STATISTICS

OF THE

FLORA OF THE NORTHERN UNITED STATES.

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WHILE engaged in the preparation of a second edition of the *Manual of the Botany of the Northern United States*, I was requested by an esteemed correspondent, upon whose judgment I place great reliance, to exhibit, in a compendious and convenient form, the elements of the flora I was occupied with. I accede to this request only because I may be presumed to possess considerable facilities for collecting and correcting a portion of the required data. But I cannot command the time needed for a proper elaboration and discussion of these materials, nor have I any special aptitude for this kind of research. I may, however, collect and arrange the principal data; for the use of those better qualified to discuss them, and to indicate their bearings upon many questions of the highest scientific interest, respecting the geographical distribution, the mutual relations, the nature, and the origin of the existing species of plants;—questions some of them so speculative or so difficult that they are not likely to be conclusively answered in our day; others more nearly within our reach; but all perhaps capable of some elucidation from the critical comparison of the flora of any one considerable region with the vegetation of other parts of the world.

The work,* which forms the basis of the following statistics of the botany of the Northern United States, has now been extended in geographical area beyond the limits of the Northern States, politically so called; inasmuch as this area includes Virginia and Kentucky, and stretches westward to the Mississippi River. The southern boundary of 36° 30′ has been adopted (instead of Mason and Dixon's line) because it coincides better than any other direct geographical line with the natural division between the cooler-temperate and the warm-temperate vegetation,—between the flora of the northern and of the southern Atlantic states. Few characteristically southern plants advance to the north of it, and those chiefly on the coast of the low south-eastern corner of Virginia, in the Dismal Swamp, and the environs of Norfolk. Could we vary the line where it intersects the longitude of Washington, carrying it north until it reaches James River, and thence due east again, the small quadrangle thus excluded would exclude nearly all the properly southern indige-

* Manual of the Botany of the Northern United States; second edition; including Virginia, Kentucky, and all east of the Mississippi: arranged according to the Natural System; by ASA GRAY, (the Mosses and Liverworts by WM. S. SULLIVANT). With 14 plates, illustrating the Genera of the Cryptogamia. New York: George P. Putnam & Co., 1856.

nous plants now comprised in the volume,* and mark the true division eastward between our southern and our northern botanical regions, namely, at the northern limit of the Live Oak, the Long-leaved Pine, and the Black Moss (*Tillandsia usneoides*), which grows pendent from their boughs.

On the Mississippi, the plant most southern in character which crosses the parallel is *Jussiæa repens.* This sparingly extends up the Ohio to lat. 38°, where also the *Taxodium* reaches about as far north as on the Atlantic coast.

In the elevated region through which the middle of our southern boundary passes, great numbers of northern plants are of course found to extend much farther southward.

Our western boundary, the Mississippi River, while it takes in a considerable prairie-region, excludes nearly all the plants peculiar to the wide western woodless plains, which stretch from the Saskatchewan to Texas and New Mexico, and approach our borders in Minnesota and Iowa. A list of the plants which we may be said to have derived from this region will be given hereafter.

The northern boundary, being that between the United States and British America, varies through about five degrees of latitude, and nearly embraces Canada proper on the east and on the

* It would apparently exclude from the flora of the Northern States the following species:—

Gordonia Lasianthus.
Stuartia Virginica.
Zanthoxylum Carolinianum.
Berchemia volubilis.
Viburnum obovatum.
Mitreola petiolata.
Liatris odoratissima.
" paniculata.
Sericocarpus tortifolius.
Chrysopsis gossypina.
Baccharis glomeruliflora.
Kalmia hirsuta.
Ilex Cassine.
" myrtifolia.
" Dahoon.
Gelsemium sempervirens.
Forsteronia difformis.
Olea Americana.
Fraxinus platycarpa.
Benzoin melissæfolium.
Tetranthera geniculata.
Stillingia sylvatica.
Quercus virens.
" cinerea.
Sagittaria falcata.
Burmannia biflora.
Tillandsia usneoides.
Smilax Walteri.
" lanceolata.
Zygadenus glaberrimus.
Mayaca Michauxii.
Pæpalanthus flavidus.
Lachnocaulon Michauxii.
Vilfa Virginica.
Ctenium Americanum.
Uniola paniculata.
Paspalum distichum.
" Digitaria.

