alp.)</i>.....	..	..	1	..	..	..	1	1	1	R							
<i>stellaris, L. (alp.)</i>	1S	1	1	M	1	A	1	1	1	WL	..	..	1				
<i>comosa, Poir.</i>																	
<i>foliolosa, Br.</i>																	
<i>Hirculus, L.</i>	1S	1	1	M	E	A	1	1	1	C	..	..	..	..	H		
<i>propinqua, Br.</i>																	
<i>flagellaris, Willd. (alp.)</i>	1S	1	1	M	1	..	1	1	1	R	..	..	..	..	H		
<i>bronchialis, L. (alp.)</i>	1	1	1	..	..	..	1	1	1	R	..	..	..	..	1		
<i>serpyllifolia, Psh.</i>.....	..	1	1	..	..	..	..	1	1	..	..	..	..	..	..
<i>tricuspidata, Retz.</i>.....	..	..	1	M	1	..	..	1	1	C	..	..	..	..	..
<i>aizoides, L. (alp.)</i>	1S	..	..	1	1	A	..	..	R	C	..	..	1				
<i>punctata, L. (alp.)</i>.....	..	1	1	1	..	..	1	1	1	R							
<i>æstivalis, Fisch.</i>																	
HEUCHERA Richardsonii, <i>Br. (alp.)</i>.....	..	..	..	1	..	..	..	..	..	R							
XXVI. Umbelliferæ.																	
CENOLOPHIUM Fischeri, <i>Koch</i>	1	..	..	..	..	N	1	..	..	..				
BUPLEURUM ranunculoides, <i>L. (alp.)</i>.....	..	..	1	1	..	A	1	1	1	..	..	..	1				
CONIOSELINUM Fischeri, <i>Wimm. (alp.)</i>	1	..	1	1	..	N	1	1	1	L	..	..	..	..	1		
<i>Tartaricum, Fisch.</i>																	
<i>Selinum Gmelini, De Bray.</i>																	
ARCHANGELICA officinalis, <i>DC.</i>	1	1	1	..	1	A	1	1	1	1	..	..	1	..	1		
<i>littoralis, Fr.</i>																	
<i>Norvegica, Tab.</i>																	
<i>atropurpurea, Hoffm.</i>																	
<i>Physolophium saxatile, Turc.</i>																	
<i>Cœlopleurum Gmelini, Led.</i>																	
<i>Pleurospermum Gmelini, Bong.</i>																	
ANGELICA sylvestris, <i>L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	1		

DICOTYLEDONES. Umbelliferae (continued).	I. Arctic.					II. N. Europ. and Asiatic.			III. American.				IV.		V.		
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ., N. Afric., Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
LIGUSTICUM Scoticum, <i>L.</i>	1	..	1	..	S	N	1	1	1	1	..	..	..	..	..	..	..
ATHAMANTA Libanotis, <i>L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..	H	..	..
arctica, <i>Nym.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
sibirica, <i>L.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
CICUTA virosa, <i>L.</i>	1	..	..	1	..	A	1	1	1	C	..	..	1	..	..	..	..
maculata, <i>DC.</i>	..	..	..	1	..	..	..	..	1	1	..	..	..	..	..	..	..
CARUM Carui, <i>L.</i>	1	..	..	..	..	A	1	1	1	1	..	..	1	..	H	..	..
PEUCEDANUM palustre, <i>Moench.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..	..	..	..
HERACLEUM Sibiricum, <i>L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	..	..	..
arcticum, <i>Rupr.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
GAYA simplex, <i>Gaud. (alp.)</i>	1	1	..	..	..	A	1	1	..	..	..	..	1	..	1	..	..
Pachypleurum alpinum, <i>Led.</i>	..	..	1	1	..	..	..	..	..	1	..	..	..	..	..	..	..
SESELI divaricatum, <i>Pursh.</i>	..	..	1	1	..	..	..	..	..	1	..	..	..	..	..	..	..
ANTHRISCUS sylvestris, <i>L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	1	..	..
CHEEROPHYLLUM bulbosum, <i>L.</i>	1	..	..	..	..	N	1	..	..	..	..	..	..	..	1	..	..
XXVII. Corneae.																	
ADOXA moschatellina, <i>L.</i>	1	..	..	1	..	A	1	1	R	C	..	..	1	..	H	..	..
CORNUS stolonifera, <i>Mich.</i>	..	..	..	1	..	..	..	..	..	1	M	..	..	..	..	..	..
Canadensis, <i>L.</i>	..	..	1	1	..	..	..	1	1	1	..	..	..	..	..	..	..
Succica, <i>L. (alp.)</i>	1	..	1	..	1	N	1	1	1	C	..	..	..	..	..	..	..
XXVIII. Caprifoliaceae.																	
VIBURNUM Opulus, <i>L.</i>	..	..	1	1	..	A	1	1	1	1	..	..	1	..	1	..	..
Oxycoccus, <i>Psh.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
LONGICERA cærulea, <i>L.</i>	1	..	1	1	..	A	1	1	1	1	..	..	1	..	1	..	..
Xylostium, <i>L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..	1	..	..
LINNÆA borealis, <i>L.</i>	1	..	1	1	..	A	1	1	1	1	..	..	1	..	..	..	..
XXIX. Rubiaceae.																	
GALIUM boreale, <i>L.</i>	1	..	1	1	..	A	1	1	1	1	..	..	1	..	H	..	..
rubioides, <i>L.</i>	..	..	1	..	..	A	1	1	1	C	..	..	1	..	..	..	..
uliginosum, <i>L.</i>	1	..	..	..	S	A	1	..	..	..	..	..	1	..	..	..	..
triflorum, <i>Muhl.</i>	1	..	..	..	S	N	..	1	1	1	..	..	..	..	..	..	..
trifidum, <i>L.</i>	1	..	..	1	..	A	1	1	1	1	..	..	..	..	..	..	..
Claytoni, <i>Mich.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
palustre, <i>L.</i>	1	..	..	..	S	A	1	..	..	..	..	..	A	..	1	..	..
Aparine, <i>L.</i>	1	..	..	..	..	A	1	1	1	1	M	1	A	..	H	..	..
infestum, <i>W. & K.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
saxatile, <i>L.</i>	..	..	..	..	1	A	1	..	..	..	..	..	1	..	..	..	..
XXX. Valerianeae.																	
VALERIANA capitata, <i>Willd.</i>	1	1	1	1	..	N	1	1	1	R	..	..	..	..	..	..	..
officinalis, <i>L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	H	..	..
XXXI. Dipsaceae.																	
KNAUTIA arvensis, <i>Coult.</i>	1	..	..	..	..	A	1	..	..	..	..	..	A	..	..	..	..
SCABIOSA succisa, <i>L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..	..	..	..
XXXII. Compositae.																	
TUSSILAGO Farfara, <i>L.</i>	1	..	..	..	..	A	1	..	..	×	..	..	1	..	H	..	..
NARDOSMIA frigida, <i>Hk. (alp.)</i>	1	1	1	M	..	N	1	1	..	C	..	..	..	..	..	..	..
corymbosa, <i>Hk.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
sagittata, <i>Hk.</i>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
glacialis, <i>Led.</i>	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Gmelini, <i>DC.</i>	..	1	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..

DICOTYLEDONES. Compositæ (continued).	I. Arctic.					II. N. Europ. and Asiatic.			III. American.			IV.	V.				
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ., N. Africa, Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
<i>HIERACIUM auricula, L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1				
<i>dubium, L.</i>																	
<i>alpinum, L. (alp.)</i>	1	1	..	..	S	A	1	1	..	..	..	..	1				
<i>triste, Willd.</i>																	
<i>umbellatum, L.</i>	1	..	1	1	S	A	1	1	..	1	..	..	1	..	H		
<i>crocatum, Fr.</i>																	
<i>boreale, Fr.</i>	1	..	..	..	..	A	1	1	..	C	..	..	1	..	1		
<i>æstivum, Fr.</i>																	
<i>paludosum, L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1				
<i>SAUSSUREA alpina, L. (alp.)</i>	1	1	1	1	..	A	1	1	1	C	..	..	1				
<i>nuda, DC.</i>																	
<i>monticola, Rich.</i>																	
<i>angustifolia, DC.</i>																	
<i>subsINUATA, Led.</i>.....	..	..	1	..	..	..	1	..	1								
<i>CARDUS crispus, L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	H		
<i>CIRSIUM palustre, Scop.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..			
<i>heterophyllum, All.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1	..	1		
XXXIII. Campanulaceæ.																	
<i>CAMPANULA rotundifolia, L.</i>	1	..	1	1	1	A	1	1	1	1	..	..	A	..	1		
<i>linifolia, Hænk.</i>																	
<i>Scheuchzeri, Vill.</i>																	
<i>uniflora, L. (alp.)</i>	1	..	1	M	1	N	..	1	1	L							
<i>dasyantha, M.B.</i>.....	..	..	1	..	..	..	1	1									
<i>lasiocarpa, A.DC.</i>.....	..	..	1	..	..	..	1	1									
<i>latifolia, L.</i>	1	..	..	..	..	A	..	..	..	..	..	..	1	..	H		
XXXIV. Vaccinieæ.																	
<i>VACCINIUM uliginosum, L.</i>	1	1	1	1	1	A	1	1	1	1	..	..	1	..	1		
<i>pubescens, Wormsk.</i>																	
<i>Oxycoccus, L. (alp.)</i>	1	1	1	1	S	A	1	1	1	1	..	..	1				
<i>microcarpum, Rupr.</i>																	
<i>Vitis Idæa, L. (alp.)</i>	1	1	1	1	1	A	1	1	1	1	..	..	1				
<i>Myrtillus, L.</i>	1	..	..	..	..	A	1	1	R	..	..	..	A	..	1		
<i>Canadense, Kalm</i>.....	..	..	..	1	..	..	..	..	1								
XXXV. Ericææ.																	
<i>CASSIOPEIA hypnoides, L. (alp.)</i>	1	1	..	..	1	N	1	1	1	WB							
<i>tetragona, L. (alp.)</i>	1S	1	1	1	1	..	1	1	1	L							
<i>ANDROMEDA polifolia, L.</i>	1	1	1	1	..	A	1	1	1	1							
<i>CASSANDRA calyculata, Don (alp.)</i>	1	..	1	..	..	N	1	1	1	1							
<i>ARCTOSTAPHYLOS Uva-ursi, Spr.</i>	1	..	1	1	1	A	1	1	1	1	..	..	1				
<i>alpina, Spr. (alp.)</i>	1	1	1	1	..	A	1	1	1	W	..	..	1				
<i>CALLUNA vulgaris, L.</i>	1	..	..	..	..	A	1	..	..	..	..	..	1				
<i>DIAPENSIA Lapponica, L. (alp.)</i>	1	..	1	1	1	N	1	1	1	W							
<i>LOISELEURIA procumbens, L. (alp.)</i>	1	..	1	1	1	A	1	1	1	1	..	..	1				
<i>RHODODENDRON Lapponicum, L. (alp.)</i>	1	..	1	1	1	N	1	..	1	W							
<i>KALMIA glauca, L.</i>.....	..	..	1	1	..	..	..	..	1	1							
<i>OSMOTHAMNUS fragrans, DC. (alp.)</i>.....	..	1	..	..	..	..	1	..	..	..	..	..	..	..	H		
<i>LEDUM palustre, L.</i>	1	1	1	1	1	N	1	1	1	1	..	..	..	..	1		
<i>Greenlandicum, Retz.</i>																	
<i>latifolium, Ait.</i>																	
<i>dilatatum, Ait.</i>																	
<i>PHYLLODOCE taxifolia, Sol. (alp.)</i>	1	1	A	1	1	1	WL							
<i>PYROLA minor, L.</i>	1	..	1	1	1	A	1	1	1	1	1				
<i>secunda, L.</i>	1	1	1	1	..	A	1	1	1	1	M	..	1				

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Labiatae (continued).																	
ORIGANUM vulgare, L.	1	A	1	A	..	H		
THYMUS Serpyllum, L.	1	1	A	1	1	..	X	1	..	H		
DRACOCEPHALUM parviflorum, Nutt. . . . .	..	..	..	1	..	..	..	..	..	1	..	..	..	..
SCUTELLARIA galericulata, L.	1	..	..	..	..	A	1	1	1	1	..	..	1	..	H		
PRUNELLA vulgaris, L.	1	..	..	..	..	A	1	1	1	1	..	..	A	..	H	1	1
GALEOPSIS versicolor, L.	1	..	..	..	..	A	1	1	..	X	..	..	1	..	H		
Tetrahit, L. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
GLECHOMA hederacea, L.	1	..	..	..	..	A	1	1	..	X	..	..	1	..			
STACHYS sylvatica, L.	1	..	..	..	..	A	1	..	..	..	..	..	1	..	H		
palustris, L.	1	..	..	1	..	A	1	1	1	1	..	..	1	..	H		
AJUGA pyramidalis, L.	1	..	..	..	..	A	..	..	..	..	..	..	1	..			
XLI. Orobanchae.																	
BOSCHNIAKIA glabra, C. A. M. . . . .	..	..	1	1	..	..	1	1	1	1	..	..	..	..
XLII. Scrophularineae.																	
LINARIA vulgaris	1	..	..	..	..	A	1	1	..	X	..	..	1	..			
LIMOSELLA aquatica, L.	1	..	..	..	S	A	1	1	1	1	..	1	1	1	H	..	1
GYMNANDRA borealis, Pall. (alp.)	1	1	1	1	..	..	1	1	1	..	..	..	..	..	H		
Pallasii, C. & S. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Stelleri, C. & S. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
CASTILLEJA pallida, Kth. (alp.)	1	1	1	1	..	..	1	1	1	WL	..	..	..	..	1		
septentrionalis, Lindl. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
VERONICA alpina, L. (alp.)	1	1	..	..	1	A	1	1	1	W	..	..	1	..			
officinalis, L.	1	..	..	..	..	A	1	1	..	1	..	..	1	..			
longifolia, L.	1	1	..	..	..	A	1	1	..	..	..	..	1	..			
chamaedrys, L.	1	..	..	..	..	A	1	..	..	X	..	..	1	..	1	..	
scutellata, L.	1	..	1	..	..	A	1	1	1	1	..	..	A	..	1	..	1
macrostemon, Bge.	1	..	..	..	..	..	1	..	..	..	..	..	..	..	H	..	1
serpyllifolia, L.	1	..	..	1	..	A	1	1	1	1	1	1	1	..	H	..	1
borealis, Læst. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
saxatilis, L. (alp.)	1	..	..	..	1	A	1	..	..	..	..	..	1	..			
fruticulosa, L. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
MELAMPYRUM pratense, L.	1	..	..	..	..	A	1	..	..	1	..	..	1	..			
Americanum, Mich. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
sylvaticum, L.	1	..	..	..	..	A	1	..	..	1	..	..	1	..			
EUPHRASIA officinalis, L.	1	..	..	..	1	A	1	1	..	1	..	..	1	..	H		
RHINANTHUS Crista-galli, L.	1	..	..	1	S	A	..	1	1	1	..	..	1	..			
minor, Ehr. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BARTSIA alpina, L. (alp.)	1	1	..	..	1	A	..	..	..	L	..	..	1	..			
PEDICULARIS capitata, Ad. . . . .	..	1	1	1	..	..	1	1	1	1	..	..	..	..	1		
Sceptrum, L.	1	1	..	..	..	A	1	1	..	..	..	..	..	..	1		
verticillata, L. (alp.)	1	1	1	..	..	A	1	1	1	..	..	..	1	..	H		
amœna, Ad. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
palustris, L.	1	..	1	..	..	A	1	1	1	L	..	..	1	..	1		
borealis, Stev. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Laponica, L. (alp.)	1	1	1	1	1	N	1	1	..	L	..	..	..	..
euphrasioides, Stev. (alp.) . . . . .	..	1	1	1	1	..	1	1	1	L	..	..	..	..
hirsuta, L. (alp.)	1S	1	1	1	1	N	..	..	..	L	..	..	..	..
lanata, Willd. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sudetica, L. (alp.)	1	1	1	M	1	N	1	1	1	L	..	..	..	..
arctica, Br. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kanei, Durand. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Langsdorffii, Fisch. . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
flammea, L. (alp.)	1	1	..	1	1	R	L			
versicolor, Wahl. (alp.)	1	1	1	1	..	A	1	1	1	H		
SCROPHULARIA nodosa, L.	1	A	1	..	1	1	1	..	1		

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DICOTYLEDONES.																
XLIII. Lentibularineæ.																
UTRICULARIA vulgaris, L.	1	1	..	A	1	1	1	1	A
minor, L.	1	1	..	A	1	1	1	1	..	H	..
intermedia, Ehr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
PINGUICULA vulgaris, L.	1	..	..	1	1	A	1	1	1	1	..	..	1	..	..	..
villosa, L.	1	..	1	1	..	N	1	1	1	L	..	..	..	..	..	..
alpina, L. (alp.)	1	1	..	..	..	A	1	..	..	..	..	..	1	..	H	..
XLIV. Primulaceæ.																
DODECATELON Meadia, L. ....	..	..	1	1	..	..	..	1	1	1	..	..	..	..	..	..
integrifolium, Mich.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
frigidum, C. & S.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
CORTUSA Matthioli, L.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	H	..
GLAUX maritima, L.	1	..	..	..	..	A	1	1	1	1	..	..	1	..	H	..
TRIENTALIS Europæa, L.	1	..	..	..	..	A	1	1	1	..	..	..	..	..	..	..
latifolia, Hook.; arctica, Fisch.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ANDROSACE septentrionalis, L.	1	1	1	1	..	A	1	1	1	C	..	..	..	..	1	..
Chamaejasme, L. (alp.)	1	1	1	1	..	A	1	1	1	R	..	..	1	..	..	..
triflora, Adams.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
DOUGLASIA arctica, Hk. (alp.) ....	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
NAUMBERGIA thyrsoflora, Reich.	1	..	..	..	..	N	1	1	1	1	..	..	..	..	..	..
LYSMACHIA vulgaris, L.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	..	1
PRIMULA stricta, Horn. (alp.)	1	..	1	1	1	N	..	1	1	1	..	..	..	..	..	..
Hornemanniana, Lehm.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mistassinica, C. & S.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
borealis, DUBY.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
nivalis, Pall. (alp.) ....	..	..	1	..	..	..	1	1	1	..	..	..	..	..	..	..
cuneifolia, Led. (alp.) ....	..	..	1	..	..	..	1	1	1	..	..	..	..	..	..	..
saxifragæfolia, Lehm.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
farinosa, L.	1	..	..	..	..	A	1	1	1	L	..	1	1	..	..	..
Scotica, Hook.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sibirica, Jacq. (alp.)	1	..	..	1	S	N	1	1	..	..	..	..	..	..	H	..
Finmarchica, Willd.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
XLV. Plumbagineæ.																
ARMERIA vulgaris, Willd.	1	1	1	1	1	A	1	1	1	C	..	1	1	..	..	..
alpina, Hoppe.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
elongata, Hoffm.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Labradorica, Wallr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
arctica, Rupr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Macloviana, Cham.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
XLVI. Plantagineæ.																
PLANTAGO major, L.	1	..	..	1	..	A	1	1	1	×	..	..	A	..	H	×
media, L.	1	..	..	..	..	A	1	1	1	..	..	..	1	..	H	×
lanceolata, L.	1	..	..	1	..	A	..	..	1	×	1	..	A	..	H	×
maritima, L.	1	1	..	..	1	A	1	1	1	1	..	1	1	..	H	..
LITTORELLA lacustris, L.	1	..	..	..	..	A	..	..	..	..	..	..	..	..	..	..
XLVII. Polygoneæ.																
KENIGIA Islandica, L. (alp.)	1S	..	1	..	1	N	1	1	1	R	..	..	..	..	H	..
OXYRIA reniformis, Hk. (alp.)	1S	1	1	M	1	A	1	1	1	W	..	..	1	..	H	..
RUMEX Acetosella, L.	1	1	..	..	S	A	1	1	1	×	..	×	A	×	H	..
Acetosella, L.	1	1	..	..	1	A	1	1	1	×	..	×	A	×	H	..
graminifolius, Lamb.	..	1	..	..	..	..	1	1	1	..	..	..	..	..	..	..
aquaticus, L.	1	1	1	1	S	A	1	1	1	1	1	..	H	..
Hippolapathum, Fr.
arcticus, Trautv.
domesticus, Hartm.

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Betulaceæ (continued).																	
ALNUS viridis, DC. (<i>alp.</i>)	1	1	1	1	1	A	1	1	1	1	1				
fruticosa, Rich.																	
repens, Vahl.																	
incana, Willd.	1	..	1	1	..	A	1	1	1	1	..	..	1	..	1		
LVI. Cupuliferæ.																	
CORYLUS Avellana, L.	1	..	..	..	..	A	1	..	..	..	..	..	1				
LVII. Salicineæ.																	
SALIX pentandra, L.	1	1	..	..	..	A	1	1	1	1	..	..	1	..	1		
lucida, Willd.																	
lanata, L. (<i>alp.</i>)	1	1	1	1	1	N	1	1	1	C							
Richardsoni, Hook.																	
Barattiana, Hook.																	
speciosa, H. & A. (<i>alp.</i>)	..	..	1	1	..	..	..	..	..	R							
Lapponum, L. (<i>alp.</i>)	1	1	..	..	..	A	1	1	..	..	..	..	1				
Stuartiana, Sm.																	
Caprea, L.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	H		
nigricans, Fr.	1	1	..	..	..	A	1	1	..	..	..	..	1				
punctata, Wahl.																	
phylicifolia, Sm. (<i>alp.</i>)	1	1	..	..	..	A	1	1	..	W	..	..	..	..	1		
myrtilloides, L.	1	1	1	1	..	N	1	1	1	1							
pedicellaris, Pursh.																	
hastata, L.	1	1	..	..	..	A	1	1	..	..	..	..	1				
cordata, Muhl.	..	..	..	1	..	..	..	..	..	1							
rhamnifolia, H. & A.	..	..	1	..	..	..	..	1	1								
ovalifolia, Trautv.	..	1	1	..	..	..	1	1	1								
glacialis, And.	..	..	1	..	..	..	..	..	..	..
Arbuscula, L. (<i>alp.</i>)	1	..	..	..	1	A	1	..	..	W	..	..	1	..	1		
glaucula, L. (<i>alp.</i>)	1	1	1	1	1	A	1	1	1	1	..	..	1				
desertorum, Rich.																	
villosa, Don.																	
arctica, Br. (<i>alp.</i>)	..	..	1	M	1	..	1	..	1	C							
alpestris, And.	1	1	1	1	1	A	1	1	..	W							
cordifolia, Pursh (partim).																	
pyrenaica, Gouan (partim).																	
myrsinites, L. (<i>alp.</i>)	1	1	1	1	S	A	1	1	..	W	..	..	1				
phlebophylla, And.	..	..	1	1	..	..	..	1	1								
reticulata, L. (<i>alp.</i>)	1S	1	1	1	1	A	1	1	1	1	..	..	1				
vestita, Pursh.																	
nivalis, Hook.																	
herbacea, L. (<i>alp.</i>)	1S	1	1	1	1	A	1	1	1	W	..	..	1				
polaris, L. (<i>alp.</i>)	1S	1	1	M	..	N	1	1	1	1	..	..	..	..	1		
POPULUS tremula, L.	1	..	..	..	..	A	1	1	..	..	..	..	A				
tremuloides, Mich.	..	..	..	1	..	..	..	..	..	1							
balsamifera, L.	..	..	1	1	..	..	1	1	1	1							
LVIII. Coniferæ.																	
PINUS sylvestris, L.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	1		
Banksiana, Lamb.	..	..	..	1	..	..	..	..	1	1							
Cembra, L. (<i>alp.</i>)	..	1	1	..	..	A	1	1	1	..	..	..	1				
ABIES alba, L.	..	1	1	1	..	..	..	..	1	1							
PICEA nigra, L.	..	..	..	1	..	..	..	..	..	1							
excelsa, DC.	1	A	1				
orientalis, L.	1	1	N	1	1					
LABIX Ledebourii, Endl.	1	1	N	1	1					
Sibirica, Led.																	

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DICOTYLEDONES.																	
Coniferae (continued).																	
LARIX Americana, Mich.	1	1	1	1	1	1	1	1
microcarpa, Lamb.
pendula, Ait.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dahurica, F. & T.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
JUNIPERUS communis, L.	1	..	1	1	1	A	1	1	1	1	..	..	A	..	H	..	..
nana, Willd.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Virginiana, L. . . . .	..	..	1	1	..	..	..	..	1	1	..	..	..	..	..	..	..
prostrata, Pers.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
MONOCOTYLEDONES.																	
LIX. Alismaceae.																	
SAGITTARIA sagittifolia, L.	1	..	..	..	..	A	1	1	1	1	..	..	1	..	H	..	..
variabilis, Engelm.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ALISMA Plantago, L.	1	..	..	..	..	A	1	1	1	1	..	..	A	..	H	..	1
LX. Fluviales.																	
TRIGLOCHIN maritimum, L.	1	..	1	1	..	A	1	1	1	1	..	..	A	..	H	..	..
palustre, L.	1	..	..	..	S	A	1	1	1	1	..	..	A	..	H	..	..
SCHUCHZERIA palustris, L.	1	..	..	..	..	A	1	..	..	1	..	..	..	..	..	..	..
POTAMOGETON natans, L.	1	..	..	..	..	A	1	1	1	1	..	1	A	1	H	1	1
sparganifolius, Læstæd.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
perfoliatus, L.	1	..	..	..	..	A	1	1	..	1	..	..	A	..	H	..	1
pectinatus, L.	1	..	..	..	..	A	1	1	1	1	..	..	A	..	H	..	1
rufescens, Schr.	1	..	..	..	S	A	..	..	1	1	..	..	1	..	H	..	..
prælongus, Wulff.	1	..	..	..	..	A	..	..	..	1	..	..	..	..	H	..	1
pusillus, L.	1	..	..	..	S	A	..	..	..	1	..	..	1	..	H	..	..
tenuissimus, M. K.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
gramineus, L.	1	..	..	..	S	A	..	..	..	1	..	..	1	..	..	..	..
nigrescens, Fr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
heterophyllus, Schreb.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ZOSTERA marina, L.	1	..	..	..	S	A	..	1	..	1	..	..	A	..	..	..	..
LXI. Melanthaceae.																	
TOFIELDIA palustris, L. (alp.)	1	1	..	1	1	A	1	1	1	C	..	..	1	..	..	..	..
borealis, Wahl.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
coccinea, Richards . . . . .	..	1	1	1	..	..	1	1	1	1	..	..	..	..	..	..	..
ZIGADENUS chloranthus, Rich. . . . .	..	..	1	1	..	..	..	..	1	1	..	..	..	..	..	..	..
VERATRUM album, L.	1	..	..	..	..	A	1	1	1	1	..	..	1	..	1	..	..
viride, Ait.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Lobelianum, Bernh.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
LXII. Liliaceae.																	
FRITILLARIA Kamschatkensis, Gawl. . . . .	..	1	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..
LLOYDIA serotina, L. (alp.)	1	1	1	1	..	A	1	..	1	1	..	..	1	..	H	..	..
ALLIUM Schönoprasum, L.	1	1	1	1	..	A	1	1	1	1	..	..	1	..	H	..	..
Sibiricum, L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
oleraceum, L.	1	..	..	..	..	A	..	..	..	..	..	..	1	..	H	..	..
LXIII. Smilacaceae.																	
PARIS quadrifolia, L.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	1	..	..
POLYGONATUM verticillatum, All.	1	..	..	..	..	A	1	..	..	..	..	..	1	..	H	..	..
SMILACINA bifolia, Desf.	1	..	..	1	..	A	1	1	1	1	..	..	1	..	1	..	..
LXIV. Orchideae.																	
ORCHIS maculata, L.	1	..	..	..	..	A	1	..	..	..	..	..	1	..	1	..	..
cruenta, Muell.	1	..	..	..	..	N	..	..	..	..	..	..	..	..	..	..	..
latifolia, L.	1	..	..	..	..	A	1	1	1	..	..	..	1	..	H	..	..

MONOCOTYLEDONES.	I. Arctic.					II. N. Europ. and Asiatic.			III. American.			IV.		V.			
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra tropical S. America.	S. Europ., N. Afric., Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
Orchideæ (continued).																	
ORCHIS Sambucina, L.	1	..	..	..	..	A	..	..	..	..	..	..	1	..	1	..	..
GYMNADENIA Conopsea, Br.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	1	..	..
PERISTYLUS albidus, L.	1	..	..	..	1	A	1	..	..	..	..	..	1	..	..	..	..
viridis, L.	1	..	..	..	..	A	1	1	..	1	..	..	1	..	..	..	..
bracteatus, Torr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Islandicus, Lindl.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
PLATANThERA hyperborea, Lindl. ....	..	..	1	1	1	N	..	..	1	1	..	..	..	..	..	..	..
dilatata, Lindl.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kœnigii, Lindl.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
obtusata, L.	1	..	1	1	..	..	..	..	1	1	..	..	..	..	..	..	..
bifolia, L.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	..	..	..
EPIPACTIS latifolia, Sw.	1	..	..	..	..	A	1	..	..	..	..	..	A	..	..	..	..
media, Fr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
HERMINIUM Monorchis, Br.	1	..	..	..	..	A	1	1	..	..	..	..	1	..	H	..	..
alpinum, L. (alp.)	1	..	..	..	..	A	..	..	..	..	..	..	1	..	..	..	..
MALAXIS paludosa, L.	1	..	..	..	..	A	1	..	..	..	..	..	..	..	..	..	..
CALYPSO borealis, L.	1	..	..	1	..	N	1	1	1	1	..	..	..	..	..	..	..
LISTERA cordata, Br.	1	..	..	..	S	A	1	1	1	1	..	..	1	..	..	..	..
ovata, L.	1	..	..	..	..	A	1	..	..	..	..	..	1	..	..	..	..
GOODYERA repens, L.	1	..	..	..	..	A	1	1	..	1	..	..	1	..	H	..	..
CORALLORRHIZA innata, L.	1	1	1	..	1	A	1	1	1	1	..	..	1	..	H	..	..
SPIRANTHES gracilis, Br. ....	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..
CYPRIPEDIUM guttatum, Sw. ....	..	..	1	1	..	N	1	1	1	1	..	..	..	..	..	..	..
humile, Salisb. ....	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..
acaule, Ait.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Calceolus, L.	1	1	..	..	..	A	1	1	..	..	..	..	1	..	H	..	..
LXV. Irideæ.																	
SISYRINCHIUM Bermudianum, L. ....	..	..	..	1	..	×	..	..	1	1	1	..	..	..	..	..	..
anceps, Cav.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
LXVI. Hydrocharideæ.																	
STRATIOTES aloides, L.	1	..	..	..	..	A	..	..	..	..	..	..	1	..	..	..	..
LXVII. Aroideæ.																	
SPARGANIUM natans, L.	1	..	1	1	S	N	1	1	1	1	..	..	A	..	1	..	..
hyperboreum, Lest.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
simplex, Sm. ....	..	..	..	1	..	A	1	1	1	1	..	1	A	..	1	..	1
CALLA palustris, L.	1	..	..	..	..	N	1	1	..	1	..	..	..	..	..	..	..
TYPHA latifolia, L. ....	..	..	1	1	..	A	1	1	1	1	..	..	A	..	H	..	..
LXVIII. Junceæ.																	
NARTHECIUM ossifragum, L.	1	..	..	..	..	A	..	..	..	1	..	..	1	..	..	..	..
Americanum, Ker.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
LUZULA spadicea, DC.	1	1	1	..	1	A	1	1	1	1	..	..	1	..	1	..	..
glabrata, Hoppe.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
parviflora, Desv.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
melanocarpa, Desv.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wahlenbergii, Rupr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
campestris, Sm.	1	1	1	1	1	A	1	1	1	1	..	1	1	1	H	..	1
palescens, Wahl.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
multiflora, Ehr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
spicata, Desv. (alp.)	1	..	1	..	1	A	1	1	1	W	..	..	1	..	H	..	..
arcuata, Hook. (alp.)	1S	1	1	M	1	N	..	1	1	W	..	..	..	..	..	..	..
hyperborea, Br.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
pilosa, Willd.	1	..	1	..	1	A	1	1	..	1	..	..	A	..	1	..	..
vernalis, DC.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
maxima, L.	1	..	..	..	..	A	..	..	..	1	..	..	1	..	..	..	..

MONOCOTYLEDONES. Gramineæ (continued).	I. Arctic.					II. N. Europ. and Asiatic.			III. American.			IV.	V.				
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Allai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ., N. Afric., Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
<i>AGROSTIS vulgaris, L.</i>	1	..	..	..	S	A	1	1	1	1	..	1	A	..	H	..	1
<i>alba, L.</i>																	
<i>polymorpha, Huels.</i>																	
<i>canina, L.</i>	1	..	..	..	1	A	..	1	1	C	..	1	A	..	H	..	1
<i>laxifolia, Rich.</i>	..	..	..	1	..	..	..	1	1	C	M	..	..	..	..	..	..
<i>DEYEUXIA Canadensis, P. B.</i>	..	..	1	1	..	..	..	..	1	1	M	..	..	..	..	..	..
<i>deschampsoides, Tr.</i>	1	..	..	..	..	..	1	1	1	1	..	..	..	..	..	..	..
<i>Laponica, Vahl</i>	1S	1	1	1	1	N	1	1	1	1	..	..	..	..	..	..	..
<i>neglecta, Rupr.</i>																	
<i>stricta, P. B.</i>																	
<i>chalybæa, Fr.</i>																	
<i>varia, P. B.</i>	..	..	1	1	1	A	1	1	R	C	..	..	1	..	..	..	..
<i>purpurascens, Br.</i>																	
<i>Grœnlandica, E. M.</i>																	
<i>montana, Host.</i>																	
<i>Hartmanniana, Fr.</i>																	
<i>strigosa, Wahl.</i>	1	..	1	..	1	N	..	1	1	..	..	..	..	..	..	..	..
<i>aleutica, Bong.</i>																	
<i>Nutkaensis, Tr.</i>																	
<i>Langsdorffii, Tr.</i>	1	..	1	..	..	N	1	1	1	..	..	..	..	..	..	..	..
<i>purpurea, Kth.</i>																	
<i>elata, Blytt.</i>																	
<i>CALAMAGROSTIS epigejos, L.</i>	1	..	..	..	..	A	1	1	..	..	..	1	1	1	H	..	..
<i>littorea, Schrad.</i>																	
<i>lanceolata, Roth</i>	1	..	..	..	1	A	1	1	..	L	..	..	1	..	..	..	..
<i>Halleriana, Gaud.</i>																	
<i>phragmitoides, Hartm.</i>																	
<i>PHRAGMITES communis, L.</i>	1	..	..	..	..	A	1	1	1	1	1	1	A	1	H	1	1
<i>SPARTINA cynosuroides, W.</i>	..	..	..	1	..	A	..	..	1	1	..	..	..	..	..	..	..
<i>AVENA pubescens, L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	..	..	..
<i>ANTHOXANTHUM odoratum, L.</i>	1	..	..	..	S	A	1	..	..	×	..	..	A	×	..	..	×
<i>HEROCHLOE borealis, L.</i>	1	..	1	..	..	A	1	1	1	1	..	..	..	×	1	..	..
<i>alpina, L.</i>	1	..	1	M	1	N	1	1	1	W	..	..	..	..	..	..	1
<i>pauciflora, Br.</i>	1S	1	1	M	..	..	..	1	..	..	..	..	..	..	..	..	..
<i>racemosa, Tr.</i>																	
<i>DESCHAMPSIA cœspitosa, P. B.</i>	1	1	1	M	E	A	1	1	1	1	..	1	1	..	H	..	1
<i>brevifolia, Br.</i>																	
<i>Aira arctica, Tr.</i>																	
<i>atropurpurea, Wahl.</i>	1	..	1	1	S	N	..	..	1	W	..	..	..	..	..	..	..
<i>alpina, L. (alp.)</i>	1S	..	..	..	1	N	..	..	1	..	..	..	..	..	..	..	..
<i>flexuosa, L.</i>	1	..	..	..	S	A	1	1	1	1	..	1	1	..	1	..	..
<i>TRISETUM subspicatum, P. B. (alp.)</i>	1S	..	1	M	1	A	1	1	1	1	1	1	1	..	H	..	1
<i>agrostoides, Tr.</i>																	
<i>flavescens, L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	A	..	H	..	1
<i>Aira Ruprechtii, Griseb.</i>																	
<i>Sibiricum, Rupr.</i>																	
<i>MELICA nutans, L.</i>	1	..	..	..	..	A	1	1	..	..	..	..	1	..	..	..	..
<i>MOLINIA cœrulea, P. B.</i>	1	..	..	..	..	A	1	..	..	..	..	..	A	..	1	..	..
<i>PHIPPSIA algida, Br.</i>	1S	1	1	M	1	N	..	..	1	..	..	..	..	..	..	..	..
<i>monandra, H. & A.</i>																	
<i>CATABROSA aquatica, P. B.</i>	1	..	1	1	S	A	1	1	1	1	..	..	A	..	H	..	..
<i>COLPODIUM latifolium, Br.</i>	1	1	1	M	1	N	1	1	1	L	..	..	..	..	..	..	..
? <i>pauciflorum, Hk.</i>																	
<i>arundinaceum, Hook.</i>																	
<i>pendulinum, Læstl.</i>	1	..	..	..	S	N	..	1	..	1	..	..	..	..	..	..	..
<i>Poa deflexa, Rupr.</i>																	
<i>remotiflora, Rupr.</i>																	
<i>similis, Rupr.</i>																	

MONOCOTYLEDONES. Gramineæ (continued).	I. Arctic.					II. N. Europ. and Asiatic.			III. American.				IV.	V.			
	Europe.	Asia	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ., N. Afric., Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
COLPODIUM fulvum, <i>Tr.</i>	1	1	1	..	..	N	..	1	1								
<i>Poa scleroclada</i> , <i>Rupr.</i>																	
<i>latiflora</i> , <i>Rupr.</i>																	
<i>pœcilantha</i> , <i>Rupr.</i>																	
DUPONTIA <i>Fisheri</i> , <i>Br.</i>	1S	..	1	M	1	..	..	1	1								
<i>psilosantha</i> , <i>Tr.</i>																	
<i>Poa pelligera</i> , <i>Rupr.</i>																	
GLYCERIA <i>fluitans</i> , <i>Br.</i> . . . . .	..	..	1	1	1	A	1	1	1	1	..	1	A	..	H	..	1
<i>artica</i> , <i>Hk.</i>																	
PLEUROPOGON <i>Sabini</i> , <i>Br.</i> . . . . .	..	..	..	M													
ATROPIS <i>distans</i> , <i>Griseb.</i>	1	..	..	..	..	A	1	1	1	1	..	..	A	1	H		
<i>Poa airoides</i> , <i>Nutt.</i>																	
<i>maritima</i> , <i>L.</i>	1	1	1	1	1	A	1	1	1	1	..	1	A				
<i>Poa angustata</i> , <i>Br.</i>																	
<i>Nutkaensis</i> , <i>Presl.</i>																	
POA <i>annua</i> , <i>L.</i>	1	..	..	..	S	A	1	1	1	1	..	1	A	..	H	..	×
<i>alpina</i> , <i>L. (alp.)</i>	1S	..	1	1	1	A	1	1	1	C	..	..	1	..	H		
<i>pratensis</i> , <i>L.</i>	1S	1	1	1	1	A	1	1	1	1	..	1	A	..	H		
<i>angustifolia</i> , <i>L.</i>																	
<i>trivialis</i> , <i>L.</i>																	
<i>nemoralis</i> , <i>L.</i>	1	1	1	M	1	A	1	1	1	1	..	1	1	..	H		
<i>cœsia</i> , <i>Sm.</i>																	
<i>aspera</i> , <i>Gaud.</i>																	
<i>Vahliana</i> , <i>Liebm.</i>																	
<i>serotina</i> , <i>Ehr.</i>																	
<i>bryophila</i> , <i>Tr.</i>																	
<i>flexuosa</i> , <i>Wahl. (alp.)</i>	1S	1	1	M	1	A	1	1	1	W	..	..	1	..	H		
<i>laxa</i> , <i>Hænke.</i>																	
<i>Cenisea</i> , <i>All.</i>																	
<i>artica</i> , <i>Br.</i>																	
<i>abbreviata</i> , <i>Br.</i>																	
DACTYLIS <i>glomerata</i> , <i>L.</i>	1	..	..	..	..	A	..	..	..	×	..	..	A	..	H	..	×
FESTUCA <i>elatior</i> , <i>L.</i>	1	..	..	..	..	A	1	1	1	C	..	1	1	..	H	..	×
<i>Richardsoni</i> , <i>Hk.</i> . . . . .	..	..	1	1	..												
<i>ovina</i> , <i>L.</i>	1S	1	1	M	1	A	1	1	1	1	1	1	A	..	H	..	1
<i>rubra</i> , <i>L.</i>																	
<i>duriuscula</i> , <i>L.</i>																	
<i>sabulicola</i> , <i>L. Dub.</i>																	
<i>arenaria</i> , <i>Osb.</i>																	
<i>Koeleria hirsuta</i> , <i>Gaud.</i>																	
<i>brevifolia</i> , <i>Br.</i>																	
BROMUS <i>ciliatus</i> , <i>L.</i>	1	..	1	1	S	A	1	1	1	1	..	1	1	..	H		
<i>inermis</i> , <i>Leyss.</i>																	
<i>purgans</i> , <i>L.</i>																	
<i>pictus</i> , <i>H.f.</i>																	
TRITICUM <i>repens</i> , <i>L.</i>	1	..	1	1	1	A	1	1	1	1	M	1	A	..	H		
<i>violaceum</i> , <i>Horn.</i>																	
<i>caninum</i> , <i>L.</i>	1	..	..	..	..	A	1	1	1	1	..	1	1	..	H		
ELYMUS <i>arenarius</i> , <i>L.</i>	1	..	1	1	1	A	1	1	1	1	..	..	1	..			
<i>mollis</i> , <i>Trin.</i> . . . . .	..	1	1	1	..	..	1	1	1	1	1	..					
HORDEUM <i>jubatum</i> , <i>L.</i> . . . . .	..	..	1	1	..	A	..	1	1	1	..	1					
NARDUS <i>stricta</i> , <i>L.</i>	1	..	..	..	S	A	1	..	..	..	..	..	1				