Probably a good many more southern species inhabit this corner of Virginia, of which I have as yet no indications. There is little doubt that the long-leaved Pine crosses the line, and perhaps an arborescent *Yucca* grows on the sea-shore.—Of characteristically southern trees that have found their way still farther northward on the coast, even beyond Virginia, I can only mention two, namely, the Red Bay (*Persea Carolinensis*) and the Bald Cypress (*Taxodium distichum*), both found in Delaware, a little beyond lat. 38° 30′. Two other characteristic trees, viz., the Palmetto and *Magnolia grandiflora*, stop about as far short of our line as the two former pass beyond it.

west; so that the volume in question probably contains nearly all the plants of Canada East, south of the St. Lawrence and of lat. 47°, and of Canada West, south of lat. 46°, or perhaps 45°. Our northern boundary rises highest at its western extremity, even to lat. 49°. But the botany of the district beyond Fond du Lac, lat. 47°, is little known. Probably many plants of the northwestern plains are to be found there, which are otherwise strangers to our region, as well as all or most of the species known to occur on the northern but not on the southern shore of Lake Superior.*

A list of the additional Canadian species, as far as now known, is appended.†

The simplicity of our flora, as a purely northern temperate one, is preserved by the absence throughout our limits of high mountains and of any considerable extent of elevated land, es-

* The following Phænogamous plants, contained in Prof. Agassiz's published list of the plants gathered on the north shore of Lake Superior, in his expedition made in 1848, are not included in the Botany of the Northern States, viz.:

Ribes oxyacanthoides.
Lonicera involucrata.
Corispermum hyssopifolium.
Tofieldia calyculata vel palustris.
Carex Vahlii.

To which I may add, that obscure and ambiguous Grass, the *Aira melicoides*, Michx., (Graphephorum, *Beauv.*). The last two, viz., *Tofieldia palustris* and *Carex Vahlii*, with an interesting Fern, *Allosorus acrostichoides*, are in Prof. Whitney's list (in Messrs. Foster and Whitney's Report on the Geology of the Lake Superior Land District, 1851), and having been gathered on Isle Royale, strictly claim admission into our Flora. But I was not aware in time that Isle Royale fell within the limits of the United States; and, seeing that in any case it geographically and botanically pertains to the northern shore, where the vegetation begins to display a subalpine character, which it does not upon the south side, I determined to take the southern shore of the lake for our boundary.

† This list includes the few just enumerated as found on the immediate coast of Lake Superior, although only one of the seven, viz., Ribes oxyacanthoides, is truly Canadian. Three of them come from the northwest and west, and three from the Hudson's Bay country. I exclude the introduced species, reckoning among these *Hesperis matronalis*, *Sisymbryum Sophia*, &c.: also all those mentioned as Canadian by Pursh, which have not been confirmed by later observers.

Aquilegia vulgaris (A. brevistyla, *Hook.*).
Turritis patula.
" retrofractra.
Thlaspi alpestre (?)
Linum perenne.
Oxytropis Lamberti (?)—the plant of Quebec, so-called.
Ribes oxyacanthoides.
Lonicera involucrata.
Hieracium vulgatum.
Nardosmia frigida.
Matricaria inodora.
Aster Cornuti.
Gentiana acuta.
Polemonium cæruleum.
Corispermum hyssopifolium.
Elæaguus argentea.
Tofieldia palustris.
Goodyera (Spiranthes, *Hook.*) decipiens
Carex Vahlii.
Graphephorum melicoides. (Poæ sp.?)
Elymus Europæus, *ex Hook.*
Allosorus acrostichoides.