ACOTYLEDONES.	I. Arctic.					II. N. Europ. and Asiatic.			III. American.				IV.	V.			
	Europe.	Asia.	W. America.	E. America.	Greenland.	Europe to Alps, &c.	Asia to Altai, &c.	N. E. Asia and Japan.	N. W. America.	N. E. America.	Tropical America.	Extra-tropical S. America.	S. Europ., N. Afric., Asia Minor.	S. Africa.	Persia, Tibet, Himalaya, &c.	Tropical Asia.	Australia and New Zealand.
LXXI. Filices.																	
POLYPODIUM Dryopteris, <i>L.</i>	1	..	..	1	S	A	1	1	1	1	..	..	1	..	1		
Rhaticum, <i>L.</i>	1	..	..	..	S	A											
Phlegopteris, <i>L.</i>	1	..	..	..	S	A	1	1	1	1	..	..	1				
vulgare, <i>L.</i>	1	..	..	..	S	A	1	1	1	1	..	..	1				
WOODSIA Ilvensis, <i>Br. (alp.)</i>	1	1	1	1	1	A	1	1	..	1			1	..	1		
hyperborea, <i>Br. (alp.)</i>	1	..	..	..	1	A	1	..	..	C							
glabella, <i>Br. (alp.)</i>	..	..	..	1	..	..	1	1	..	1							
CISTOPTERIS fragilis, <i>Bernh.</i>	1	..	1	1	1	A	1	1	..	C		1	A	1	1	..	1
montana, <i>Henk. (alp.)</i>	1	..	..	..	..	A	..	..	..	R							
LASTREA fragrans, <i>Sw.</i>	..	1	1	1	1	..	1	1	..	1							
spinulosa, <i>Willd.</i>	1	..	1	..	..	A	1	1	1	1	..	..	1				
Filix-mas, <i>Sw.</i>	1	..	..	..	S	A	1	1	..	..	..	..	A	..	1		
Oreopteris, <i>Ehr.</i>	1	..	..	..	..	A	..	..	..	..	..	..	1	..	H		
POLYSTICHUM angulare, <i>Willd.</i>	1	..	..	..	..	A	..	..	..	..	..	..	1	..	H		
Lonchitis, <i>L. (alp.)</i>	1	..	..	1	1	A	1	1	..	1			1				
PTERIS atropurpurea, <i>L.</i>	..	..	..	..	..	..	..	..	..	1							
aquilina, <i>L.</i>	1	..	..	..	..	A	..	1	1	1	..	..	A	1	H	1	1
CRYPTOGRAMMA acrostichoides, <i>R. (alp.)</i>	..	..	..	1	..	..	..	..	1	C							
crispa, <i>Bernh.</i>	1	..	..	..	..	A	..	..	1	..	..	..	1				
STREPTOPTERIS Germanica, <i>L.</i>	1	..	..	..	..	A	1	1	..	1							
BLECHNUM Spicant, <i>L.</i>	1	..	..	..	..	A	..	..	1	..	..	..	1				
ASPLENIUM Filix-femina, <i>L.</i>	1	..	..	..	..	A	1	1	1	1	..	..	A	..	1		
Ruta-muraria, <i>L.</i>	1	..	..	..	..	A	..	..	..	1	..	..	1	..	1		
viride, <i>L. (alp.)</i>	1	..	..	..	A	A	..	..	..	R	..	..	1				
crenulatum, <i>Fr.</i>	1	..	..	..	..	N	1	1	..	..	..	..	
Aspidium erenatum, <i>Somf.</i>	..	..	..	..	..	..	..	..	..	..	..	..
BOTRYCHIUM Lunaria, <i>L.</i>	1	..	..	..	1	A	1	1	..	1	..	1	1	..	H	..	1
Virginianum, <i>Sw.</i>	1	..	..	..	S	N	1	..	1	1	..	..	..	..	H	1	1
OPHIOGLOSSUM vulgatum, <i>L.</i>	1	..	..	..	..	A	..	..	..	1	..	1	1	1	H	1	1
LXXII. Lycopodiaceæ.																	
LYCOPodium Selago, <i>L.</i>	1S	1	1	1	1	A	1	1	1	1	..	..	1	..	1	1	1
annotinum, <i>L.</i>	1	..	1	..	1	A	1	1	1	1	..	..	1	..	1	..	1
clavatum, <i>L.</i>	1	..	..	..	S	A	1	1	1	1	..	..	1	1	H	1	1
complanatum, <i>L.</i>	1	1	..	..	..	A	1	1	1	1	..	..	1				
selaginoides, <i>L.</i>	1	..	..	..	S	A	1	1	..	1	..	..	..	..	H		
alpinum, <i>L.</i>	1	..	..	..	S	A	1	..	..	R	..	..	1	..	H	1	
ISOETES lacustris, <i>L.</i>	1	..	..	..	S	A	..	..	..	1							
LXXIII. Equisetaceæ.																	
EQUISETUM palustre, <i>L.</i>	1	..	1	1	..	A	1	..	..	..	..	..	1	..	1		
variegatum, <i>L.</i>	1	..	?	?	1	A	1	1	..	1	..	..	A	..			
arvense, <i>L.</i>	1S	1	1	1	1	A	1	1	1	1	..	..	1				
sylvaticum, <i>L.</i>	1	..	1	..	1	A	1	1	..	1	..	..	1				
pratense, <i>Ehr.</i>	1	..	..	..	..	A	..	1	..	1	..	..	1				
limosum, <i>L.</i>	1	..	..	..	..	A	1	1	..	1	..	..	1				
hiemale, <i>L.</i>	1	..	..	..	..	A	1	1	1	1	..	..	A				
scirpoides, <i>Mich.</i>	1	1	1	1	1	N	1	1	1	1	..	..			

ADDENDUM.

ASTRAGALUS polaris, Bth., Arctic West America. See "Observations on the Species," at p. 323.

Observations on the Species.

In the preceding table I have attempted to group the arctic plants under comprehensive forms, founded on a careful study of the plants indicated by the names quoted: this I first did with as little reference as possible to the labours of others,—endeavouring, as far as was in my power, to suppress my preconceived ideas, whether original or adopted. Having thus arrived at the nearest possible approach to independent conclusions, when I compared my work with the descriptive Floras which I have elsewhere indicated as forming the basis of the Systematic Catalogue, I was surprised to find how many authors have directly or indirectly arrived at the same conclusions as myself with regard to the specific limits of the plants indicated. In some instances such revision corrected my previous views; but in by far the most numerous cases the summing up of this authoritative evidence afforded extraneous reasons for abiding by my own conclusions. The following notes are intended both to give these extraneous reasons, and to show to how much greater an extent than is generally supposed, the most able and experienced descriptive botanists vary in their estimate of the value of the “specific term” as applied to many of the commonest plants of the best-known countries. From the results of this and other most perplexing and laborious comparisons of the labours and opinions of the authors of many local and general Floras, I think I may safely affirm that the *specific term* has three different standard values, all current in descriptive botany, but each more or less confined to one class of observers, though more or less variable with all. With the general botanist it is a comprehensive term, and becomes more so with age and experience; with the monographer of large and widely diffused natural orders or genera its standard is contracted at first, but rapidly expands in successive revisions of his work; while the local botanist, or monographer of genera or orders with restricted ranges, begins with a rather broad standard, which rapidly contracts. This is no question of what is right or wrong as to the real value of the specific term. I believe each is right according to the standard he assumes as the specific; moreover, in the majority of cases all agree with regard to the absolute and undeniable distinctness of a moiety of the plants of every area*; all agree with regard to the permanent distinctiveness of many of the subspecies, varieties, &c. of the other or variable moiety; and all agree with regard to the propriety and importance of tracing the characters and ranges of varieties as carefully as of species. Still the questions remain—Should the specific term ever be arbitrary? and if so, should it be broad or narrow? I believe it must often be arbitrarily defined, and that it should be broad, because the object of botanical nomenclature is defeated by an undue multiplication of names necessary to be borne in mind by the general botanist, whose convenience ought first to be considered, and also because the multiplication of specific names will demand a corresponding increase of generic ones; moreover the daily discovery of intermediate forms, or new or closely allied forms, is introducing an incessant change in the nomenclature of narrowly defined species.

* See *Introd. Essay to Tasmanian Flora*, p. v, for some ideas as to the objective and subjective values of the characters of species, and the division thereby of all species into groups.

THALICTRUM. For observations on the Arctic Scandinavian forms of this genus, see Fries, *Summa Veg. Scand.* p. 135.

T. Kemense, Fr. When engaged on the 'Flora Indica,' Dr. Thomson and I made a very laborious investigation of this genus, referring the *T. Kemense* of Fries's 'Herb. Normale' to *T. majus*, Jacq., and further identifying it with the Himalayan *T. Maxwellii*, Royle, which also occasionally possesses stipellæ. Wahlenberg referred *T. Kemense* to *T. flavum*, β (fid. Ledebour and Ruprecht); and I have received from Dr. Andersson a specimen of *T. Kemense* that seems different from Fries's and to be identical with *T. simplex*, L., having the inflorescence of that plant, which is itself a form of *T. flavum*. Of Fries's *T. Kemense* I have fine specimens also from Alten, gathered by the late W. Christy, Esq., having rather larger leaves than those of the 'Herb. Normale.' Harvey ('Flora Capensis') has referred the only South-African *Thalictrum* to *T. minus* (*Caffrum*, E. & Z., and *gracile*, E. Meyer).

T. rariflorum, Fr. (*minus*, Fries, Herb. Norm.), appears to me almost identical in inflorescence with the *T. strictum*, Led. (*T. exaltatum*, C. A. M.), which, again, resembles few-flowered specimens of *T. flavum*, L. The 'Herb. Normale' specimen of *T. flavum*, marked "certiss." is undistinguishable from a Siberian one of Ledebour's marked "*exaltatum*, C. A. M." According to Nyman, the *T. rariflorum*, Fr., is the same as *T. Friesii*, Rupr., and *T. strictum-boreale* of Nylander. Fries does not regard the true *T. minus* of Linnæus as Lapponian.

ANEMONE *Nuttalliana*, DC. This is certainly identical with *A. patens*, L., and was so considered in *Flor. Bor.-Am.*, in Torrey and Gray's *Flora*, and in the first edition of A. Gray's *Manual*. In the second edition of this last work, however, A. Gray keeps it distinct, saying that it more resembles *A. pulsatilla* than *patens*: this must arise from misconception, as *pulsatilla* has pinnatisect foliage, and there is no difference whatever discernible between *Nuttalliana* and *patens*, of both which I have compared large suites of specimens in all states.

A. VahlII, Horn. (*Flor. Dan.* t. 2176), a Greenland plant, is referred by Lange to *A. Richardsoni*.

A. alpina, L. I have seen but one Arctic American specimen; it is much stunted. This species has not been found east of the Caucasus in the Old World, though it is not uncommon in North America on both sides of the Rocky Mountains.

RANUNCULUS *confervoides*, Fr. This slender form of the protean *R. aquatilis* is the only one found within the arctic circle; it is the *R. aquatilis* β . *pantothrix* of Ledebour, and, I think, also the *R. aquatilis* β . *heterophyllus*, Fr., of Babington's 'Iceland Plants.' My Greenland, Iceland, and Lapponian specimens seem to accord well; but Durand ('Kane's Voyage,' Appendix) calls the Greenland plant "var. *arcticus*," and states that it is the "*hederaceo-proximus*" of Gieseke, having a great affinity with *hederaceus*, Lam., non Linn.

R. Chamissonis, Schl., according to authentic specimens, appears to be the same with *R. glacialis*, L. The distribution of *glacialis* is peculiar, it having been found in East Greenland by the earliest and by all subsequent voyagers, but never on the Baffin's

Bay side (where it occurs in very high latitudes only) till Kane's Expedition, when it was brought from North Proven, lat. 72° N.

R. Flammula, L., and *reptans*, L., are both arctic plants, the latter the more so. Fries keeps these distinct, as do Torrey and Gray and others, and Koch, in his *Addenda et Emendanda*, because of the short-beaked achenium of *reptans*: in the body of his 'Flora' he made it var. β of *Flammula*, as do Bentham and various other authors. I find the beak of the fruit of *Flammula* to be very variable and often quite undistinguishable from that of *reptans*. There is a United States plant very like *Flammula*, but with a much more slender beak than the European plant, which is called *R. Flammula* by American authors.

R. affinis, Br. Ledebour unites this with his *R. amœnus*. I have no hesitation in referring both to *auricomus*, L.

R. frigidus, DC., and *R. Eschscholtzii*, Schl., seem to me inseparable from *nivalis*. *R. sulfureus*, Sol., is more distinct, and kept separate by Fries, but is referred to *nivalis* β by Ledebour: it is one of the most arctic plants known, and certainly passes into *nivalis*.

R. polyanthemus, L. It is so difficult to distinguish herbarium specimens of this from *R. acris*, L., that I am not sure I have got its full distribution, for which I have relied on authentic book sources. *R. nemorosus* is usually combined with it.

R. glabriusculus, Rupr. Fl. Sam., is an imperfectly described plant, referred doubtfully to *R. acris*. No allusion is made in the author's description to the peduncle, which is figured like that of *acris*; but the receptacle is described as glabrous. It was, further, found with *acris* at the Gulf of Indega, east of the mouth of the White Sea. The *acris* β . *humilis*, Wahl., is also, according to Ruprecht, common on the Samoied shores of the same sea, and in the arctic Island of Kolgужew.

R. pygmæus, Wahl. A high-arctic species, best known from *hyperboreus*, with which it is united in 'Flora Indica,' by wanting the creeping flagelliform stems. The Tyrol is the only European habitat south of Scandinavia. The *R. Sabinii*, which I have placed with it, is so named authentically, but does not differ from *pygmæus*; it is, however, one of those extremely reduced forms whose origin can only be ascertained by examining an extensive suite of specimens. Of the *R. Samojedarum*, Rupr., I have seen no specimen; it is an imperfectly described plant, found in the Island of Kolgужew at the mouth of the White Sea, and described as being very nearly related to *R. Purshii*.

R. hyperboreus, Rottb. Of this, which is a Greenland, European, and Siberian plant, I have seen no Arctic American specimen; all so called hitherto are, I think, referable to *pygmæus*. The *R. Gmelini*, referred to *hyperboreus* in Flor. Bor.-Am., is reduced to *Purshii* by Ledebour.

CALTHA palustris, L. The prevalent opinion amongst botanists is to unite as varieties all the names I have placed under this. The true *palustris* itself inhabits the extreme north (Island of Kolgужew, Rupr.). *C. natans*, L., is a floating plant affecting high latitudes only. *C. radicans* and *C. arctica* are probably synonyms, the yellow colour of the persistent sepals being discharged after flowering. Watson regards *C. radicans* as certainly a reduced form; Nyman makes it distinct, giving Scotland as its habitat, but says of *C. palustris*, "species ut videtur collectiva"; Fries makes it a variety found in Lap-

land; Bentham would unite them all. The absence of any form in Greenland is a most remarkable fact, the common one being most abundant and conspicuous in Iceland.

DELPHINIUM Middendorffii. Trautvetter, the author of this species, indicates its affinity with *Menziesii*, but does not appear to have compared it with that plant, which, judging from the figure of Trautvetter, may not be distinguished. Whether *D. Menziesii* itself may not be the same with some better-known species, is a question for future determination.

D. intermedium, Ait., is *elatum* β , Turc. (Fl. Baik. Dahur.).

AQUILEGIA Canadensis, L. The very close affinity and probable identity of *A. Canadensis*, L., and *A. formosa*, Fisch., is indicated in the 'Flora Indica;' and on re-examination, with more specimens of the former to compare, I find no reason for modifying that conclusion.

A. brevistylis, Hook. Originally doubtfully referred by Richardson to *A. vulgaris*, L.; the styles, however, which are somewhat variable in the European plant, are always much shorter in the American. It is a very northern species in America, and not hitherto known west of the Rocky Mountains, though I have seen specimens of a Sitka plant, in an indifferent state, which is a great deal like it. It is also allied to the Siberian *A. parviflora*, Led.

ACTÆA spicata, L. The *A. rubra*, Willd., is referred to *nigra* by Fries, both being Lapponian. Asa Gray (in litt.) combines with them *A. alba*, Big., and *arguta*, Nutt.

PAPAVER nudicaule is now almost universally regarded as specifically the same with *alpinum*, L.

FUMARIA officinalis, L., occurs sporadically throughout Nordland, according to Fries and Andersson, but can hardly, I think, be considered an indigenous plant.

NUPHAR lutea, L. This, together with the species enumerated under it, and *N. advena*, Ait., are, perhaps, rather forms of one collective or aggregate species than permanent undistinguishable plants; and it is further possible that the *N. sagittifolia*, Pursh, may be another state, in which the early sagittate form of leaf is retained in the adult plant. Torrey and Gray refer *Kalmiana* to *lutea* β , and say of *advena* that it is not specifically distinct. Asa Gray latterly keeps up *advena* and *Kalmiana*, but adds to the latter *N. intermedia*, Led.? Nyman and Ledebour keep all distinct. Watson, from his notes under *pumila*, seems to regard it with doubt. Fries keeps *lutea* and *pumila* distinct, but regards *intermedia*, Led., as a variety of *lutea*, and adds as a Lapland variety to *pumila* the *Spenneriana*, Gaud. Lastly, Koch keeps *lutea*, *pumila*, and *Spenneriana*, all distinct; and Bentham unites the two first together with *intermedia* and *minima* of Engl. Bot.

BARBAREA vulgaris, Br. This, again, is either a collective species or several species variously discriminated. Fries distinguishes *stricta*, Fr., *vulgaris*, Br. (including under it as a variety *arcuata*, Reich.), and *præcox*, Sm. Nyman excludes *præcox*, Br., from Scandinavia, and reduces *præcox*, Sm., to *arcuata*. Watson finds himself compelled to

treat the distribution of *vulgaris*, Br., *stricta*, Andrz., and *arcuata* Reich., in connexion. A. Gray considers the American *stricta* and *arcuata* as varieties of *vulgaris*. Bentham says that *B. vulgaris*, *præcox*, and *stricta* pass through every gradation into one another. Another element of confusion in this group is the doubtful origin of the common pot-herb *B. præcox*. Watson treats it as an alien. Torrey and Gray, on the other hand, describe it as a native of Canada, ascending to 68° N., though perhaps *stricta* is here meant, for A. Gray latterly refers *præcox* of Fl. Bor.-Am. to *vulgaris*, var. *stricta*, and rightly as far as the specimens I have examined go to show. Fries remarks (Summa, p. 146) that Smith's original *præcox* (Flora Britannica) is a cultivated *arcuata*, the English Botany plant being different (thus accounting for Nyman's conclusions above stated). My North Indian and Himalayan Barbareas are, again, generally referable to the European forms, though scarcely characteristic of them. I long endeavoured to keep the Australian and New Zealand form distinct; but neither Bentham nor Mueller regard it as different from *vulgaris*, with which undoubted wild specimens from the Australian Alps well accord.

TURRITIS *patula*, Graham, and *retrofracta*, Hook., are, I think, identical with *T. mollis*, Hook. The *Arabis Holböllii*, Horn., is another synonym. There are certainly differences in the length and breadth of the pod in both *patula* and *retrofracta*; but these do not at all indicate the seeds being in one or two rows, which is a very variable character in both. *Arabis Holböllii* is identified with *A. retrofracta*, Grah., by Lange.

ARABIS *lyrata*, DC. This, which is the *Sisymbrium humifusum*, J. Vahl, and *Arabis sisymbrioides*, Hook., differs according to descriptions from *A. petræa*, Lamk., in the rather oblique radicle of the embryo, and biennial root (Torrey and Gray, i. 80, 81), neither of which characters appear to me to hold good in the rather numerous specimens I have examined, the radicle being in both variable as to direction, and the roots identical. In habit and every other respect, the plants entirely accord, as far as herbarium specimens allow me to judge. According to Fries, *A. petræa* is not a native of Lapland; nor does Ledebour give any European or Asiatic arctic habitat for it; it is, however, common in Finland, Scandinavia, Iceland, and N. Britain. Fries includes *A. ambigua*, DC., under it, a plant kept distinct by Ledebour and by Torrey and Gray.

CARDAMINE *bellidifolia*, L. I have sometimes been almost disposed to suspect that this may be an arctic form of *hirsuta*, to which it certainly is very closely allied, and to which it tends through *microphylla*, Willd. *C. Lenensis* is identical with *bellidifolia*, and is var. *Lenensis*, Trautv. (Florula Taimyr.).

C. hirsuta, L. This, though a common Icelandic plant, and one that crosses the circle in America, does not occur in Scandinavia north of Gothland and Finland. The *C. sylvatica*, Link, is distinguished by its six stamens, spreading pedicels, and style as long as the siliqua is broad,—all variable characters, except that of the stamens. In the southern hemisphere and elsewhere *C. hirsuta* is hexandrous. Watson finds no difficulty in distinguishing these as wild plants in England, but considers *sylvatica* a doubtful species, adding that the distinctions are less decided under cultivation. Bentham considers *sylvatica* to be a large luxuriant hexandrous form of *hirsuta*.

C. digitata, Rich. I have examined a large suite of excellent flowering specimens of

this plant, in which state it differs in no respect from *pratensis*. I have not seen the fruit, however.

C. umbrosa, DC., is referred by Fries to a variety of *amara*, L.; both are Lapponian.

EUTREMA arenicola, Hook. I have examined this plant very carefully; it is certainly not a *Eutrema*. In the few specimens known to me the radicle is slightly oblique. Turczaninoff (in Herb. Hook.) suspects that it may be his *E. piliferum* (*Draba grandiflora*, C. A. M.; *Pachyneurum grandiflorum*, Bunge; *Braya Meyeri*, Bge.; *Parrya microcarpa*, Led.); but I find no traces of the peculiar hairs of this plant in the *P. arenicola*. Richardson observes that it ranges from 107°–150° W. I have seen no specimens but his own.

VESICARIA arctica, Rich. Planchon, who has examined the specimens in the Hookerian Herbarium with a great deal of care, confirms the identification of the Chilean plant with the arctic. It is singular that this plant should be found as far north as 81° in Greenland, but not amongst the Polar American Islands.

DRABA. Of all the arctic genera, none but *Salix* present so many difficulties as *Draba*. Whether by variation, or hybridization, or other unknown cause, the prevalent forms seem, wherever they grow, to pass into one another by insensible gradations; and no botanist has succeeded in bringing the arctic stunted varieties within such specific limits as to have gained the assent of others. No doubt many are, in their arrested condition of growth, absolutely undistinguishable in the present state of science; and whoever attempts their discrimination must expect to change his opinion somewhat at every re-examination. I am fortunate in having Mr. Ball's advice upon some of the European species, which he has studied with great care, and have followed his opinion in the naming and grouping the arctic ones; unfortunately, however, he has not completed his study of the genus, nor of all the species here enumerated; so that the geographical data are approximate only; nor does he speak with implicit confidence of their synonymy. In addition to the excellent critical notes he has published in the Bulletin of the Botanical Society of Paris (vol. vii. pp. 227 & 247), I have from him the following provisional grouping of the commoner forms:—

1. *D. androsacea*, Wahl., 1812, an Willd. ?
D. Wahlenbergii, Hartm. 1820. *D. Lapponica*, DC. Syst., an Willd. ? *D. nivalis*, DC., non Lilj.
2. *D. Fladnitzensis*, Wulf., Jacq. Misc.
D. lactea, Adams. ? *D. Carinthiaca*, Hoppe. *D. crassifolia*, Grah.
3. *D. muricella*, Wahl.
D. nivalis, Lilj., non DC.
4. *D. rupestris*, Br.
D. Altaica, Bge.
5. *D. hirta*, L.
D. Dovrensis, Fr. *D. arctica*, Vahl.
6. *D. incana*, L.
D. contorta, Ehr. *D. confusa*, Ehr. & DC. *D. Thomasii*, Koch.

Of these, Mr. Ball is disposed to unite 1 and 2, and also 4, 5, and 6, making but three species in the above group, but distinguishing six sufficiently well-marked forms.

D. muricella is in Europe confined to Scandinavia; neither *D. hirta* nor *rupestris* are found in the Alps.

DRABA alpina, L. Regarding the numerous plants here brought together I have the following notes:—

D. algida, Ad., according to specimens from Ledebour and Bunge, differs in no respect from *D. alpina*.

D. pilosa, DC., is reduced to a synonym of *D. algida* by Ledebour. I have no authentic specimens of it.

D. aspera, Adams, is placed by Ledebour in the section *Aizoopsis*, the species of which are eminently southern and oriental; that author, however, had not seen the plant, and overlooks the fact of the distinguishing characters given by Adams being those of *D. alpina*.

D. Adamsii, Led. (*lasiocarpa*, Adams), is described as differing from *D. alpina* in the pubescent pods, stellate hairs of leaves and scape, and small flowers; but the pods of *alpina* are glabrous or pilose, and the other characters equally inconstant.

D. glacialis, Adams. Of this there are five varieties described in 'Flora Boreali-Americana.' It should be distinguished by the costa prominent in the under surface of the leaf; but amongst a vast suite of specimens thus named I find the prominence of the costa to depend on the development of the leaf, and no characters that would serve to include those so distinguished, even as a permanent variety of *alpina*, L. Durand (Kane's Voy.) keeps *glacialis* β distinct.

D. pauciflora, Br. This was proposed by Brown as a doubtful species from Melville Island; and I find, amongst starved specimens of *D. alpina* from that island, some that may be the plant that Brown alluded to.

D. micropetala, Hook. This appears to me, without doubt, to be a starved form of *alpina*. It occurs only in very high northern latitudes, amongst the polar islands. Durand (Kane's Voy.) makes of it *D. alpina*, var. *micropetala*.

D. trichella, Fr. Mr. Ball considers this to be probably a form of *alpina*.

DRABA androsacea, Wahl. (*Lapponica*, DC. an Willd.?). This is a white-flowered species presenting as many puzzling forms as *D. alpina*, besides appearing to pass by insensible grades into *hirta*, *rupestris*, and *muricella*. Nor is it always possible to distinguish *androsacea* from *alpina* in a dried state, nor when the flowers of the former are bleached or vary to whitish, which they occasionally do both in the arctic circle and Himalaya. Of this plant *D. Wahlenbergii*, Hart., and *lactea*, Adams, are now generally acknowledged synonyms, as is *D. nivalis*, DC., non Lilj.

D. crassifolia, Grah., has been referred by Mr. Ball (in Herb. Hook.) to *lactea*, Ad. (*Fladnitzensis*, Wulf), and certainly rightly. The yellow-flowered plant figured in 'Flora Danica' is referable to *alpina*, L.

D. Martinsiana, J. Gay. Of this species I know nothing accurately.

D. oligosperma, Hook., is not different, I think, from the specimens marked *Fladnitzensis* from the Alps and Altai, and, further, is certainly a small form of *androsacea*, with

Pods short, elliptical, sharp at both ends, and few seeds. It is, on the other hand, very near *muricella* and *rupestris*, and to small forms of *hirta*. I have it both from the Rocky Mountains and Lapland.

D. corymbosa, Br. Durand doubtfully refers this to his var. *corymbosa* of *alpina* (= *alpina* δ , Hook.). The figure of the Greenland plant in 'Flora Danica' appears to belong to a common arctic form of *androsacea*.

DRABA *muricella*, Wahl. This Mr. Ball distinguishes from *D. stellata*, Jacq., which is nowhere found in the arctic regions. *D. muricella*, Wahl., on the other hand, has not been found in Middle or Southern Europe. It is the *D. nivalis*, Lilj., non DC. Durand (Kane's Voyage) refers the *D. rupestris*, var. β , of Torrey and Gray to *nivalis*, Willd., apparently from description only.

DRABA *stellata*, Jacq., non DC. Mr. Ball is my authority for including *D. Johannis*, Host.

DRABA *hirta*, L. I have Mr. Ball's authority for including *Dovreensis*, Fr., and *arctica*, Vahl, under this plant. I have no confidence in its permanent distinction from *D. incana*. It is usually a much less leafy plant, with longer pedicels in comparison to the pods.

D. oblongata, Br., is apparently founded on a small specimen of *D. hirta*.

DRABA *incana*, L. *D. contorta*, Ehr., and *confusa*, Ehr., are now generally considered to be forms of this; and I find them to be scarcely distinguishable as varieties.

D. Magellanica, Lamk. I have already ('Flor. Antarct.' ii. p. 233) referred this to *incana*; and a fresh series of specimens, received since that time, not only confirm this opinion, but incline me to regard *D. Falklandica*, mihi, as a mere stunted form.

D. borealis, DC. I have examined two specimens of this, communicated by Prof. Fischer; and it appears to be nothing but a rather luxuriantly leafy form of *D. incana*; the specimens have not ripe fruit, however.

DRABA *rupestris*, Br. It is extremely difficult to distinguish this from small states of *lactea*, *hirta*, and *incana*, and in some cases from *D. muricella*. *D. Altaica*, Bunge, is clearly a synonym. Durand refers here the *D. hirta*, E. Bot., and *hirta*, var. 4, of Fl. Bor.-Am. Bentham refers the British *rupestris* to *hirta*.

DRABA *aurea*, Vahl. This is a very puzzling plant, so like in its normal state to *D. incana*, that I do not see how these plants can be distinguished, except by the colour of the flower, which, again, apparently varies to white. I am not aware of any yellow-flowered *Draba* with the habit of *incana* being found, except in Labrador, Greenland, and the Rocky Mountains.

COCHLEARIA. This has always proved to me to be one of the most intractable boreal genera; and I do not believe that the common littoral forms are always defineable specifically. Habit, pods, and leaves afford the characters hitherto made use of; and all are equally fallacious, as far as affording permanent distinctions.

Ruprecht, speaking of the Samoied forms (Flor. Samoied. p. 21) says of *C. Wahlenbergii*, Rup. (*anglica*, Wahl., non L.), *C. oblongifolia*, DC., *C. arctica*, DC., *C. fenestrata*, Br., *C. Danica*, L., "Quod reliquum est, vereor, ne *Cochleariæ omnes hic enumeratæ ad*

unam speciem pertineant valde variabilem; interim tamen formas distinguere necesse fuit."

In endeavouring to dispose of the arctic forms of this genus I have found myself obliged to return to the old species and definitions of Linnæus, who, as it appears to me, had a definite idea of the following four prevalent forms:—

C. officinalis, with cordate subrotund radical leaves, and oblong subsinuate cauline;

C. Danica, with hastate, angular, deltoid, petioled leaves;

C. Anglica, with all the leaves ovate lanceolate;

C. Grænlantica, with reniform, fleshy, quite entire leaves (generally small).

Of these I find *Grænlantica* so often passing directly into *officinalis*, both in America and Europe, that I have brought them together; the others are more distinguishable prevalent forms, though all pass into one another.

COCHLEARIA sisymbrioides, DC. This is much more distinct from any of the other arctic forms than the most distinct of these latter are from one another. I know of no other which at all approaches it, though the perfectly flat pod, so opposed to the prevalent generic character, may be found in states of *C. officinalis*.

COCHLEARIA Danica, L. This, in its typical form of a small slender spreading plant, with hastate, petioled, small leaves, is by far the most distinct of the group to which it belongs. It is found on all the northern coasts of Europe as far south as Brittany and Normandy, and suddenly reappears in its typical state in the Pyrenees. According to Fries it does not inhabit Lapland.

COCHLEARIA Anglica, L. Watson confesses his difficulty in always distinguishing this, which to him appears to pass on one hand into *Danica*, and on the other into *officinalis*. In Western Europe it is common as far south as the Channel, but does not extend beyond Boulogne (Gren. & Godr.). Durand appears to restrict this in Greenland to a form with elliptical pods and fenestrate septa.

C. oblongifolia, DC. Ruprecht, *l. c.*, observes that the form with elliptic silicles occurs almost everywhere on the Samoied beaches; that with globose pods only at Cape Konuschin.

C. fenestrata, Br. Nyman ('Sylloge') includes this under *Wahlenbergii*, Rupr. Durand (Kane's Voy.) distinguishes it by its smaller size. Fries makes it a var. of *Anglica*, L.

COCHLEARIA officinalis, L. Nyman ('Sylloge,' p. 198) refers *C. Grænlantica*, L., and *Pyrenaica*, DC., to this. Watson ('Cybele') confines it to shore plants with globose silicles, doubtfully keeping distinct the mountain form *C. alpina*, Sweet?, *Grænlantica*, With.?, Sm. It is a common mountain plant in Northern Europe, occurring as far south as the Pyrenees and Carpathians, but it does not extend far down the French coast. It includes Wahlenberg's *officinalis* (*Wahlenbergii*, Rupr.), also *arctica*, *Lenensis*, and *fenestrata*, Br., though the latter name has, I suspect, been rather indiscriminately applied to other *Cochleariæ* with ruptured septa. Durand defines the Greenland form by its globose silicles.

C. arctica, DC. Of this, Ruprecht remarks that the Samoied specimens have entire or fenestrate septa, but that it differs from *C. fenestrata*, Br., in larger size ($\frac{1}{2}$ –1 foot) and distinctly-nerved siliquæ, from *C. Anglica* in the ellipsoid silicles (not subrotund),

which are longer than their pedicel, not twice as short. Fries retains *arctica*, Schlecht., as a species not yet sufficiently established.

C. Wahlenbergii, Rupr. (*Anglica*, Wahl., Fl. Lap., non L.). Ruprecht remarks of the Samoied plant that the leaves are almost those of *C. Danica*, L., but the siliquæ elliptic, the valves sometimes nerved, and much narrower than in true *Anglica*.

HESPERIS *Pallasii*, Torr. & Gray. Durand (Kane's Voy.) includes *H. minima*, T. & G., as well as *pygmæa*, Hk. In Greenland it has been found only in the extreme north, by Kane's Expedition, on Washington Land, lat. 81° N.

SISYMBRIUM *sophioides*, Fisch. This is nothing but an abnormal form of *S. Sophia*, L., with a remarkably corymbose inflorescence. It has hitherto been found only in high northern regions.

S. brachycarpum, Rich. This, which passes by insensible transitions into *S. canescens*, Nutt., which inhabits the same regions to the south, often approaches finely-cut-leaved states of *S. Sophia*.

S. salsugineum, Pall. I have carefully compared with this the *Turritis diffusa*, Hook., and have no doubt of their absolute identity.

ERYSIMUM *hieraciifolium*, L. Ruprecht (Fl. Sam.) refers this to *E. strictum*, Fl. Wett., and notices *E. cheiranthoides*, L., as occurring very close upon the arctic circle, almost at the termination of the woody region. I am quite unable to discriminate between these northern *Erysima* and their southern congeners, nor do I find any satisfactory characters for them in books. Fries does not consider either the true *hieraciifolium*, L., or *cheiranthoides* to be Lapponian; but *E. alpinum*, Sm., is so, and is ranked by him as an insufficiently established species. Nylander ('Flora Helsingfors,' 31) mentions *E. alpinum* as a form of *cheiranthoides*, and keeps *hieraciifolium* distinct. Some idea of the difficulty (impossibility?) of distinguishing these species may be obtained by reading Fries's notes ('Summa,' p. 148) and observing the synonyms quoted by Koch under *E. strictum*.

BRAYA *alpina*, Sternb. I think there can be no doubt that *B. glabella*, Rich., and *dubia*, Br., are both synonyms of *B. alpina*, Sternb., or, at the furthest, arctic forms of that plant. I am quite unable to distinguish them by any good characters. The pods are singularly variable in length and breadth, and, as with other arctic *Cruciferæ*, are apt to be arrested by cold in early states of development, and hence to assume at later periods various forms, depending on subsequent accessions of heat and moisture.

BRAYA *rosea*, Bunge. I have retained this species, though I extremely doubt its distinctness from *B. alpina*. The Arctic European habitat is introduced on the faith of Nyman's 'Sylloge,' who quotes Bunge (Cat. Sem. Dorp., anni 1839) for its being a native of Arctic Russia (Samojed.); but I do not find any of the genus in Ruprecht's Flor. Samojed. Cisural. (1845).

BRAYA *pilosa*, Hook. I have repeatedly examined this form very carefully, and, though undoubtedly very near *B. alpina* in general appearance, I am unable to identify it with any state of that plant.

THLASPI montanum, L. I am quite unable to satisfy myself about the specific limits of this plant, and indeed of many other forms of the genus, whose species appear to be extravagantly multiplied. Belgium is its northern limit in Europe, whereas *T. alpestre*, to which the American plant may belong, reaches Gothland.

LEPIDIUM ruderale, L. This widely-spread plant advances beyond the arctic circle in North-eastern America, but apparently not in West America or Europe. It is so frequently an introduced plant, that it is difficult to assign its indigenous limits.

SUBULARIA aquatica, L., though apparently not a native of the Alps, is found in the Pyrenees.

VIOLA palustris, L. According to Fries, the typical plant of this name is rare and local in Lapland. Asa Gray identifies the White Mountain plant with it; and it is also found in Southern Greenland. It is absent in Arctic Russia.

V. epipsila, Led. Fries, in his 'Novitiæ,' makes this a variety of *palustris*; and in his 'Summa Veg. Scand.' it is regarded as a species found throughout Lapland. Koch keeps it distinct, but has never seen living specimens. Ruprecht (Flor. Samojed. Cisural.) mentions a variety *hyperborea*, in which the sepals are narrower and sharper than in the typical states, and the peduncles and petioles more slender. In the interior of the arctic Island of Kolgужew it is very rare, and has glabrous leaves.

V. blanda, Wahl. I am doubtful about the specific distinctness of this plant. It closely resembles *V. palustris*; and A. Gray keeps it distinct, but his differential characters appear very trifling. In 'Flora Bor.-Am.' the flowers of the two are said to present "the most perfect agreement." In 'Bot. Beechey's Voy.,' *V. blanda* is said to inhabit Kotzebue's Sound; and Ledebour, who has seen specimens, retains it with a query, and says that, though allied to *V. palustris* and *epipsila*, it differs in habit, smaller flowers, and approximate nodes of the root. Seemann does not include it in his Flora of Western Eskimo-land. The *blanda* is said to be fragrant. *V. uliginosa*, Schrad., is another species which is so excessively close to *palustris* as to be with difficulty distinguishable.

V. microceras, Rupr., is founded on a solitary specimen from the shores of Kolgужew Island; its author says of it, "facies tota *V. palustris*, sed folia margine et pagina superiore (non inferiore) pubescentia; sepala linearia, acuta, margine rigide ciliata, serrata."

VIOLA canina, L. The various forms and near allies of this plant are sources of infinite diversity of opinion amongst botanists; added to which, regarding *canina* and its allies as a group designated *Sylvestres* by Fries, they seem to inosculate in many points with another and different one, the *Prätenses*, Fries. Thus it is not difficult to unite *canina* with *Ruppii* and *stagnina*, through the forms of what is often called *lactea*. Watson has some excellent remarks on these forms; he includes *lactea*, Sm., under *flavicornis*, and keeps it doubtfully distinct from *canina*. Fries considers *montana*, L., a distinct variety only of *canina*, and gives all Lapland as the habitat for both, whereas *arenaria* and *sylvatica*, though also Lapponian, are more local: in his 'Novitiæ' he makes *sylvestris*, Lam., a variety of *canina*, as does De Gingins in DeCandolle's 'Prodromus.' Koch makes both

Ruppii and *montana* varieties of *canina*. Babington, in Henfrey's 'Bot. Gazette,' 1850, p. 141, roughly discriminates three British forms:—*sylvatica*, Fr., 'Herb. Norm.' (*canina* β , Fries, Novit. 272; *sylvestris*, Koch, non Lam.); *canina*, Linn. (*sylvestris*, Lam.), with a var. β including *lactea*, Sm.; and *stagnina*, Kit. (*persicæfolia*, Fr.; *lactea*, Reich.), which I do not find quoted in any Arctic Flora, and so have not entered in my list of names.

V. arenaria, DC., is very closely allied to *canina*; and though distinct in appearance, it is difficult to find any good characters. Bentham quotes both *lactea* and *sylvatica* as varieties under *canina*.

V. Muhlenbergii, Torrey (*Muhlenbergiana*, Ging.). Torrey and Gray remark how very near this is to *canina*; and in the 'Flora Boreali-Americana' the difficulty of pointing out diagnostic characters is admitted; it is, however, kept up by all authors, and is no doubt a permanently but slightly altered form. It is found in Greenland.

V. bicolor, Pursh, is regarded by the American botanists as a variety of *arvensis*, DC., itself a form of *V. tricolor*; to me it appears to be a permanently distinct plant, though having but feeble diagnostic characters. Both *tricolor* and *arvensis* are Arctic European and Siberian; but *bicolor* alone is American, and found only to the eastward of the Rocky Mountains.

DIANTHUS *repens*, Willd. This, which is not Scandinavian, appears to me nothing but an arctic form of *alpina*, L. Both are arctic.

D. dentosus, Fisch., appears the same with *D. Seguieri*, Vill., or so nearly allied that it is difficult to distinguish them. Neither are natives of Scandinavia.

SILENE *inflata*, L., and *S. maritima*, L. I have kept these forms apart, though they are united by many authors (Bentham included). In the arctic regions they are distinguishable. *S. maritima* has not been found on the Pacific coasts, though *S. inflata* occurs in N. E. Asia? Watson observes that, on the coast of Britain, some forms of *maritima* become so very like those of *inflata* as to be hardly distinguishable.

S. paucifolia, Ledeb., from the shores of the Arctic Ocean, is unknown to me; it is a plant of Pallas, and evidently very near, if not identical with *S. inflata*.

LYCHNIS *apetala*, L. I have no hesitation in saying that no satisfactory limits can be assigned to the six forms ranged under this name. In the Himalaya, where it is abundant at great elevations (*macrorhiza* and *cuneifolia*, Royle), I have observed it to be singularly variable in most or all of those characters which have been employed to separate its forms in other countries. Durand (Kane's Voyage, Appendix) finds the characters of *pauciflora* Fisch., and *uniflora*, Led., to be present in Greenland specimens. Fries keeps *apetala* and *affinis* distinct, the former being found throughout Lapland, the latter rare; he distinguishes *affinis* by its flowers, erect at period of expansion, and obovate angular (not reniform) seeds.