So far as we know at present, therefore, only 22 indigenous Phænogamous species and Ferns (of which 12 are also European) would therefore be added, by comprising Canada proper, that is, the country bordering the north of the St. Lawrence and of the Great Lakes.

pecially at the north, and the consequent paucity of truly alpine or even subalpine species. We have an alpine region indeed; but it is restricted to a few isolated mountain-tops in the northern part of New England and New York, between or near lat. 44° and 45°. The White Mountains of New Hampshire furnish far the larger part, viz., the range strictly so called, with six or seven square miles (taken horizontally) of alpine region, of which the highest point slightly exceeds 6200 feet in elevation, and its lower limit is about 4500 feet above the level of the sea, and Mount Lafayette (reaching to 5200 feet) along with other smaller patches, together making up almost as much more. Mount Katahdin in Maine (about 5300 feet high) may furnish a square mile or so of alpine region. The Green Mountains of Vermont (with a maximum elevation of 4360 feet) present mere vestiges of alpine vegetation in one or two places; and two or three summits of the Adirondack Mountains of northeastern New York (with a maximum elevation said to exceed 5400) are of a more decidedly alpine character, but apparently of small extent and far from rich in species.

The southern shore of Lake Superior affords no alpine and perhaps no strictly subalpine species; nor do any occur in the Alleghany Mountains, although they rise to above 5000 feet at one point in the south of Virginia,* and to 6000 and about 6300 in North Carolina. *Scirpus cæspitosus*, *Lycopodium selago*, *Andræa petrophila*, and *Cetraria Islandica*, are the most nearly alpine species known in the Alleghany Mountains. As will be seen by the list on a following page, the number of our truly alpine species does not equal that of the southern plants which have extended into the low southeastern corner of Virginia.

After that of Europe, no northern temperate flora of equal extent, and perhaps no flora of any large region, is so well known as that of the Northern United States, at least as to its Phanerogamia and highest Cryptogamia: and although very much still remains to be done, yet we are now in condition profitably to compare our vegetation with that of Europe, and also, though less critically, with that of other parts of the northern temperate zone.

The following tables exhibit the principal elements of our flora, and some of its relations to the European, &c.

* The White Top Mountain in Virginia, just within its southern boundary, is commonly said to be about 6000 feet in elevation; but this is probably an exaggeration.

List of the Natural Orders of the Flora of the Northern United States, with the number of Genera and Species comprised in them,—distinguishing the introduced and the indigenous Species,—and of the indigenous Species common to this district and to Europe.

Class I. DICOTYLEDONÆ S. EXOGENÆ.

Orders.	Whole No. of Genera.	No. of Genera with Indigenous Species.	No. of Introduced (naturalized and adventive) Species.	Whole No. of Species.	No. of Indigenous Species.	No. of our Indigenous Species common to Europe.
Subclass. I. Angiospermæ.						
Ranunculaceæ,	21	20	6	55	49	10
Magnoliaceæ,	2	2		6	6	
Anonaceæ,	1	1		1	1	
Menispermaceæ,	3	3		3	3	
Berberidaceæ,	5	5	1	6	5	
Nelumbiaceæ,	1	1		1	1	
Cabombaceæ,	1	1		1	1	
Nymphæaceæ,	2	2		3	3	1
Sarraceniaceæ,	1	1		2	2	
Papaveraceæ,	6	2	5	7	2	
Fumariaceæ,	4	3	1	7	6	
Cruciferæ,	20	16	14	60	46	11
Capparidaceæ,	1	1		1	1	
Resedaceæ,	1		1	1		
Violaceæ,	2	2	1	19	18	1
Cistaceæ,	3	3		7	7	
Droseraceæ,	1	1		4	4	2
Parnassiaceæ,	1	1		3	3	1
Hypericaceæ,	3	3	1	19	18	
Elatinaceæ,	1	1		1	1	
Caryophyllaceæ,	19	11	17	47	30	13
Portulacaceæ,	4	3	1	5	4	
Malvaceæ,	9	7	6	15	9	
Tiliaceæ,	1	1		2	2	
Camelliaceæ,	2	2		2	2	
Linaceæ,	1	1		2	2	
Oxalidaceæ,	1	1		3	3	2
Geraniaceæ,	2	1	2	5	3	1
Balsaminaceæ,	1	1		2	2	
Limnanthaceæ,	1	1		1	1	
Rutaceæ,	2	2		3	3	
Anacardiaceæ,	1	1		6	6	
Vitaceæ,	2	2		7	7	
Rhamnaceæ,	4	4	1	7	6	
Celastraceæ,	2	2		3	3	
Sapindaceæ,	4	4	1	11	10	
Polygalaceæ,	1	1		13	13	
Leguminosæ,	36	33	14	105	91	4
Rosaceæ,	18	17	5	76	71	16