L. sylvestris, Schkr., is *doica* α of Linnæus, and *diurna*, Sibth. *L. pratensis*, Spr., is *dioica* β , L., and *vespertina*, Sibth. Bentham keeps them distinct.

SAGINA *cæspitosa*, J. Vahl, is *Arenaria cæspitosa*, Fl. Dan. 2289, according to Lange.

S. intermedia, Fenzl in Rupr. Flor. Samoied., is the same with *nivalis*, Fr.

S. saxatilis, Wimm., is the same with *Linnæi*, Presl, and approaches very closely both

to *S. nivalis* and *procumbens*. Bentham unites with it *S. subulata*, Wimm. (*procumbens* β , L.).

ARENARIA nardifolia, Led. This and *A. formosa* are considered varieties of one by Fenzl (Led. Fl. Ross.). Torrey and Gray remark that the Arctic American plant figured in 'Flor. Bor.-Am.' does not accord well with Ledebour's. To me they appear both to resemble very closely *A. lychnidea*, M. Bieb, a Caucasian species; but very large suites of all these and their cognate species are required to arrive at any conclusion as to their limits. All the North Asiatic and American *Alsineæ* are in a most unsatisfactory state.

A. Lapponica, Spr., is reduced to *A. uliginosa*, by Fenzl in 'Flor. Ross.,' and both to *Alsine stricta*, Wahl.

A. Rossii, Br. This, which I find often confounded with *rubella* in Arctic Herbaria, may prove to be a polar state of *A. uliginosa*, Schl.; it has been found in very high latitudes only.

A. stricta, Mich., is *A. (Alsine) Michauxii*, Fenzl, according to A. Gray (Bot. N. U. States).

A. verna, L. Under this name I have grouped four others, which represent as many arctic forms of this protean plant, and have all been reduced to it by Fenzl and other writers. Thus *hirta* and *propinqua* both come under *lusus* L. of Fenzl's var. β . *hirta*; *rubella* and *quadri-valvis* under var. θ . *glacialis*. Fries, however, distinguishes *rubella* specifically from *verna* by its habit, and rugulose, not granulate seeds. *A. Giesekii*, Horn. (Flor. Dan. 1518), is *rubella* γ of Lange.

A. Pumilio, Br., is reduced to *arctica*, Stev., β , by Torrey and Gray; but if correctly, I do not see how *arctica* is to be kept distinct from *biflora*, Wahl. Ledebour's *arctica* is indeed referred to *biflora* by Fenzl. According to Fenzl's descriptions (which do not however contrast), *arctica* is distinguished by the broader petals (sometimes narrower by deformity), and seeds "lævissimis fuscis," in opposition to "levissime rugulosis." But I find the seeds of the Lapland plant to be undistinguishable under any magnifying power from those of the American; and the petals are, as Fenzl's description states, excessively variable in both.

A. Norvegica, Gunn. Fries, who includes this under *A. ciliata* as a variety, or, perhaps, distinct species, assigns it a rather different range, *ciliata* being found in Lapland and N. Finland only; *Norvegica* in N. Norway and S. Lapland. *A. ciliata* alone is found in Arctic Russia, according to Ledebour's 'Flora;' but neither appear in Ruprecht's 'Samoied Flora.' Watson considers their distinctness to be questionable; and Bentham unites them.

A. Grænlandica, Spr. This has been found in Arctic Greenland by Kane's Expedition only, which brought it from Upernavik, lat. 73° N.

HONKENEJA peploides, Ehr. A doubtful native of Lapland according to Fries, who indicates a subspecies (*oblongifolia*, Torr. & Gray) as inhabiting that country.

STELLARIA crispa, Cham. Fenzl says of this, "A *S. boreali* vix distincta, facile tamen distinguenda." I am at a loss to distinguish it, either by specimens or book characters. According to Fries, *borealis* is rare in Lapland, but its var. *calycantha* is common throughout that country. Planchon, who has studied the genus very carefully, points out (Herb.

Hook.) that the *borealis* γ of 'Fl. Bor.-Am.' is the same with *gracilis*, Rich., *l. c.*, and a plant of Drummond's, called *Larbreia aquatica*, and further that all are referable to *S. umbellata*, Turc.

S. longipes, Goldie. Of the plants brought under this name, *S. læta*, Rich., and *Edward-sii*, Br., are all but universally considered to be identical or states. Of Bunge's *S. peduncularis* being the same, there can I think be little question. Of *S. hebecalyx*, Fenzl, and *ciliatosepala*, Trautv., I have seen no authentic specimens; but, judging from the drawings and descriptions, and from specimens in the Herbarium from Labrador, displaying similar characters, I have no doubt of these also being mere varieties. Fenzl says that *hebecalyx* is intermediate between a variety of *longipes* and *Dahurica* β . Planchon (in Herb. Hook.) refers *Dahurica* to *longipes* doubtfully; and Turczaninoff (fid. Rupr. Fl. Sam.) regards *Dahurica* β 2 of Fenzl as the same with *glauca*, L. The smooth testa of the seed, however, distinguishes all the forms of *longipes*. Durand (Kanc's Voy.) refers *S. stricta*, Rich., to *longipes* β . *minor* and δ . *læta*. Planchon (Herb. Hook.) further refers *S. imbricata*, Bunge, *alpestris*, Turc., and *Fischeriana*, Ser., to *longipes*, and, I think, rightly. The *S. glauca* of Greenland (Lyll's plants, nob. in Linn. Journ. vol. i. p. 116) is a state of this plant.

S. longifolia, Fries. A very confusing plant, whether as regards its synonymy or limits. I am quite unable to distinguish the European from the American form; both have a smooth testa, and seeds otherwise identical. Fries distinguishes them; and Koch ('Synops.' 131) says that *longifolia*, Muhl., is most certainly distinct, but gives no characters.

S. alpestris is regarded by Fries as a variety, and perhaps a distinct species; it approaches states of *uliginosa* in many characters; but the seeds are always smooth.

LEPIGONUM *salinum*, Fr. This should perhaps be regarded as a member of an aggregate species including *L. marinum*, Wahl., of which Babington considers it a variety, and *rubrum*, Wahl., plants which in their extreme forms differ widely, but seem united by innumerable variations; Bentham unites them.

CERASTIUM *Fischerianum*, Ser. Ruprecht includes a plant of this name, in 'Herb. Chamisso,' under *vulgatum*, and further doubts the possibility of distinguishing it from arctic forms of *C. arvense*. Fenzl (in 'Led. Fl. Ross.') reduces both this and *Beerianum* to *vulgatum*. Torrey and Gray, and, following these, Durand, refer *Fischerianum* to *alpinum*, and keep *Beerianum* distinct, but next to it in order.

C. arvense, L. Ruprecht gives the only arctic habitat for this, viz. the extreme forest-limit in Samoiedland, but he gives its var. β (*arvense*, *incanum*, Led.) as abundant in sandy places on the arctic Island of Kolgужew.

POLYGALA *vulgaris*, L. I hesitated long whether to amalgamate the distribution of this with the Siberian *P. comosa*, but have refrained.

ASTRAGALUS POLARIS, Benth.; glaber v. parce pubescens, caule breviter diffuso, stipulis postice concretis, foliolis 11-15 ovatis oblongisve retusis v. emarginato-bifidis, pedunculis folio subæqualibus apice 1-4-floris, calycis dentibus tubo paullo brevioribus, corolla calyce subtriplo longiore, carina alis vexilloque brevioribus, legumine sessili

inflato membranacco nigro-piloso calyce 3-4-plo longiore, sutura carinali haud intrusa.—G. B.

Hab. Eschscholtz Bay, in Kotzebue's Sound, *Seemann*.

In many respects similar, especially in habit, stipules, and form, to *A. alpinus*, L., but always more glabrous, with more deeply emarginate or almost bilobed leaflets, fewer flowers, longer calyx, narrower petals, shorter keel, almost sessile ovary, and widely different pod, which is broadly linear oblong, not pendent, inflated, fully an inch long, and rounded at the ends.

The introduction of a perfectly new and distinct arctic plant into the supplementary observations appended to this paper requires some notice here. I am indebted for it to Dr. Seemann, who pointed it out to me, on his return from the Fiji Islands (after the first part of this paper was printed), as a plant omitted in his Botany of the 'Voyage of the Herald,' and as that alluded to by him as *Oxytropis polaris* in the narrative of that voyage. It is so like *Astragalus alpinus*, that it had been mixed with specimens of that plant, which is abundant throughout Eskimo-land. I have sought in vain, through a very large suite of specimens of *A. alpinus* and *oroboides* (which it also in many respects resembles), for another specimen of *polaris*; it must therefore at present be considered as an addition (eighth) to the small list of peculiarly arctic plants mentioned at p. 258, and the sixth to the species peculiar to Arctic N. W. America enumerated at p. 267.

OXYTROPIS campestris, DC. Many names are included under this, which represent species, varieties, and synonyms in the opinions of different authors. Of these, *O. borealis*, DC., is referred (with *O. sordida*) to *campestris* by Ledebour. Of *O. Middendorffii*, Trautv., I have seen no authentic specimens; but Trautvetter's plate appears to identify it with a not uncommon form of the same plant.

O. sordida, Pers. The plant of Fries, 'Herb. Normale,' is undoubtedly referable to *campestris*; Ruprecht (Flor. Samojed.) goes at length into its characters, describes it as very near *O. campestris* ϵ . *verrucosa*, Led., from the Gulf of St. Lawrence. This latter, Ruprecht refers to *borealis*, DC., which differs from *campestris* "in the glandular verrucose parts, and calyx covered densely with black hairs,"—all very inconstant characters in arctic specimens. Nyman and Fries put *O. sordida* under *campestris*. Koch and Ledebour both regard it as a variety, β . *sordida*.

O. polaris, Seem., alluded to (but not described) in Seemann's 'Narrative of the Voyage of the Herald,' is founded in error. See *ASTRAGALUS polaris*, *suprà*.

O. arctica, Br. Ruprecht appears to refer the Arctic Siberian and Kotzebue Sound plant of this name to *O. sordida*. Ledebour refers Brown's *arctica* of Arctic America to a form of *Uralensis*. Torrey and Gray follow 'Flora Boreali-Americana,' in keeping it distinct, with the observation that it probably does not differ from *Uralensis*.

O. nigrescens, Fisch. This is certainly a very distinct and remarkable form; but I much doubt its permanent distinctness from *O. Uralensis*. In the 'Flora Boreali-Americana' it is regarded as probably very nearly allied to *arctica* (*Uralensis*).

SPIRÆA chamædrifolia, L. The only apparently Arctic European habitat which I find

recorded for this plant is the River Kolva in Samoiedland; but, the precise spot not being indicated by Ruprecht, it may not cross the arctic circle. Though a high northern species, it is not Scandinavian.

DRYAS integrifolia, Vahl, was originally considered a variety by Chamisso and Schlechtendal, but is kept distinct in 'Flora Boreali-Americana,' by Torrey and Gray, and Asa Gray. I have, however, vainly endeavoured to find any satisfactory characters for it; the only one of any consequence, derived from the outline, &c. of the leaf, is not only most inconstant, but presents every transition to *D. octopetala*. As, however, the most narrow- and entire-leaved forms have been found only in the extreme north, no doubt due to excessive cold, the occurrence of *integrifolia* on the White Mountains would, if confirmed, be a curious proof of the permanence in a local variety of the most variable of all characters—the development of the leaf. Peck is (according to Pursh) the authority for the United States locality, which wants confirmation.

GEUM strictum, Ait. This, though kept as a distinct species by Torrey and Gray and all authors, appears to differ from *G. urbanum* only in its stout form, and petals longer than the calyx; it is described by American authors as an extremely variable plant. There are other species that might equally well be included; but the whole genus wants working up.

SIEVERSIA humilis, Br. This is scarcely worthy of ranking as a variety of *S. Rossii*, to which it is reduced by Ledebour and Torrey and Gray.

RUBUS propinquus, Richardson, is *R. arcticus* γ of Torrey and Gray, distinguished by having flagelliform stems.

R. acaulis, Mich., is *R. arcticus* β , Torrey and Gray, and *R. pistillatus*, Smith.

R. castoreus, Læst. Fries keeps this distinct from *arcticus*, both being Lapponian. See many excellent remarks on all these species in his 'Summa Veg. Scand.' p. 169. Wahlberg makes this a bastard between *arcticus* and *saxatilis*, occurring under two forms.

R. triflorus, Hook. This Fries regards as a hybrid between *saxatilis* and *castoreus*, if I understand aright his system of symbols and nomenclature. Torrey and Gray regard it as a distinct species, as does Asa Gray. Michaux and Seringe both ranked it as a variety of *saxatilis*. As *castoreus* and the European form of *saxatilis* are not found together on the American continent, Fries's view of *triflorus* being a hybrid seems untenable.

POTENTILLA Pennsylvanica, L. Spain is the only European habitat for this plant. *P. rubricaulis*, Lehm., does not seem to differ at all from *sericea*, L. Torrey and Gray indicate numerous varieties of *sericea*, but keep *Pennsylvanica* a distinct species. When studying the Himalayan forms of *Potentilla*, I found it impossible to draw any line between the following varieties of *sericea*, viz. *Soongarica*, Bge., *conferta*, Bge., *multicaulis*, Bge., *holosericea*, Nutt., *multifida*, L., *Pennsylvanica* β . *strigosa*, and γ . *bipinnatifida*, T. and G.; and it further appeared to me that *P. sericea* was connected with *nivea* by numerous inosculating forms.

P. nivea, L. I have (under *sericea*) stated the difficulty of discriminating between this and *sericea*. The names included under it represent varieties, subspecies, or species.

according to the different views of botanists. Thus *P. Vahliana*, L., is the *nivea* var. γ of Torrey and Gray, and includes *Jamesoniana*, Grev. *P. pulchella*, Br., is a very arctic form, and according to Brown is Greville's *sericea*, L., between which plant and *nivea* it appears quite intermediate; all depends upon what arbitrary character is assumed to be the diagnostic one.

P. Keilhauii, Sommf. Of this I know nothing; Nyman doubtfully refers the Spitzbergen plant of this name to Brown's *pulchella*. *P. frigida*? Grev., is referred here by Brown, and by Torrey and Gray under *Vahliana*, L., β , which is also the *P. Grælandica*, Br., of the same authors.

P. frigida, Vill. I am quite puzzled with this. Arctic American and Greenland specimens seem to connect *P. minima*, Hall. (*Brauniana*, Hoppe), *glacialis*, Hall., and *nana*, Lehm. The United States plant, found only on the White Mountains (*P. Robbinsiana*, Oakes), is referred to *minima* β by Torrey and Gray, and afterwards to *frigida*, Vill., by Gray, who observes that the European *minima* is probably a variety. The Danish authorities refer the Greenland and Labrador plant to *P. emarginata*, Pursh (*nana*, Lehm.), whilst both Asa Gray and Durand refer it to *frigida*, Vill. I cannot help suspecting that *P. elegans*, C. & S., of Eastern Siberia, is the same thing, and that all will be found to inosculate with the varieties or forms of *P. verna*. I have confirmed Torrey and Gray's conjecture regarding *nana*, Lehm., being the same with *emarginata*, Pursh.

P. verna, L. Under this, as one collective species or group of subspecies and varieties, I have introduced five North European arctic and alpine plants, whose forms inosculate perplexingly. The typical *P. verna* is not Lapponian, according to Fries; and none of its included forms occur anywhere in N.E. America, except Labrador and Greenland (assuming that *biflora* is distinct as a species). *P. aurea*, L., is distinguished by Koch by its leaves silvery beneath; the *aurea* of Smith he refers to *alpestris*, Hall. I find this character to be very variable. *P. crocea*, Schl., is referred by Koch to a variety of *alpestris*; he has, however, a var. *crocea* of *verna*. *P. maculata*, Lehm., is, together with *aurea* and *crocea*, referred to *Salisburgensis* by Torrey and Gray.—*P. Salisburgensis*, Hænke, is regarded by Koch as a synonym of *alpestris*. Ruprecht, who observes that *Salisburgensis* is found throughout the arctic Island of Kolgужew, says that it is the same with *verna*, L., "genuina." *P. alpestris*, Hall.: this, which is a much larger-flowered plant than the ordinary *verna*, and otherwise different in habit, is kept distinct by Fries. Koch also distinguishes it from *verna* by its habit and ovate stipules, and from *aurea* by the leaves not silvery beneath. Bentham regards both *aurea* and *alpestris* as luxuriant forms of *verna*. Watson suggests that the distribution of *verna*, *alpestris*, and *Salisburgensis* should be treated in Great Britain as that of one plant.

FRAGARIA vesca, L. I have adopted the conclusions of J. Gay (Ann. Sc. Nat. ser. 4. vol. viii. p. 196) for the distribution of this plant, but very much suspect that it would have been more consistent to have (for distributional purposes) included that of *collina*, Ehr., *canadensis*, Mich., and *Chilensis*, Ehr., under it.

SANGUISORBA officinalis, L. The four species brought under this vary very much; and I doubt if the majority will ever rank above local or permanent varieties. *S. officinalis* itself is

European, Caucasian, and Siberian. *S. media*, L., which is reduced by Torrey and Gray to a var. of *Canadensis*, L., is N.W. American. *S. Canadensis*, L., is not found anywhere in Canada, though a native of both N.E. and N.W. America; it differs from *officinalis* in the long stamens and narrower spikes. *S. tenuifolia*, Fisch., is N.E. Asian, and considered by Asa Gray (Bot. of Japan, p. 387) as hardly more than a variety of *Canadensis*. So much for the local distribution of the common forms; the only other is *S. polygama*, Nylander, a species retained by Fries, with East Lapland as its only Scandinavian habitat.

ROSA majalis, Herm. This is *R. cinnamomea* β , Torrey & Gray, which Ledebour and Koch do not even rank as a variety.

R. blanda, Ait. This is also *R. Woodsii*, Borr., of 'Flor. Bor.-Am.' according to Torrey and Gray. Fries does not include it in his Lapland column. *R. acicularis*, Lindl. (non DC.), is referred by Ledebour to *alpina*, L., and appears to be the same with *R. Gmelini*, a common Siberian plant. I do not see how it is to be distinguished from *blanda*. *R. Carelica*, F.: Ruprecht (Flor. Sam. p. 33) reduces this to a var. of *R. acicularis*, as do Meyen (see Nylander, Dist. Plant. Fenn. p. 86) and Trautvetter (Flor. Boganid.). *R. fraxinifolia*, Lindl. (and Seringe), is referred to *blanda* in 'Flora Boreali-Americana' and by Torrey and Gray.

R. villosa, L., *tomentosa*, Sm. Bentham adds to this *R. mollis*, E. Bot.

R. canina, L., is, according to Ledebour, found in Arctic Lapland; but I find no Scandinavian authority for it, and have not included it.

PYRUS Aucuparia, L. This, and the two plants brought under it, are species, subspecies, or local forms, according to the value assigned to those terms. It is remarkable that the Greenland one is nearer the American form than the European. *P. Americana* was *Aucuparia* β of Michaux. The true *P. Aucuparia* is, however, a native of both continents, having been found at Lake Winnipeg by Bourgeau, and in Siberia, lat. 64° (Trautv. Flora Jenissei).

PUNUS Padus, L. I almost think that I should consistently have added *P. serotina*, DC., of North of America, to this.

AMELANCHIER alnifolia, Nutt. Torrey and Gray reduce all the American *Amelanchiers* to *Canadensis*, of which this is their var. δ ; it is found on both sides of the Rocky Mountains.

EPILOBIUM alsinifolium, Vill. Watson regards this as possibly a luxuriant form of *alpinum*, adding that intermediate forms may be assigned to either; he also cautions us that mountain forms of *E. tetragonum* occasionally pass for it. Bentham keeps it distinct; Koch, Torrey and Gray, and Asa Gray make it the same with *origanifolium*.

E. Hornemanni, Reich. This is *alpinum* β of 'Flora Bor.-Am.', and γ of Torrey and Gray. Ledebour keeps it distinct.

E. organifolium, Lam. This is *E. alpinum* γ of Torrey and Gray and Asa Gray; Ledebour keeps it distinct, as does Fries, who gives Lapland as habitat for both. Andersson distinguishes these and *lineare* by the seeds, which, not being perfected in the majority of

specimens from arctic habitats, are to me unavailable characters; Koch also keeps them distinct, and characterizes them by their leaves.

E. lineare, Muhl. Fries keeps this distinct from *palustre*, L., both being found in Lapland. It is referred to *palustre*, var. β , in the 'Flora Bor.-Am.,' in Torrey and Gray's Flora, and in Asa Gray's Manual.

CALLITRICHE *verna*, L. I have treated this as one collective species, including *autumnalis*, following Bentham's idea. Fries keeps this and *autumnalis*, L., distinct, giving Lapland as a habitat for both. Bentham unites them. A. Gray and most authors keep them distinct.

MYRIOPHYLLUM *spicatum*, L., is not Lapponian according to Fries, though Lapland and Asiatic Russia are given as habitats by Ledebour.

HIPPURIS *montana*, Led. I have not seen this plant, which, judging from Ledebour's description, would appear undoubtedly to be only a starved state of *H. vulgaris*. *H. maritima*, Hellen, is reduced by Wahlenberg, Fries, and Koch to a variety of *vulgaris*; on the other hand, it is retained as a species by Brown, Ruprecht, 'Flor. Bor.-Am.,' and Torrey and Gray. Both this and *vulgaris* are arctic.

CERATOPHYLLUM. Owing chiefly to imperfect materials, I am obliged to treat *Ceratophyllum* as consisting of one collective species. The specimens I have examined do not present such definite characters in the fruit as the descriptions of authors would seem to imply. Bentham regards *submersum* and *demersum* as forms of one; Torrey and Gray suggest that there is but one American species; Fries, Koch, and Watson keep these two distinct. Neither of them are Arctic European or Asiatic, though found in Arctic America.

CLAYTONIA *lanceolata*, Pursh, *arctica*, Adams, and *sarmentosa*, C. A. M., are undoubtedly trifling varieties of one plant, neither constant *inter se* nor as to locality.

MONTIA *fontana*, L. The absence of this cosmopolitan plant in all parts of Temperate America east of the Rocky Mountains, except Labrador, is one of the most remarkable facts in botanical geography. Newfoundland is given as a habitat by Le Pylaie; but this, like that of *Calluna vulgaris*, wants confirmation. *M. rivularis*, Gmel., is reduced to a variety by Fries and Torrey and Gray.

SEDUM *elongatum*, Led. I do not know this plant by authentic specimens. Ledebour gives it as a doubtful species, confounded with *S. Rhodiola* by Chamisso, Hooker and Arnott, and Torrey and Gray.

S. euphorbioides, Schl. Of this I know nothing; according to Ledebour it is probably a variety of the Siberian *S. algidum*, Led., itself very near to *quadrifidum*, Pall.

RIBES *propinquum*, Richardson. This does not differ from *R. rubrum*, L., to which it is reduced as var. β by Trautvetter and Meyer in 'Flora Ochotsk.'

CHRYSOSPLENIUM *tetrandrum*, Lund, is noticed by Fries as a variety of *alternifolium*, also occurring in Lapland. I have not seen authentic specimens.

PARNASSIA *obtusiflora*, Rupr., appears nothing but a small specimen of *palustris*, L.,

in which the petals are often as short and of the same shape as in Ruprecht's plant, and the cauline leaf wanting. I doubt much if *P. Kotzebuei* is really distinct.

SAXIFRAGA Aizoon, Jacq. Koch, Fries, and most authors keep this distinct from *S. Cotyledon*; but I must own that I cannot satisfactorily discriminate their forms or make them tally with their assigned habitats, and am thus obliged to treat them as one plant. Both, according to Fries, grow in Lapland and Western Europe generally. *Cotyledon* alone is stated to be Icelandic; *Aizoon*, which alone is Greenlandic, Labrador, and N. American, is nowhere stated to occur in the Russian dominions.

S. cæspitosa, L. It is not my purpose to enter into the disputed question of the limits of the members of this aggregate collective species. I have repeatedly examined all, and found innumerable grades connecting the most dissimilar, such as *exarata* and *sileniflora*. Almost all are high arctic. *S. uniflora* is the same as *venosa*, and is referred by Torrey and Gray to *cæspitosa*, to which *S. Grælandica* is reduced by almost all authors. *S. exarata*, Vill., is kept distinct in 'Flor. Bor.-Am.' (with an appended observation regarding the difficulty of distinguishing it), as also by Torrey and Gray, Ledebour, and most authors. *S. muscoides*, Wulff., is the common Middle and S. European form.

S. sileniflora is confined to Arctic America; and *Magellanica*, in a form identical with *exarata*, does not extend in S. America north of Peru.

S. controversa, Sternb., which, according to most authors, is a synonym of *adscendens*, has been found on the Rocky Mountains by Bourgeau and Hector during Palliser's Expedition, but nowhere else in Continental America.

S. exilis, DC. This, as suggested in 'Flor. Bor.-Am.,' is, so far as may be judged by specimens tallying with the description, certainly only a weedy state of *cernua*.

S. bulbifera, L. Koch distinguishes this from *granulata* by its leafy cyme and other characters that appear to be clearly connected with its being a bulbiferous condition of *S. granulata*, between which and *bulbifera* I find intermediate grades. Ledebour and Fries also keep it distinct. It is not Arctic Lapponian, but Russian.

S. hyperborea, Br., is referred to *rivularis* β in 'Flor. Bor.-Am.' and by Torrey and Gray; it is often a starved high-arctic form, but not a permanent or well-marked one; it is confined to Arctic America, and Greenland.

S. coriacea, Adams. This appears to me, from the description, not to be distinct from *nivalis*. I have seen no authentically named specimens.

S. reflexa, Hook. This is certainly only *Virginensis*, of which several specimens from the Rocky Mountains precisely accord with the arctic.

S. hieraciifolia, W. & K., though Arctic Russian, fid. Ledebour, is not Lapponian, according to Fries.

S. foliolosa, Br. This is a monster, as pointed out by Fries (*comosa*), rather than a variety proper, the foliaceous cyme and bulbilli being produced at the expense of the inflorescence proper. Ledebour reduces it, and Ruprecht notices its transition to *stellaris*, L.

S. propinqua, Br., is identified with *Hirculus*, L., in 'Flor. Bor.-Am.' and by most succeeding authors.

S. aestivalis, Fisch., is reduced to *punctata* by Ledebour.

CONIOSELINUM *Tataricum*, Fisch., and *Selinum Gmelini*, De Bray, are both synonyms of *C. Fischeri*, Wimm.

ARCHANGELICA *littoralis*, Fries. Wahlenberg originally regarded this as a variety, and, I think, rightly, its characters being slight and of relative value only. Ledebour doubts its claims. Fries, who keeps it distinct, discusses the species (Summa, p. 181).

A. Norvegica, Tabern., is not contained in Fries's 'Summa.' Ruprecht (Flor. Samojed.) gives it as the *Angelica Archangelica* β of Linnæus, and adds that it is most highly esteemed as an article of food.

A. atropurpurea, Hoffm. This is the "Common Archangelica" of American authors, which, according to the specimen I have seen and descriptions I have compared, differs very slightly from *Angelica Archangelica*, L. The *Physolophium saxatile*, Turcz. (*Cælopleurum* [*Pleurospermum*, Bong.] *Gmelini*, Led. fid. Flor. Ochotsk.), is, as far as I can make out from descriptions, either a form of *Archangelica officinalis*, or some very closely allied plant which I cannot distinguish from its forms.

ATHAMANTA *arctica*, Nym., is *Libanotis arctica*, Rupr., a plant of which but one specimen is known, differing, according to its author, from *condensata*, L., in the colour of the flower only. DeCandolle reduces *condensata* to a var. of *A. Libanotis*, L.; and *A. Sibirica* is only another form of the same species.

HERACLEUM *arcticum*, Rupr. I have not seen this plant, which, from a careful comparison of its description with *H. Sibiricum*, I take to be an arctic state of that plant.

PACHYPLEURUM *alpinum*, Led., is the same with *Gaya* (*Neogaya*) *simplex*, Gaud.

SIUM *latifolium*, L., is stated by Gunner to be an inhabitant of Tromsø (Wahlenberg); but I do not find so northern a habitat confirmed by Fries or Andersson, and so have not included the species.

VIBURNUM *Opulus*, L., scarcely reaches the arctic circle in Lapland. *V. Oxycoccus*, Pursh, is finally identified with it by A. Gray.

GALIUM *uliginosum*, L. Watson remarks that states of this are frequently confounded with *palustre* and *pusillum*, which may well be the case with arctic specimens.

G. trifidum, L. Ruprecht calls the European plant β . *Europæum*, and indicates some differences, which I do not think hold in the extensive suite of specimens I have examined. *G. Claytoni* was thought to be distinct in 'Flor. Bor.-Am.,' but is reduced by Torrey and Gray, and by Ledebour.

G. infestum, W. K. Fries considers this to be a variety of *Aparine*; and it alone is Lapponian.

G. saxatile, L., does not advance north of Southern Norway, nor west of Uralian Siberia; hence its being arctic in Greenland is remarkable. It is also Icelandic.

NARDOSMIA *frigida*, Hk., *corymbosa*, Hk., and *sagittata*, Hk., are clearly all forms of one rather variable plant, connected by intermediates.

N. straminea, Cass. United with *N. lævigata*, DC., by Ledebour; but Ruprecht considers it different.

PTARMICA *alpina*, L. The numerous plants here brought together do not differ more *inter se* than do the forms of *P. vulgaris* (with which this is intimately connected), and they are further all united by intermediate forms. *P. alpina* itself is found in Arctic Siberia and the Altai; *P. oxyloba* is only known in Arctic Siberia. *P. speciosa*, DC.: Ledebour rightly remarks that this is rather a form of *vulgaris* than a species. *P. multiflora*, Hk., was originally referred to a var. of *vulgaris*, from which it differs in its deeply cut leaves, and broad-, short-ligulate flowers. *P. Sibirica*, Led., is confined to East Siberia and Escholtz Bay. Of the *borealis*, Bong., of Sitcha, I have seen no authentic specimens.

CHRYSANTHEMUM *Sibiricum*, Turc., is retained by DC., Ledebour, &c., but apparently on very slender grounds.

C. integrifolium, Rich., is an eminently northern form, not found west or north of the Tchuktchi country, and scarcely south of the polar circle; it may prove to be connected with *leucanthemum* by intermediate forms.

C. leucanthemum, L., is not Lapponian, but Arctic Russian. *C. Segetum* is occasionally found in Nordland, but apparently rather as an alien than a genuine arctic plant.

PYRETHRUM *pulchellum*, Turc., is certainly identical with the small arctic form of *inodorum*; and Fries adds as a variety the *P. ambiguum*, Ledeb., correctly. Ruprecht considered the woolly hairs on the peduncle of *P. pulchellum* sufficient to distinguish it; but this is not the case.

ARTEMISIA *Tilesii*, Led. Fries ranks this as a var. of *vulgaris*, L., both being found in Lapland. Seemann remarks that they occur together throughout Western Eskimo-land.

A. Chamissoniana, Bess., is reduced to *arctica*, Less., in 'Flor. Bor.-Am.,' and by most succeeding authors. *A. Norvegica*, Fr.: in the 'Flor. Bor.-Am.' it is stated that this is identical with *A. Chamissoniana*; on comparison I find it has rather larger capitula, but is not otherwise different; it is a very rare alpine plant in Norway, not entering the arctic circle.

A. globularia, Cham. I think this is quite the same with *glomerata*; both are confined to the country around Behring's Straits.

A. androsacea, Seem. This is a remarkable and very local plant, which I cannot identify with any more southern species, though, judging from analogy, I suspect that it may eventually prove only an arctic tufted variety of some better-known plant.

A. cæspitosa, Bess. I have seen no specimen of this; but, judging both by plate and description, I do not doubt that Torrey and Gray's surmise is correct as to its being the same with *Richardsoniana*.

A. Canadensis, Mich. This, according to Richardson, advances to the arctic circle east of the Rocky Mountains. After a careful re-examination I cannot doubt its identity with *A. desertorum*, Spr., as also certainly with *commutata* β . *Gebleriana*, Bess. in Herb. Hook. *Canadensis* is the earliest name.

BIDENS *tripartita*, L., is not found in Arctic Lapland, though it enters the arctic circle in Russia. I am quite unable to distinguish the American *B. connata*, Muhl.

ANTENNARIA *hyperborea*, Don, is considered by Fries to be a corymbose form of *dioica*, Br.

GNAPHALIUM *Norvegicum*, Gunn. Fries and Koch consider this a distinct species from *sylvaticum*, both being Lapponian. Watson finds the British *Norvegicum* so linked to *sylvaticum*, that he is obliged to treat them as one. Bentham considers *Norvegicum* a high-arctic and alpine form of *sylvaticum*.

G. pilulare, Wahl., is reduced to a var. of *uliginosum* by Fries.

ARNICA *montana*, L., certainly includes the three which I have included under it, and which hardly deserve to be ranked as constant varieties. Fries keeps *alpina* distinct, and assigns it a more northern habitat than *montana*. Torrey and Gray unite *angustifolia*, Vahl, with *alpina*, Læst., and make of it *montana* β . *alpina*. The *angustifolia*, H. & A., is by the same authors considered the same as *alpina*, and called *angustifolia* β . *Lessingii*; they observe, at the same time, that the arctic forms, though so very closely approaching, appear quite distinct in more southern habitats. Durand (Kane's Voy.) unites *alpina*, Wahl., *plantaginea* and *fulgens*, Pursh, with *montana*, var. *alpina*, L.

SENECIO *resedafolius*, Less., is Arctic Russian, but not Lapponian.

S. arcticus, Rupr., is *Cineraria congesta*, Br., "sensu latiore?" of Fries; and *C. congesta*, Br., is reduced by him to a northern var. of *S. palustris*. The absence of both this and *campestris* in Greenland is very remarkable.

S. campestris, L. I have very carefully compared many specimens of the plants placed under this, and am quite unable to discriminate between their forms. According to Koch and Fries, *Cineraria alpina* includes *C. campestris*, Retz. *C. aurantiaca*, Hoppe, is kept distinct by Koch, but united by Fries as a var. of *C. alpina*.

S. octoglossus, Ledeb., is referred by Fries to *nemorensis*, which in Scandinavia is not found south of Lapland.

LIGULARIA *Sibirica*, L., is found only in East Lapland and Arctic Russia, Finland, &c., not in Nordland.

SOLIDAGO *multiradiata*, Aiton, is the *Virga-aurea* γ of Torrey and Gray, and ϵ . *arctica* of Ledebour.

ASTER *Richardsoni*, Spr., and *montanus*, Richardson, are referred to *Sibiricus* by Fries, and, I think, rightly; also doubtfully by Ruprecht. Trautvetter (Flora Boganid.) refers *Richardsoni* to *Sibiricus* β . *subintegerrima*.

A. pygmæus, T. & G. I have vainly sought to distinguish this from *salsuginosus*.

A. alpinus, L. (with which *A. flaccidus*, Bunge, of Siberia and Dahuria appears to be identical), is not reputed to be Scandinavian, but a native of the Alps and Carpathians.

A. falcatus, Lindl., is certainly nothing but *multiflorus*, Ait.

ERIGERON *trifidus*, Hook., is identical with *compositus*, Psh., as is now well known.

E. elongatus, Led. Fries, who keeps this distinct, says (in Herb. Norm.) that it should rather be considered a form of *acris*, of which it appears to me to be a mere variety, and a very slight one.

E. politus, Fr. This also Fries keeps distinct; he considers it most allied to *alpinus*, and

includes under it *glabratus*, Hook. For my own part, I find it impossible to separate the forms of *acris* from those of *alpinus*, and am rather disposed to refer this to the former.

E. uniflorus, L. This is *E. alpinus* β of Ledebour, and *alpinus* γ of De Candolle, and is united with *alpinus* by Bentham also. According to Fries, who unites *pulchellus*, DC., with it as a variety, it is a good species. I cannot regard it otherwise than as an arctic and alpine state of *alpinus*, with a more woolly involucre, fewer capitula, and better-developed inner-ray florets. I find all intermediate forms.

E. purpureus, Ait., is included under *Philadelphicus* by Torrey and Gray, &c.

TARAXACUM *Dens-leonis*, Desf. Fries adopts the name *officinale*, Weber, and includes *palustre* as a variety, both being Lapponian, in which Watson, Koch, and most botanists coincide. *T. ceratophorum* is rather a form with an over-developed condition of the involucre scales, than a variety properly so called.

T. Scorzonera, Reich., from Arctic Siberia (Flor. Taimyr.), is not included in Ledebour's 'Flora Rossica.'

T. phymatocarpum, J. Vahl, Flor. Dan. 2298, found in Arctic Greenland only, is a small form with the habit and involucre of *T. palustre*, Sm., and shorter achenia than is usual in the genus.

SONCHUS *maritimus*, L., is kept distinct by Koch, but included by Fries as a variety of *arvensis*.

LEONTODON *autumnalis*, L. I am obliged to regard *Keretinus*, Nyl., as the same with *autumnalis*, because Ball (Ann. Nat. Hist. 1850, p. 2) observes that the character of erect and drooping capitulum (on which this species appears founded) is not to be relied on in other species of the genus. I have never seen copious specimens of this *L. Keretinus*, which Ball omits in his otherwise very full account of the genus (*l. c.*). Fries regards it as a not yet fully developed species. Ledebour puts it in another section of the genus. Koch makes *L. Taraxaci*, L. (*Apargia*, Smith), a variety of *autumnalis*; and Watson says that the British *Taraxaci* graduates insensibly into *autumnalis*. Ball makes it a synonym. Fries introduces under *autumnalis* a variety *nigro-lanatum*; he describes both as being common throughout Lapland.

HIERACIUM. I have grouped the various arctic forms discriminated by Fries, into a few aggregate species, such as are recognized by Arnott, Bentham, Watson, &c.

SAUSSUREA *alpina*, L. I have treated this as an aggregate species, because *S. nuda*, *monticola*, and *angustifolia* all seem to graduate into it, and several of them into one another. I should not be surprised if *S. subsinuata*, which is hitherto known from one locality only, proved still another form of the same variable plant.

CARDUUS *crispus*, L. This attains a higher latitude than *C. acanthoides*, L., of which Bentham and others consider it a variety. The two certainly pass into one another.

CAMPANULA *linifolia*, Hænke, and *Scheuzeri*, Vill., are certainly referable to *C. rotundifolia*, as held by Linnæus and most modern authors, though *Scheuzeri* is regarded by Fries as distinct.

VACCINIUM pubescens, Wormsk. (Flor. Dan. 1516), a Greenland plant, is referred to *uliginosum* variety by Lange.

VACCINIUM (*OXYOCOCCUS*) *microcarpum*, Rupr., is included under *O. palustris* by Nyman, and is clearly nothing but a small-fruited state of that plant.

CALLUNA vulgaris, L., is mentioned in DeCandolle's 'Prodromus,' on the authority of a specimen gathered by La Pylaie, as a native of Newfoundland; but I find no confirmation of this habitat, nor is it found in any part of the American continent. In the Old World it wanders no further east than the Ural district.

LEDUM palustre, L. Asa Gray and DeCandolle distinguish two species, by the stamens 5 and 10, leaves broad and narrow, and capsules; but these do not affect different geographical ranges, and Andersson, a most careful observer, says (Conspect. Veg. Lapp. 18, in note), "inter hanc varietatem (*latifolium*) et normalem tam multi animadvertuntur transitus, ut nullo modo distingui possint. Nostra planta foliis etiam latioribus, quam specimina Grœnlandica, nonnunquam lecta." Of the three included species, *L. dilatatum* is ranked by Fries with *palustre*, to which also *Grœnlandicum* is referable—*L. latifolium*, Ait., is merged into *palustre* by Michaux and in 'Flor. Bor.-Am.'

PYROLA rotundifolia, L. This I consider includes *chlorantha*, Sw., which, though not found in Arctic Europe, is said by Durand (Kane's Voyage) to be found in Greenland. As, however, Durand does not include *grandiflora*, Rad., and Lange makes no mention of *chlorantha*, it is possible that the same species is intended by both authors.

P. Grœnlandica is referred to *rotundifolia* in Flor. Bor.-Am., and by DeCandolle; it is kept distinct by Lange, who refers it to *grandiflora*, Rad.

P. elliptica, Nut., is certainly only a variety of *rotundifolia*, and is in most respects intermediate between *rotundifolia* and *chlorantha*.

P. media, L. Bentham is inclined to doubt if this be permanently distinct from *P. minor*.

Ruprecht (Flor. Samojed.) mentions *P. uniflora*, L., as a doubtful native of Kolgужew Island, off the White Sea.

GENTIANA lingulata, Ag. Fries treats this as a distinct variety of *Amarella*, which alone is Lapponian. After a very careful examination of *G. acuta*, Mich., I am disposed to regard it as the Lapponian form of *Amarella*; I cannot fix characters that will distinguish them. Grisebach says of it, "*Amarellæ* simillima sed bene distincta species."

G. involucrata, Rottb. This very rare plant is also Icelandic.

G. æstiva, R. & S., is *verna* γ of Grisebach; it is not found in Lapland, any more than *Pleurogyne rotata*; both, however, are Arctic Russian.

POLEMONIUM cœruleum, L. I have treated all the arctic forms of this variable plant as constituting an aggregate species. All are regarded as varieties in 'Flora Boreali-Americana.' Ledebour makes *pulchellum* different, and includes *capitatum* and *humile* under it; these, however, graduate quite insensibly into *cœruleum*. Ruprecht finds both in the arctic island of Kolgужew. It is very remarkable that this plant inhabits no part of Greenland but the east coast only, and at a very high latitude.

PHLOX *Richardsonii*, Hook. This appears to me only an arctic tufted form of *P. Sibirica*, to which, I think, may also be referred *P. Douglassii*; all have more or less, and often strongly, recurved margins to the leaves; and the other differences are comparative and trifling.

MYOSOTIS *alpestris*, Sw. (*suaveolens*, M. & K.). Fries and Koch merge this into a variety of *sylvatica*, which alone inhabits Lapland. Bentham takes the same view. Watson retains it, finding that it keeps its characters well under cultivation.