CLASS I—*continued.*

Orders.	Whole No. of Genera.	No. of Genera with Indigenous Species.	No. of Introduced (naturalized and adventive) Species.	Whole No of Species.	No. of Indigenous Species.	No of our Indigenous Species common to Europe.
Calycanthaceæ,	1	1		3	3	
Melastomaceæ,	1	1		3	3	
Lythraceæ,	4	4	1	8	7	1
Onagraceæ,	9	9		36	36	10
Loasaceæ,	1	1		1	1	
Cactaceæ,	1	1		1	1	
Grossulaceæ,	1	1		7	7	1
Passifloraceæ,	1	1		2	2	
Cucurbitaceæ,	3	3		3	3	
Crassulaceæ,	3	3	1	6	5	
Saxifragaceæ,	11	11		22	22	5
Hamamelaceæ,	3	3		3	3	
Umbelliferæ,	26	21	5	42	37	2
Araliaceæ,	1	1		6	6	
Cornaceæ,	2	2		11	11	
Caprifoliaceæ,	7	7		27	27	3
Rubiaceæ,	9	9	1	24	23	4
Valerianaceæ,	2	2	1	8	7	
Dipsaceæ,	1		1	1		
Compositæ,	83	67	27	300	273	9
Lobeliaceæ,	1	1		12	12	1
Campanulaceæ,	2	2		5	5	1
Ericaceæ,	27	27		62	62	19
Galacineæ,	1	1		1	1	
Aquifoliaceæ,	2	2		10	10	
Styracaceæ,	3	3		5	5	
Ebenaceæ,	1	1		1	1	
Sapotaceæ,	1	1		2	2	
Plantaginaceæ,	1	1	2	8	6	1
Plumbaginaceæ,	1	1		1	1	1
Primulaceæ,	11	10	1	17	16	6
Lentibulaceæ,	2	2		12	12	4
Bignoniaceæ,	4	2	2	4	2	
Orobanchaceæ,	4	4		5	5	
Scrophulariaceæ,	26	24	11	65	54	10
Acanthaceæ,	2	2		3	3	
Verbenaceæ,	4	2	3	10	7	
Labiatæ,	33	21	22	71	49	4
Borraginaceæ,	11	5	9	25	16	3
Hydrophyllaceæ,	4	4		11	11	
Polemoniaceæ,	4	4		12	12	1
Convolvulaceæ,	7	5	5	20	15	1
Solanaceæ,	6	2	6	10	4	
Gentianaceæ,	9	8	3	27	24	2
Apocynaceæ,	3	3		4	4	
Asclepiadaceæ,	5	4	1	22	21	

CLASS II—*continued.*

Orders.	Whole No. of Genera.	No. of Genera with Indigenous Species.	No. of Introduced (naturalized and adventive) Species.	Whole No of Species	No. of Indigenous Species.	No of our Indigenous Species common to Europe.
Oleaceæ,	5	4	1	10	9	
Aristolochiaceæ,	2	2		6	6	
Nyctaginaceæ,	1	1		1	1	
Phytolaccaceæ,	1	1		1	1	
Chenopodiaceæ,	9	7	11	21	10	6
Amarantaceæ,	6	5	9	14	5	
Polygonaceæ,	4	3	10	32	22	6
Lauraceæ,	4	4		5	5	
Thymeleaceæ,	1	1		1	1	
Elæagnaceæ,	1	1		1	1	
Santalaceæ,	2	2		3	3	
Loranthaceæ,	1	1		1	1	
Saururaceæ,	1	1		1	1	
Ceratophyllaceæ,	1	1		1	1	1
Callitrichaceæ,	1	1		3	3	3
Podostemaceæ,	1	1		1	1	
Euphorbiaceæ,	9	9	5	33	28	
Empetraceæ,	2	2		2	2	1
Urticaceæ,	11	10	4	19	15	1
Platanaceæ,	1	1		1	1	
Juglandaceæ,	2	2		9	9	
Cupuliferæ,	6	6		25	25	1
Myricaceæ,	2	2		3	3	1
Betulaceæ,	2	2		10	10	4
Salicaceæ,	2	2	4	28	24	3
Subcl. II. GYMNOSPERMÆ.						
Coniferæ,	8	8		20	20	2
Total,	622	522	223	1713	1490	180

CLASS II. MONOCOTYLEDONEÆ seu ENDOGENÆ.