M. cæspitosa, Schltz. This Bentham unites with *palustris*, and probably correctly.

M. arvensis, L. (*intermedia*, Link.). Watson finds this occasionally approximating to *cæspitosa*; and I find it difficult to separate northern forms of one from the other.

ERETRICHIMUM *villosum*, Bunge. *E. aretioides*, A. DC., is nothing but a dwarf arctic state of this. Ledebour unites *E. latifolium*, Rupr. (non Kar. & Kir.), with the same, as var. β ; and so does Trautvetter (Flor. Taimyr.).

MERTENSIA *pilosa*, DC., which includes *Lith. corymbosum*, Lehm., and *paniculatum*, Don, is clearly referable to *denticulata*, Don, the hairy calyx being a very inconstant character. These should possibly all be united under *Sibirica*.

M. Drummondii, Don. I find no plicæ in the tube of the corolla of this plant, whence it must be removed from the section in which DeCandolle places it to that with *Virginensis*, of which it appears to be a northern form, as suspected in 'Flora Bor.-Am.' It has not, however, been gathered anywhere between the Arctic Sea-coast and the United States.

MENTHA *Lapponica*, Wahl., is referred by Fries to a northern variety of *arvensis*. Both grow in Lapland.

GALEOPSIS *Tetrahit*, L. Fries and Koch keep this distinct, as does Watson, who gives as presumptive evidence in its favour the statement that the seeds of *versicolor* yield plants of their own kind only. Bentham says that they graduate one into the other.

STACHYS *palustris*, L. According to the synonyms quoted by Asa Gray, this N. American plant includes many very divergent forms, including some that might almost be referred to *S. sylvatica*. Under the latter plant I have not introduced the Chilian *S. chonotica*, which approaches it closely.

LIMOSELLA *aquatica*, L. I include under this *L. tenuifolia*, which is the more common southern form, and certainly is nothing but a variety with reduced foliage. *L. borealis*, Lessing, is another form, found in Lapland only, according to Fries.

GYMNANDRA *borealis*, Pall. I am quite unable to distinguish *Stelleri* and *Pallasii*, which were included originally by Pallas under *borealis*. Choisy says, in DC. Prodr. xii. 24, that it is difficult to dissent from Pallas's view, who regarded the genus as *monotypic*, Willdenow makes eight species, which Chamisso and Schlechtendal reduce to three.

CASTILLEJA *septentrionalis*, Lindl. I have no hesitation in uniting this with *pallida*, as suggested 'in Flor. Bor.-Am.' It advances south to Canada.

VERONICA *borealis*, Læst., is included by Fries as a variety of *serpyllifolia*, both being Lapponian.

V. fruticulosa, L. Koch retains this as different from *saxatilis*, but Bentham considers it the same.

MELAMPYRUM *Americanum*, Mich. Asa Gray keeps this up as a species, but Bentham reduces it to a var. of *pratense*. The smaller, more slender corolla is the only character I can find.

RHINANTHUS *minor*, Ehr. This form of the genus is, according to Fries, the only one found in Lapland; it is the *Crista-galli*, var. *α*, of Linnæus according to Koch. Bentham does not consider it a sufficiently constant form to rank as a race even.

EUPHRASIA *officinalis*, L. The varieties *montana*, Fr., and *alpestris*, Koch, are found throughout Lapland according to Fries.

PEDICULARIS *amæna*, Ad. Retained as distinct from *verticillata* by Ledebour and by Bentham, who, however, on examining more specimens with me, agrees that it is only a slight variety connected by intermediates; both are arctic plants.

P. borealis, Stev., is, according to Fries, a Lapland and Finland variety of *palustris*, L.

P. lanata, Willd., is reduced to *hirsuta* by Bentham, and, I think, rightly.

P. arctica, Br., is reduced to *Langsdorffii* by Bentham, with *purpurascens*, for an old synonym.

P. Langsdorffii. This I find to pass by insensible gradations into *Sudetica*.

P. Kanei. I have never seen authentic specimens of this, but the description agrees with forms of undoubted *Sudetica* gathered in Greenland.

UTRICULARIA *vulgaris*, L. This is unquestionably a native of Arctic Europe; but though common in Temperate N. America, both east and west, I am not so sure of its entering the arctic circle there. I presume, however, it is one of the two alluded to by Richardson ('Boat Journey through Rupert's Land').

U. intermedia, Ehr. Fries and Koch keep this distinct from *U. minor*. Watson also retains them, but observes that much confusion exists about them. Bentham and Oliver (who has lately worked a great deal at this genus) think that *intermedia* is only a form of *minor*. Of the two, *U. intermedia* is both Arctic European and American; *minor* is Arctic European, but is also found in Tibet.

DODECATHEON *integrifolium*, Mich., and *frigidum*, C. & S., are certainly only varieties of *Meadia*. Torrey indeed (Bot. Whipple's Exped., p. 62) recognizes but one species of the genus, which is found from the arctic circle to New Mexico.

TRIENTALIS *latifolia*, Hook., is considered a variety of *Europæa* by Torrey (Bot. Whipple's Exped.); it extends along the Rocky Mountains to California.

T. arctica, Fisch., is scarcely distinguishable from *Europæa* as a variety, to which Ledebour refers it. I have seen no arctic specimens, though it extends to Sitcha and Kamschatka. The *T. Americana*, the best-marked American species, extends from the U. States to Labrador. It differs in appearance from *Europæa*, and is certainly far more

distinct from it than either *arctica* or *latifolia*. Torrey at first considered it a variety; but both he and Asa Gray have since regarded it as a species.

ANDROSACE triflora, Adams. This, which is unknown to Ledebour, DUBY, and myself, appears, from the description, not to differ from *Chamaejasme*. *A. Chamaejasme*, though more properly a West Arctic American plant, extends eastward to Victoria Land.

Ledebour (Flor. Ross. iii.18) gives Kotzebue Sound as a habitat for *villosa*, quoting, erroneously, Beechey's 'Voyage.' I do not think it is anywhere an arctic plant.

PRIMULA stricta, Horn. I find it difficult to distinguish some arctic forms of this from others of *farinosa*, but think I have given its distribution correctly. *P. Hornemanniana* is now generally admitted to be a synonym. *P. Mistassinica*, C. & S. (non Mich.), is referred by Ledebour to *P. stricta*; and *P. Mistassinica*, Mich., was united with the same plant in the 'Flora Boreali-Americana,' with probably good reason according to DUBY.

P. borealis, DUBY. Ledebour says of this, "planta mire varians." Ruprecht suggests that it is only a var. of *stricta*, and rightly, I have no doubt.

P. nivalis, Pall. The distribution of this plant is peculiar. It is found nowhere in Europe, except the Caucasian provinces be considered such; it is, however, a native of all Siberia and N. W. America.

P. saxifragæfolia, Lehm. Ledebour reduces this to *cuneifolia*, and no doubt correctly.

P. Scotica, Hook. This is a form distinct enough in many places, but graduates into *P. farinosa*, with which Bentham joins it. Fries keeps it distinct, as does Watson, who remarks that its characters depend chiefly on its larger purple corolla. *P. farinosa* itself, though a native of Finland, scarcely extends into Lapland.

P. Finmarchica, Willd. Fries says the flowers are purple, and distinguishes it from *Sibirica*, observing that it is arctic, and not alpine. Ruprecht, Ledebour, and DUBY make of it *Sibirica* β .

ARMERIA vulgaris, L. I do not see how the distribution of the plants named under this can be treated apart. Of these *A. alpina* is an inland form found in the Alps of various parts of Europe, though not Scandinavian according to Fries; it is the *Armeria γ alpina* of DeCandolle. *A. elongata*, Hoffm., is the only one entered as Lapponian by Fries; it is referred to *Armeria α* by Ledebour. *A. Labradorica*, Wallr., is *vulgaris* ϵ of Meyen's Labrador plants. *A. arctica*, Rupr., is *A. vulgaris* of Nyman, and *vulgaris* β . *arctica* of Ledebour. *A. Macloviana*, Cham., is the same with *Andina*, which Torrey (who has a var. *Californica*) refers to *vulgaris*, observing that many of the species broken off from *vulgaris* had better be referred back (Bot. Whipple's Exped. p. 62).

RUMEX Hippolapathum, Fr., is reduced to *aquaticus* by Meisner in DC. Prod., and in part by Ledebour.

R. arcticus, Trautv. I am unacquainted with this plant, which would seem not to differ from *R. aquaticus* in any important character, or in distribution. Trautvetter (Plant. Taimyr.) observes that it is perhaps Chamisso's variety of *domesticus* with a simple whorled raceme.

R. domesticus, Hartm., is *aquaticus* β of Wahlenberg. Fries reduces *aquaticus*, L., to a var. of *domesticus*. Both are Lapponian. Koch separates them, but by characters

hardly tangible; Ledebour, who keeps them distinct, thinks it would be better to unite them. Meisner refers *domesticus* to *longifolius*, DC., and makes of the Arctic American plant the var. *nanus*.

R. salicifolius, Weinm. I am doubtful as to the merits of this species, and cannot come to any conclusion about it.

POLYGONUM *polymorphum*, Led., is not Scandinavian; but several of its varieties are Arctic Siberian and American, as β . *setigerum*, γ . *lapathifolium*, and *frigidum* (*P. alpinum*, All.).

P. lapathifolium, L. Kept distinct from *Persicaria* by Fries, Watson, Koch, and Bentham; but I find it impossible to distinguish North Indian specimens of one from the other, these being united by every intermediate form. *P. Persicaria* is, according to Fries, very rare in Lapland, and sporadic only.

Ledebour includes *P. Hydropiper* as Arctic Lapland on the authority of Felmann; but I find no confirmation in the works of Fries and Andersson.

CHENOPODIUM *maritimum*, L., is doubtfully mentioned as a native of the arctic sea-coast of America by Richardson. I have examined the specimens; they are very young, but identical with *maritimum*, which is a common subarctic plant.

MONOLEPIS *Asiatica*, Moq. I know nothing of this plant. The only recorded habitats I find are both Arctic Siberian, viz. Nishni Kolymsk and the Boganida River.

ATRIPLEX *patula*, L., It is impossible to unravel the synonymy and distribution of this plant and *A. hastata*, if, indeed, they really be distinct, which Moquin doubts. Fries keeps one *hastata* distinct, assigning it a place in the section with rugose seeds. Koch distinguishes it by the cordate-triangular (not hastato-rhomboid) sinuate-toothed perigonia. Moquin unites *angustifolia* with it. Bentham unites both these with *deltoidea*, *littoralis*, and *erecta*. See, for further remarks in reference to the British species, Woods (Proc. Linn. for April 17, 1849), who observes that in several species the seeds are of two forms in the same individual,—one form slightly depressed, smooth, black and shining; the other (in larger lower perigonia) three times as large, more depressed, chesnut and wrinkled: he admits *angustifolia*, *patula*, *deltoidea*, and perhaps *erecta*. On the south-east coasts of England, I recognize three very distinct forms, often growing intermixed, viz. *A. littoralis*, L., *A. patula*, L. (*erecta*, Huds.), and *angustifolia*, Smith (all fairly well represented in English Botany). Of these the first and last are Arctic European and Arctic W. American; and *littoralis* Arctic W. American only, though common in temperate America.

A. deltoidea, Bab. Moquin refers this to *hastata*; Fries makes a variety of this (*prostrata*) a native of Lapland; Watson includes its distribution under that of *patula* (see remarks, 'Cybele,' ii. 324).

A. angustifolia, Sm. Moquin makes of this a synonym of *patula*; Watson keeps it distinct, but says nothing in its favour; Koch brings it to *patula*, and both to *latifolia*, Wahl.

A. Gmelini, C. A. M. A little-known plant, referable, according to Ledebour, to *patula*, but rather, I think, to *littoralis*, L., or perhaps to *angustifolia*, Sm.

URTICA gracilis, Ait. This is reduced to *dioica*, var. ϵ , by Weddell.

BETULA. I am quite unable to disentangle the species, forms, and varieties of this genus, or to harmonize the views of Fries, Spach, Regel, and other botanists. The Northern species are clearly most difficult of discrimination, as a reference to Fries's notes (Summa, pp. 211 and 556) will show. Regel's recent 'Monograph' seems carefully and judiciously executed.

B. glutinosa, Wallr., is now by Fries and others considered one with *alba*. Koch refers it to *pubescens*, Ehr., β . *Carpatica*; Regel (Monog. Betulac. p. 21) to *alba* δ . *glutinosa*.

B. intermedia, Wahl., is *alba* β of Ledebour, an Arctic Russian plant; it is the *humilis* of Hartm. and Rupr. (non Schrank). Ledebour observes that it approaches to *nana* very closely.

B. papyracea, Ait., is reduced to a var. of *alba* by Spach and Regel, and possibly rightly; but the American botanists, who know both, keep them distinct.

B. nana, L., is, according to Asa Gray, distinguished by a narrowly winged fruit; but the wing of Scotch specimens is very broad, and Ledebour remarks that this is a variable character; Regel says it is narrow or almost absent.

B. glandulosa, Mich. This, according to Asa Gray, is the *pumila*, L., distinguished by its cylindric catkins and broad-winged fruit. I have seen no Greenland specimens of it. It is the *nana* γ . *intermedia* of Regel, who keeps *pumila*, L., as a distinct species; he apparently has not consulted Asa Gray's 'Botany of the N. U. States.'

B. alpestris, Fr., is the *humilis*, Hartm., fid. Fries, and is so like British specimens of *nana* as to be scarcely distinguishable. I think it may well be included under *fruticosa*, Pall.; Ruprecht, however, refers *humilis*, Hartm. (non Schrank), to *intermedia* (*alba*, var. *intermedia*, Wahl.). Regel makes of it *nana* δ . *alpestris*, and possibly rightly.

ALNUS barbata, C. A. M. Fries keeps this distinct, and gives as a habitat Lapland, where *glutinosa* does not grow. It is the *glutinosa* γ . *barbata* of Ledebour, and β . *pubescens* of Regel.

A. viridis, DC. Ledebour distinguishes the plant of Chamisso, from Arctic America, from DeCandolle's; but to me they seem identical.

A. fruticosa, Rich. This, in the list, p. 301, is a misprint for *glutinosa*, Richardson (non Willd., &c.), which has been referred to *viridis* in 'Flor. Bor.-Am.,' and rightly.

A. repens, Vahl. The specimens I have examined of this appear identical with Richardson's *glutinosa*, and with *A. viridis*, DC. It is omitted in Regel's Monograph.

SALIX. I am indebted to Dr. Andersson of Stockholm for the Arctic List of this genus, who has further kindly supplied the following observations.

Salix pentandra. In Lapponia et Siberia certissime occurrit, in Lapponia ad locum Enare (maxime septentrionem versus!), in terra Samojedorum, in Kamschatka infra circulum polarem. In America sub forma *lucida* ad Fort Franklin et Mackenzie River. Ibi itaque non ad floram arcticam pertinet.

S. lanata, L. In omnibus regionibus arcticis vulgaris.

S. Richardsoni, H., est *S. lanatae* forma Americana: cf. And. *l. c.* p. 13.

S. speciosa, H. et A. Species elegantissima, Americæ decus!

- S. Lapponum*, L. In Lapponia et Norvegia vulgaris. Terra Samojed. Siberia arctica ad Obdosek, etiam ibi rara. Ex America valde dubia: cf. And. *l. c.* p. 17.
- S. Stuartiana*, Sm. *S. Lapponum* est forma.
- S. caprea*. In Scandinavia ad promontorium boreale usque. In Rossia arctica (Kiola, terra Samojed.); in Siberia regiones tantum meridionales amat. In America non adest (ibi *S. capreoides*, And.).
- S. nigricans*. In Scandinavia omni etiam maxime boreali vulgaris. In Rossia Asiatica non circum polarem ascendit, terra Samojedorum excepta, ubi a Ruprecht observata. In Kamschatka adest. In America nondum inventa.
- S. punctata*, Ldbg. Est modificatio lævis *S. nigricantis*, in Lapponia tantum observata.
- S. phyllicifolia*, L. In Scandinavia omni boreali vulgaris. In Rossia arctica quidem occurrit, sed rarior. In America *S. discolor*, Muhl., *S. phyllicoides*, And., et *S. macrocarpa* in regionibus extra-arcticis eam repræsentant: cf. And. *l. c.* pp. 18, 19.
- S. myrtilloides*, L. (*S. pedicellaris* auct. Amer.).
- S. hastata*, L. In Lapponia vulgaris, Rossia arctica etiam incola. In America *S. cordata* hujus est forma analogæ.
- S. rhamnifolia*. Ad sinus St. Laurentii et in Unalasccha.
- S. ovalifolia*, Trautv. Ibidem.
- S. Arbuscula*. Vera Linnæi species Lapponia arctica est incola. Ex Rossia Asiatica ut etiam ex America dubia; in formis autem nostræ analogis ibi occurrit, regiones autem magis meridionales amat.
- S. glauca*, L. In regionibus arcticis omnibus vulgaris.
- S. desertorum*, Rich. *S. glauca* forma vel subspecies: cf. And. *l. c.* p. 23.
- S. villosa*, Don. *Salicis glauca* est forma vegeta: cf. Andersson, 'Salices boreali-Americanae,' p. 22.
- ? *S. arctica*, Br. Maxima vel polymorpha species regionibus omnibus arcticis peculiaris. Vereor ne sub nominibus variis (*S. myrsinites*, *S. retusa*, *S. ovalifolia*, *S. polaris*, &c.) formæ variæ hujus speciei ab auctoribus sæpe descriptæ sint. And. *l. c.* p. 23.
- S. cordifolia*, Psh. Partim ad *S. alpestrum*, And., partim ad *S. subcordatam*, And., pertinet: cf. And. *l. c.* p. 24.
- S. Pyrenaica*, G. In Lapponia et America (*S. cordifolia*, Pal. pro parte): cf. *S. alpestrum*, And., *l. c.* p. 27. Verisimiliter etiam in Siberia arctica occurrit sub speciebus plurimis diu cognitis latens obscura.
- S. myrsinites*, L. Sub plurimis formis in regione arctica ubique.
- S. reticulata*, L. In regionibus arcticis omnibus vulgaris.
- S. vestita*. *S. reticulata* est forma fruticosa et vegeta: cf. And. *l. c.* p. 29.
- S. nivalis*. *S. reticulata* est forma nana: cf. And. *l. c.* p. 29.
- S. herbacea*, }
S. polaris. } In regionibus omnibus arcticis vulgaris.

The following species, though enumerated as arctic by sundry authors, are not included by Dr. Andersson, who has the following remarks on them:—

- S. laurina*. Vere silvestris in Suecia non occurrit. In Europa centrali et australi magis vulgaris, regiones boreales non petit: proles forsan hybrida.
- S. Smithiana*. Ab ill. Ruprecht ad ostium fl. Mesen in terra Samojedorum lecta dicitur. Specimina nulla ex eo loco vidi, eamque ibi silvestrem esse dubito, potius *S. viminalis* forma latifolia. *S. viminalis* et *Smithiana* in Songaria endemicæ!
- S. mollissima*, Sm.=*S. Smithiana*. Vix in regionibus arcticis lecta.
- S. acuminata*, Sm. Auctoritate Ruprechtii terræ Samojed. a Ledebourio adscripta. Mihi forma *S. caprea* videtur! Species a *S. caprea* et *S. Smithiana* hybrida, raro occurrit.
- S. aurita*. In Scandinavia infra circulum polarem desinit. Rossicæ Asiaticæ a Fellman adscripta, sine dubio *immerito*. In terra Samojed. a Schrank lecta dicitur, attamen maxime dubito! E flora arctica certe excludenda. (In America *S. brachystachys*, Benth.)
- S. depressa*, L. Nomen in *S. vagans* mutandum: cf. And. *l. c.* p. 15, q. v.
- S. reptans* (Rich.? Ruprecht, Flora Samojed. p. 54). Specimina authentica non vidi; vereor ne forma sit *S. arcticæ*? vix autem, ut opinatur Ledebour, *S. glauca*.
- S. Finmarchica*, Fr. Species a *S. myrtilloidi* et *S. aurita* sine dubio hybrida, non supra circulum borealem detecta!
- S. Uva-ursi*, Psh. Nomen excludendum ut e *S. rhamnifolia*, *ovalifolia* et sequente compositum.
- S. Cutleri*, Tuck. In civ. New York: cf. And. *l. c.* pp. 26, 28.
- S. canescens*, Fr. Species a *S. Lapponum* cum *S. caprea*, *cinerea* et *aurita* hybrida, passim in Lapponia inferiore obvia. Ex ceteris regionibus incerta.
- S. Taymyrensis*, } Species hasce valde dubias judico. Potius *S. phyllicæfoliæ* v. *S. Ar-*
S. Boganidensis. } *busculæ* formæ pygmææ trunco subterraneo. Quidquam certi de
iis nondum enuntiare non audeo.
- S. repens*, L. Intra fines Lapponicæ non occurrit. Nec Asiam nec Americam borealem inhabitat. Itaque omnino excludenda!
- S. versifolia*, Wahlb., est species a *S. myrtilloidi* et *Lapponum* certissime hybrida, in Lapponia sporadica inventa. E Siberia arctica, prope Obdosck, signo (?) eam affert Ledebour. In regionibus extra Scandinavias, Livonia excepta, a me nunquam visa.
- S. glabra*, Scop. Nunquam extra alpes Europæ meridionalis observata!
- S. grandifolia* vera extra alpes Helvetiæ et Austriæ nondum observata!
- S. amygdalina*. Ad fluv. Tomea (infra circul. polarem) occurrit in Scandinavia. Nec in Rossia regiones subarcticas adpropinquat.
- S. cinerea*. In Lapponia subarctica non occurrit, etiam Asiam arcticam v. subarcticam fugit. In America vix adest.
- S. retusa*, L. In Lapponia non inventa. Species Rossicæ vix certæ, in *S. cuneatam* abeuntes. In America fit *S. phlebophylla*: And. *l. c.* p. 27.