Araceæ,	6	6		7	7	2
Typhaceæ,	2	2		7	7	6
Lemnaceæ,	1	1		5	5	4
Naiadaceæ,	5	5		16	16	12
Alismaceæ,	5	5		12	12	4
Hydrocharidaceæ,	3	3		3	3	2
Burmanniaceæ,	1	1		1	1	
Orchidaceæ,	17	17		51	51	10
Amaryllidaceæ,	4	4		4	4	
Hæmodoraceæ,	3	3		4	4	
Bromeliaceæ,	1	1		1	1	
Iridaceæ,	2	2		6	6	
Dioscoreaceæ,	1	1		1	1	
Smilaceæ,	3	3		18	18	

CLASS I—*continued.*

Orders.	Whole No. of Genera.	No. of Genera with Indigenous Species.	No of Introduced (naturalized and adventive) species.	Whole No. of Species.	No. of Indigenous Species.	No. of our Indigenous Species common to Europe.
Liliaceæ,	12	9	4	28	24	5
Melanthaceæ,	12	12		21	21	1
Juncaceæ,	3	3		26	26	14
Pontederiaceæ,	3	3		4	4	
Commelynaceæ,	2	2		6	6	
Xyridaceæ,	2	2		4	4	
Eriocaulonaceæ,	3	3		5	5	1
Cyperaceæ,	16	16	1	214	213	48
Gramineæ,	65	55	32	194	162	32
	172	159	37	638	601	141
Total Phænogamous Plants.	794	681	260	2351	2091	321

CLASS III. ACROGENÆ.

Equisetaceæ,	1	1		10	10	8
Filices,	20	20		49	49	20
Lycopodiaceæ,	2	2		12	12	6
Hydropterides (Marsileaceæ),	2	2		4	4	1
	25	25	0	75	75	35

CLASS IV. ANOPHYTA.

Musci,	80	80	0	394	394	255
Hepaticæ,	38	38	0	108	108	65
Total,	118	118	0	502	502	320
Total Cryptogamia, Cl. 3 and 4,	143	143	0	577	577	355
Total of the 4 Classes,	937	824	260	2928	2668	676

It is plain enough that the numbers in this tabular view must be essentially influenced throughout by one's views as to the limitation of species and genera. In the hands of a few botanists, the flora of the Northern States might exhibit a somewhat smaller number of species than it here does; but with most, there would undoubtedly be a stronger tendency in the opposite direction. As it is obviously impossible at present to reduce the various ideas and shades of difference that prevail respecting species to one common standard, all that can be done is to indicate the bias, or what astronomers call the *personal equation*, of each author, which must be duly considered when different

floras are to be compared. This is not the place to discuss the principles involved in the general question, nor to explain or defend any conclusions to which I may have arrived;—except to say that my determination of species in each particular case has been based on the evidence before me as irrespective of all theoretical considerations as possibly could be. It is necessary to state, however, that, so far as I can judge, the authors of the principal and most esteemed recent European Floras, if in my place, would be likely to increase the present number of our Phænogamous plants and Ferns about five per cent. One school, indeed, would doubtless add at least ten or twelve per cent. to the species here received, and give results quite incommeasurable with my own. I can only say, on my own part, that an enlarged experience certainly inclines one to take broader views of species than those which prevail among the generality of European botanists.

The numerical comparison of our Phænogamous with our Cryptogamous species, however interesting it might become in a complete flora, is here of little moment; only the higher Cryptogamia being included. Moreover, it should be noted that the *Musci* and *Hepaticæ* enumerated in the above table are those of a geographical area about twice that of the higher or Acrogenous Cryptogamia and the Phænogamia. For the distinguished American muscologist who elaborated these two orders for our 'Botany of the Northern States,' anxious to afford facilities for the study of our mosses throughout the country, has included all known to him within the whole United States east of the Mississippi, and even some as yet found only to the north and west of these limits. It is evident, also, that the number of forms admitted as species is proportionally larger in these two orders than in the rest of the work. On the other hand it is to be considered how little our mosses have as yet been collected and studied, and how likely it is, in view of their general wide range, that most of these outlying species may yet be detected within the Northern States, including Virginia and Kentucky.