LARIX Sibirica, Led. This, which is synonymous with *Ledebourii*, Endl., is neither American nor Western European. Its western limit is Archangel.

L. microcarpa, Lamb., is reduced by Asa Gray to a form of *Americana*, and, no doubt,

rightly. *L. pendula*, Ait., is the same plant; and I can find nothing to warrant the separation of *L. Dahurica*, F. & Turc., from these.

JUNIPERUS nana, Willd. Fries makes of this a variety of *communis*, L. (as do Watson, Koch, and Ledebour), which is distinguished by the broader, incurved leaves. Every intermediate grade of leaf may be found uniting them.

J. prostrata, Pers. The Arctic American plant is certainly nothing but a stunted form of *Virginiana*, and is with difficulty distinguished from *J. Sabina*, L.

MONOCOTYLEDONES.

SAGITTARIA variabilis, Engelm. This is extremely closely allied to and the representative of *S. sagittifolia*; it is chiefly distinguished by the absence of purple on the claw of the petals. The latter plant is Arctic Russian, but not Lapponian.

POTAMOGETON sparganifolius, Læst. Fries and Ledebour both retain this as a distinct species, the former noticing its very close affinity with *natans*.

P. tenuissimus, M. K. Fries makes of this a Lapponian variety of *pusillus*; Ledebour follows him.

P. nigrescens, Fr. Under this Fries doubtfully includes *lanceolatus*, E. Bot. He observes its very close affinity with *gramineus*, and that *P. coloratus*, Hoffm., is wholly intermediate.

P. heterophyllus, Schreb. Fries, Koch, and Ledebour all agree in considering this a form of *gramineus*, L.

TOFIELDIA borealis, Wahl., is the same with *T. palustris*, L.

VERATRUM viride, Ait. Asa Gray says of this, "too near the European *V. album*." The chief character lies in the breadth of the segments of the perianth, which, however, varies considerably in both.

V. Lobelianum, Bernh., is *album* β , floribus viridibus, of Chamisso and Ledebour, a very arctic form.

ALLIUM Sibiricum, L. Ledebour unites this with *Schænoprasum*; Fries keeps them distinct, regarding the latter as a cultivated plant only.

ORCHIS sambucina, L. The distribution of this is peculiarly wide in some respects for an Orchideous plant, extending diagonally through Europe from Lapland to the confines of N.E. Persia in Karabagh.

PERISTYLUS bracteatus, Torr. This and *P. Islandicus*, Lindl., are so very closely allied to *viridis*, that they can hardly rank as anything but forms of that plant. This would appear to be the opinion of Lindley and of the 'Flora Boreali-Americana.'

PLATANThERA hyperborea, Lindl. Iceland is the only European locality for this plant. From Lindley's observations and those in 'Flora Boreali-Americana,' there is no doubt that *dilatata*, Lindl., and *Kænigii*, Lindl., are states of the same. Asa Gray further adds that *Huronensis* is a synonym of *hyperborea*, and that *dilatata* is too near the same.

EPIPACTIS media, Fr. This its author makes a distinct species, and does not include the true *latifolia* in his Lapland list. Koch refers it to *rubiginosa*, Gaud., distinguished

from *latifolia* by the crispate callosities on the labellum. Watson includes the English *media* under *latifolia*, but doubts its being the same as Fries's plant. Bentham unites the English one, which I have seen under cultivation in Dr. Lindley's garden, where it was considered by that learned author to be a slight variety of *latifolia*, and essentially the same as Fries's *media*, though differing somewhat.

CYPRIPEDIUM acaule, Ait., is a synonym of *humile*, according to A. Gray.

C. Calceolus, L., is introduced into the Arctic European column on Ledebour's authority; it is not in Fries's List as an Arctic Lapland plant.

SISYRINCHIUM Bermudianum, L. The distribution of this plant is very extensive, reaching from the arctic circle to the Bahamas; and I strongly suspect that an Andean and Chilian species is identifiable with it.

S. anceps, Cav., is referred by A. Gray and others to a variety of *Bermudianum*, L.

SPARGANIUM hyperboreum, Læst., is *S. natans* β . *submuticum*, Hartmann; it is not in Fries's 'Summa,' where *S. natans* appears as an Arctic Lapland species.

NARTHECIUM Americanum, Ker. This, though kept up in all the American Floras, appears to me to be absolutely identical with the European *N. ossifragum*.

LUZULA spadicea, DC. All the species, &c., enumerated under this are considered varieties or synonyms, by Ernest Meyer in Ledebour's 'Flora Rossica.' *L. glabrata*, Hoppe, is distinct according to Fries, and is the *spadicea* γ of DeCandolle, and η *Kunthii* of E. Meyer; it is distinguished by the usually single-flowered pedicels. *L. parviflora*, Desv., also kept distinct by Fries, and found throughout Lapland, is *spadicea* ϵ of E. Meyer. *L. melanocarpa*, Desv., is considered a var. of *parviflora* by Asa Gray. *L. Wahlenbergii*, Rupr., is the same with *spadicea* η *Kunthii*, E. Meyer. For remarks on its distinctness from *glabrata* and *parviflora* see Ruprecht's 'Flor. Samojed.' Trautvetter (Plant. Taim.) observes that some of Ruprecht's *Wahlenbergii* probably belong to a var. of *hyperborea*.

L. pallescens, Wahl. Fries regards this as a species not yet fully established. Koch makes of it *multiflora*, var. ϵ . E. Meyer and Bentham unite it, *congesta*, and *multiflora* with *campestris*.

L. multiflora, Ehr., is *campestris* β of DC. and E. Meyer. Fries and Koch keep it distinct and include *congesta* under it.

L. hyperborea, Br. E. Meyer and most authors unite this with *arcuata*, Hook. Fries distinguishes it specifically by its plane leaves and capitate spikes.

L. vernalis, DC., is referred to *pilosa*, by Koch, E. Meyer, and most authors.

JUNCUS biglumis, L., and *triglumis*, L., are united by Bentham, and are possibly states of one plant, though always so distinguishable that most other authors keep them apart.

J. conglomeratus, L., and *effusus*, L., the two principal forms of *J. communis*, Ehr., are both arctic.

J. Balticus, Willd. Bentham observes that this is probably a luxuriant form of *arcticus*.

J. uliginosus, Roth. Fries and Koch keep this (the *supinus*, Mœnch.) distinct from *articulatus*. E. Meyer regards them as synonyms.

J. lampocarpus, Ehr., is *articulatus* α and β of Linnæus, fide Koch. E. Meyer unites it. According to Fries, it is not Scandinavian.

J. alpinus, Vill. I have followed E. Meyer, Fries, and Koch, in keeping this distinct, though Kunth unites it with *articulatus*, and in the 'Flora Boreali-Americana' it is put as a synonym of *uliginosus*.

J. compressus, Jacq., is the same with *bulbosus*, L.

J. Bothnicus, Wahl., is a synonym of *Gerardi*, according to Koch and E. Meyer, as is *cenosus*, Bich. fid. Fries and E. Meyer: the latter observes that *J. Gerardi* always grows in salt marshes, and *compressus* never.

J. atrofuscus, Rupr., is reduced to a synonym of *Gerardi* by E. Meyer in Ledebour, Fl. Ross.

CAREX. I am indebted to Dr. Boott for revising the list of Carices, which, as it stands, embodies his views as to the specific limits of the Arctic forms and their distribution.

SCIRPUS *Olneyi*, A. Gray. This appears to me nothing but a very slight variety of *S. triqueter*.

ERIOPHORUM *Chamissonis*, C.A.M., is regarded by Fries as identical with *capitatum*.

E. Scheuchzeri, Hoppe (*capitatum*, Host.), is distinguished from *capitatum* by the leaves scabrous at the margin, subglobose spike, and stoloniferous roots; it is not Scandinavian, but found in Arctic Greenland.

E. russeolum, Fr. Kept distinct by Fries, from its opaque mucronate scales and yellow-brown setæ. It is found only in Lapland and West Finland.

E. latifolium, L. I find it quite impossible to distinguish *gracile*, *angustifolium*, and *polystachyum* by any definite or constant characters, and revert to the Linnæan opinion that all are forms of one, in which Bentham concurs.

GRAMINEÆ.—This list has been twice most carefully revised by Col. Munro, who regards all the names brought under others as undoubted varieties or synonyms. I have in the following notes invariably put foremost the views of Grisebach (Flor. Ross.) and Andersson, as those of the two best and most accurate authors on Northern Grasses with whom I am acquainted. Andersson's in particular is an excellent work in all respects; he keeps up many critical species, but indicates in all cases accurately their intermediate positions, and recognizes the trivial nature of their characters.

ALOPECURUS *ovatus*, Horn., is *alpinus* β . *borealis* of Trinius and Grisebach, in Ledebour (Fl. Ross.), according to whom the α . *Scoticus* does not occur in Russia. *A. alpinus*, L., does not occur in Andersson's 'Gramineæ Scandinaviæ.'

A. Ruthenicus, Wein. This, a synonym of *nigricans*, Hornemann, is kept distinct by Fries, Andersson, and Grisebach. Fries says of a variety *pusillus*, "fere *A. alpinus*, Sm.;" again, of *nigricans*, "*A. pratensi* valde affinis."

A. aristulatus, Mich. Kept distinct by Asa Gray; it is the *geniculatus*, var. β , of Torrey's Flora.

A. fulvus, Sm., is kept up by Grisebach and Fries. It is considered the same as *aristulatus* in 'Flor. Bor.-Am.' Andersson says of it, "*A. geniculato* valde affinis ejusque varietati *fluitanti* nimium similis."

BECKMANNIA erucaeformis, Host. The distribution of this plant is most extraordinary : in Europe it is absent in the whole north, west, and central area, but extends from N. Italy to Middle Russia through Greece. In Asia it is found in Mesopotamia, Persia, Caucasus, Siberia, N.E. Asia, and Japan. In America it inhabits the whole west coast from Oregon to California, the Rocky Mountains, the Saskatchewan, and passes down the Mackenzie to beyond the arctic circle. It is absent in the North and Central United States, but was found at St. Louis by Drummond. It is omitted in 'Flora Boreali-Americana.'

AGROSTIS alpina, Wahl. The *alpina* of Scopoli is kept distinct by Grisebach. Fries includes a Lapland plant of Villars's of that name under *rupestris*, All., as Laponian. Andersson reduces *alpina*, Wahl., to *rubra*, and observes that it is a very northern plant, hardly known out of Scandinavia. I follow Munro in bringing *alpina* under *rubra*, L., though I must confess I do not see why in that case *A. rupestris*, All., should not follow. The true *A. alpina* of Scopoli, said to have been once found on the Loffoden Islands, is excluded by Andersson. The true *A. rupestris*, All., according to Blytt and Andersson, is not Scandinavian.

A. alba, L. I follow Munro in uniting this (*polymorpha*, Huds.) with *vulgaris*. Grisebach keeps it distinct.

DEYEUXIA and *CALAMAGROSTIS*. I have implicitly followed Munro in these genera, being quite unable to arrive at any satisfactory conclusion regarding them.

D. Canadensis, P. B. Durand is the only authority for this being a South Greenland plant; but as he does not mention *varia*, *strigosa*, or *lanceolata* (all reputed Greenland plants), I hesitate to admit it.

D. neglecta, Rupr. and Ehr., is a synonym of *stricta*, according to Grisebach, Fries, and Andersson. It is kept distinct from *Lapponica* by all.

D. chalybæa, Fries, is kept distinct by its author and Andersson, who observes of it, "*C. Lapponicæ* simillima, sed non parum diversa." It is the *Lapponica* β . *chalybæa* of Læstad.

D. purpurascens, Br. Asa Gray refers this doubtfully to *sylvatica*, DC. (Manual Bot. N. U. S.); Torrey more confidently (see 'Flor. Bor.-Am.').

D. Grænländica, E. M. This is one of Kunth's unknown species (Agrost. 239) referred here by Col. Munro. It is not referred to in Lange's Greenland list. It is also a Labrador plant, according to E. Meyer.

D. montana, Host., is the *Arundo varia* of Wahlenberg. Fries gives the Baltic Islands as its only Scandinavian habitat.

D. Hartmanniana, Fr., is kept distinct by Andersson and Grisebach; but Fries considers it insufficiently established. Andersson says of it, "pulcherrima species, inter *Hallerianam* et *sylvaticam* fere media;" he places it next *strigosa*. I follow Munro in bringing it under *varia*.

D. aleutica, Bong. Kept up by Grisebach; but Col. Munro considers it identical with *strigosa*.

D. Langsdorffii, Tr. Kept up by Grisebach, but considered by Munro the same with *purpurea*.

D. elata, Blytt, is the form β . *major* of *phragmitoides*, according to Andersson, which approaches *lanceolata*.

CALAMAGROSTIS *litorca*, DC., is a synonym of *laxa*, Host., according to Grisebach. According to Fries, it is an insufficiently defined species. Andersson observes its extremely close affinity with *Epigejos*.

C. Halleriana, Gaud. A distinct species, according to Grisebach, Fries, and Andersson, who, however, says (under *lanceolata*, var. *cinerascens*), "*C. Hallerianæ* proxima," and, again, "inter *C. lanceolatam* et *phragmitoidem* omnino media videtur."

C. phragmitoides, Hartm. Also kept up by Grisebach, Fries, and by Andersson, who observes of one variety, "*C. Hallerianæ* analoga;" of another, "ad *C. lanceolatam* quodammodo vergens;" and of a third, "a *C. lanceolata* difficile dignoscitur."

HIEROCHLOE *racemosa*, Tr., is a synonym of *pauciflora*, according to Grisebach.

DESCHAMPSIA *brevifolia*, Br. This, the *Aira arctica*, Tr., who elsewhere regards it as a var. of *cæspitosa*, is kept up by Grisebach. Fries reduces it. Andersson remarks of *brevifolia*, Hn., that it is very remarkable from resembling a hybrid between *cæspitosa* and *flexuosa*.

TRISETUM *agrostideum*, Tr., is kept distinct from *subspicatum* by Andersson, Grisebach, and Fries. Andersson remarks that it is so entirely intermediate between *flavescens* and *subspicatum*, that it is extremely difficult to say to which it is best referred.

T. Sibiricum, Rupr. (*Aira Ruprechtii*, Griseb.), is distinguished by Grisebach by its much larger scabrous-bearded florets. Andersson observes how very near it is to *agrostideum*.

PHIPPSIA *monandra*, H. & A., is a synonym of *algida*, according to Grisebach. It is *algida* β of Kunth. It is kept distinct in 'Flor. Bor.-Am.'

CATABROSA *aquatica*, Br. Durand gives this as a native of Greenland, lat. 65° N.

COLPODIUM *pauciflorum*, Hook. Only one habitat is known for this; it may be a reduced or starved state of *latifolium*; but much better specimens are required to determine the point.

C. arundinaceum, Hook., is *latifolium* β , Trinius and Grisebach, and is reduced to a synonym by Andersson.

C. fulvum, Tr. Andersson doubts whether this and *pendulinum* are really distinct species; and judging from the fine specimen in Herb. Hook., I am disposed to think, with reason.

Poa deflexa, Rupr., *remotiflora*, Rupr., and *similis*, Rupr., all of Samoyedland, are all reduced by Grisebach to *Colp. pendulinum*—the last as a variety, the two first as synonyms.

P. scleroclada, Rupr., *latiflora*, Rupr., and *pæcilantha*, Rupr., all of Samoyedland, are reduced by Grisebach to synonyms of *Colp. fulvum*.

DUPONTIA *Fisheri*, Br., was named after Mr. Fisher, one of Parry's officers, and should not be written *Fischeri*.

D. psilosantha, Tr., of which *Poa pelligera*, Rupr., is a synonym, according to Grisebach, is kept by that author as a distinct species.

GLYCERIA arctica, Ilk., is certainly only a starved state of *fluitans*. Durand gives this as a native of Greenland, lat. 68° N.

POA airoides, Nutt., is identical with *Atropis distans*, Griseb.

P. angustata, Br. (*Atropis*, Griseb.), is kept distinct by Grisebach with *P. Nutkaensis* as a synonym; it is a very arctic form.

P. angustifolia, L., is *pratensis* γ of Grisebach; it is rare in the arctic regions. Andersson refers it, with a query, to *serotina*.

P. trivialis, L., is kept distinct by Grisebach, Fries, Andersson, and almost all authors; it is also arctic. Fries doubts the identity of the Linnæan plant.

P. nemoralis, L. I have followed Munro in bringing together the following names, which, whether species or no, are not to be discriminated by arctic stunted specimens; he considers them all forms of one:—

P. cæsia, Smith, is kept up by Grisebach and Andersson, with *aspera*, Gaud., as a synonym; Fries also keeps it distinct; Andersson indicates its extremely close affinity with *nemoralis*.

P. Grænländica, Steud., is nothing but *serotina*, Ehr., which is kept up by Grisebach, Fries, Asa Gray, and Andersson.

P. bryophila, Tr. Called arctic by Grisebach, who has never seen the plant; but I do not find the locality (Fret. Senjawin) in any map. Munro reduces it to *nemoralis*.

P. Vahliana, Liebm., Flor. Dan. 2401, is but a slight variety of *nemoralis*.

P. laxa, Hænke. Grisebach, Andersson, and Fries all keep this distinct from *flexuosa*. In 'Flor. Bor.-Am.' they are treated as synonyms. For remarks on its affinities, see Andersson (Gram. Scand.).

P. Cenisia, All. Grisebach keeps this distinct, but refers *Cenisia* of Fries's Herb. Norm. to *arctica*, Br. (*flexuosa*, Wahl.). Fries refers *flexuosa*, Wahl., to *Cenisia*. Andersson considers *Cenisia* hardly distinct from *arctica*, Br.

P. arctica, Br. Kept distinct by Grisebach, who makes *flexuosa*, Wahl., a synonym of it. It is *flexuosa* β of Trinius, and *laxa*, Br. in Ross's Voyage.

P. abbreviata, Br. Unknown to Grisebach, and reduced by Munro. Fries and Andersson reduce *abbreviata*, Blytt, to *Cenisia*, var. *depauperata*.

FESTUCA Richardsoni, Hook. Durand, on Torrey's authority, gives what Torrey doubtfully considers a variety of this plant as a native of Greenland. I know of no species to which *Richardsoni* is closely allied, except the Rocky Mountain var. *F. scabrella*, of which it may be a hirsute form.

F. ovina, L. I follow Munro and Bentham in reducing *rubra* and *duriuscula*, and the former authority in bringing *Kæleria hirsuta* and *F. brevifolia* here. The latter is a marked small form, but passes gradually into *rubra*. Andersson keeps up *ovina*, *duriuscula*, and *rubra*, bringing *arenaria* under the last, and *sabulosa* under the first. Grisebach keeps up *ovina*, L., with *duriuscula* as var. δ ; also *rubra*, L., with *arenaria* as var. β , and *Kæleria hirsuta* (of which I know nothing) as distinct from both; but Munro reduces all to *ovina*, L. Fries unites *arenaria* and *rubra*, keeping *duriuscula* and *ovina* distinct.

F. brevifolia, Br. Brown says of this (Flora of Melville Island), "forsan nimis affinis *F. ovinae*."

BROMUS *inermis*, Leys., and *purgans*, L., are both kept distinct from *ciliatus*, L., by Grisebach. I am indebted to Munro for their identification, together with that of *pictus*, mihi, which is undoubtedly *ciliatus*, L. Asa Gray refers *purgans* to *ciliatus*. Durand mentions this plant as a native of Greenland, lat. 65°, under the name of *B. Kulmii*? according to Dr. Torrey.

TRITICUM *violaceum*, Horn. Fries keeps this distinct; but Blytt suspects it to be a variety of *T. caninum*. Andersson observes that it is an alpine and arctic plant, not uncommon in Greenland, altogether intermediate between *caninum* and *repens*, and concludes "nonne attamen modificatio alpina?"

Since the printing of the foregoing paper, I have received, through the kindness of Dr. Asa Gray, particulars of the discovery of *Calluna vulgaris* near Tewksbury, Massachusetts, by Mr. Jackson Dawson, occurring rather abundantly over about half an acre of boggy ground, amongst various strictly American plants. This tends to confirm the statement of De la Pylaie, that *Calluna* is an inhabitant of Newfoundland.

J. D. HOOKER.

Kew, Oct. 11, 1861.

ERRATUM.

At p. 317, line 8, after "regions" add "of Europe and Asia."