We naturally restrict our attention mainly to the Phænogamous vegetation, as best known in all countries and affording the most precise data for comparison. And we exclude at once the 260 *introduced* species, most if not all of which have become denizens of our country since its settlement by Europeans, and in consequence of that settlement;—leaving the question of their origin, introduction, &c., for future consideration. Their admission into the account in the comparing our flora with that of Europe, as has been done, seriously vitiates our conclusions.*

* Thus Mr. Watson, as cited by Alph. DeCandolle (Geogr. Bot. p. 511) enumerates 602, out of 1428 phænogamous British plants, as common to Great Britain and America. I count only 321 out of 2091 phænogamous species *indigenous* to the Northern United States as indigenous also to Europe.

The numerical elements of our Phænogamous flora, considered as to classes, are, as the tabular view shows:

Dicotyledoneæ or Exogenæ,	1490 species in	522 genera.
Monocotyledoneæ or Endogenæ,	601 "	159 "
Total Phænogamous indigenous plants,	2091 "	681 "

Or about 2½ Dicotyledonous to one Monocotyledonous species.

Their distribution among the 132 Natural Orders represented in our flora (*Resedaceæ* and *Dipsaceæ* of the above table being excluded, as having no indigenous representatives), is shown in the following:

List of the principal Phænogamous Natural Orders represented in the flora of Northern United States, arranged according to the number of indigenous species they severally comprise.

	Species.		Species.
Compositæ,	273	Liliaceæ,	24
about ⅛th of the 2091 Phanerogamia.		Rubiaceæ,	23
Cyperaceæ, about $\frac{1}{10}$th, "	213	Saxifragaceæ,	22
Gramineæ, about $\frac{1}{13}$th, "	162	Polygonaceæ,	22
Leguminosæ, about $\frac{1}{24}$th, "	91	Asclepiadaceæ,	21
Rosaceæ, about $\frac{1}{25}$th, "	71	Melanthaceæ,	21
Ericaceæ,	62	Coniferæ,	20
Scrophulariaceæ,	54	Violaceæ, Hypericaceæ, and	
Orchidaceæ,	51	Smilaceæ, each	18
Ranunculaceæ,	49	Primulaceæ, Borraginaceæ,	
Labiatæ,	49	and Naidaceæ, each	16
Cruciferæ,	46	Convolvulaceæ and Urticaceæ,	
Umbelliferæ,	37	each,	15
Onagraceæ,	36	Polygalaceæ,	13
Caryophyllaceæ,	30	Lobeliaceæ, Lentibulaceæ, Pole-	
Euphorbiaceæ,	28	moniaceæ, and Alismaceæ, each,	12
Caprifoliaceæ,	27	Cornaceæ, and Hydrophyllaceæ,	
Juncaceæ,	26	each,	11
Cupuliferæ,	25	Sapindaceæ, Aquifoliaceæ, Che-	
Salicaceæ,	24	nopodiaceæ, and Betulaceæ,	
Gentianaceæ,	24	each,	10

Only 46 of our orders have 10 or more indigenous species: 63 orders have from 2 to 9 species, and 23 orders are represented each by a single species. The average allows 15·09 species to an order.

Alphonse De Candolle and others have remarked that in almost every flora of the temperate zone which is pretty thoroughly known, the eight or nine largest families comprise half of its Phænogamous plants. In the present case the first nine families, having 1026 species, lack nineteen of making half; the sum of ten families exceeds the moiety by thirty. The result is nearly the same as that brought out by De Candolle from a similar schedule, tabulated by him from Beck's Botany of the Northern

and Middle States, north of Virginia, 1833, although the elements are considerably different and the ten largest orders are not the same throughout.*

Moreover, our ten predominant families do not properly correspond with the ten mentioned by De Candolle as generally predominant in the temperate regions of the northern hemisphere: viz. "of the first rank, *Compositæ*, *Gramineæ*, *Cyperaceæ*, *Leguminosæ;* then the *Cruciferæ*, *Umbelliferæ*, and *Caryophyllaceæ*, and then, though less decidedly, the *Labiatæ*, *Rosaceæ*, and *Scrophulariaceæ*.† Nor would they do so if, by dividing the Ericaceæ into smaller orders, we were to exclude that family from the list of those (elèven in number) which severally comprise not less than two per cent of our phænogamous species. The three most predominant families accord indeed with De Candolle's conclusion, only the *Cyperaceæ* with us are remarkable for surpassing the *Gramineæ*. But the next three in our list are quite different, even if we omit *Ericaceæ*, being *Rosaceæ*, *Scrophulariaceæ*, and *Orchidaceæ;* and all three of De Candolles second rank fall below our first ten; and one of them, the order *Caryophyllaceæ* would fall still lower, if it were not reinforced by the *Illecebreæ*, so generally regarded as a distinct family.

It is easy to see that these differences are owing to the unusual richness of our flora in *Cyperaceæ* (chiefly in *Carices*), and to our poverty in *Cruciferæ*, *Umbelliferæ*, *Caryophyllaceæ*, and *Labiatæ*, especially in the second and fourth, at least as compared with corresponding parts of Europe.

* The schedule drawn from Beck's Botany is as follows:

Compositæ,	265	
Gramineæ,	169	
Cyperaceæ,	157	
Rosaceæ,	97	
Amentaceæ,	94	=1066 species out of 2125 Phænogamous plants.
Leguminosæ,	80	
Labiatæ,	59	
Ranunculaceæ,	50	
Scrophulariaceæ,	48	
Orchidaceæ,	47	

The differences are readily to be accounted for. 1. The substitution of *Amentaceæ* in this list for *Ericaceæ* in the other, results from the former Jussiæan order having been preserved entire by Beck, but distributed into several in the present work; while I have admitted the order *Ericaceæ* in its most extensive sense. 2. The precedence of *Cyperaceæ* to *Gramineæ* in my list,—which appears not to be the case in corresponding floras of the Old World,—is wholly owing to the great increase in the number of *Carices*, in which the Northern United States are absolutely very rich; which increase has resulted from the remarkable attention and repeated elaboration this genus has received since Dr. Beck's time, from several hands, and perhaps also from a minuter discrimination of the species than in other families. 3. The order *Rosaceæ*, which strangely takes precedence of the *Leguminosæ*, is unduly expanded by a crowd of nominal or traditional species, and has four times as many introduced species as the latter family. 4. The naturalized plants being included, alters the proper proportion of most of these orders, and swells the number of the Phænogamous plants to 2125, while we count only 2091 truly indigenous species within an area about one-half larger and now much more thoroughly known.

† Alph. De Candolle: Geogr. Bot., p. 1245.

I must not stop here to compare our flora with that of Europe as respects the proportions of the *predominant* families. The data on our part for such comparison are recorded above. I pass on to notice some *characteristic* features which depend upon positive differences in the families.

The orders represented in the N. European flora and not in ours are the *Resedaceæ*, *Frankeniaceæ*, *Tamariscineæ*, *Zygophyllaceæ*, *Dipsaceæ*, *Globulariaceæ*, and *Butomaceæ*;—all very small orders; five of the seven are not represented at all by indigenous species in North America; two of them are represented on our continent in what answers to the Mediterranean region.

Of our 132 orders none is peculiar to our district, and only two are restricted to the United States; namely, *Limnanthaceæ*, of one species in the Northern States and one or two in California, and *Galacineæ*, of one genus and species,—a *genus incertæ sedis*, rather than an order.

Our orders peculiar to America are the following:—

Sarraceniaceæ,	Cactaceæ,	Hydrophyllaceæ,
Limnanthaceæ,	Galacineæ,	Bromeliaceæ;
Loasaceæ,		

all of which, except *Galacineæ* and perhaps *Bromeliaceæ*, are also represented on the western side of our continent. Besides these the following 19 orders are extra-European. Those which have known representatives in western North America, that is, in Oregon and California, are repeated in the second column; those known in corresponding parts of eastern Asia, i. e. in Japan, China, and the Himalayas, in the third column.

Extra-European Orders not peculiar to America.

Extra-European Orders of the Flora of the Northern States.	Also represented in Western N. America.	Represented in Japan, China, or Himalayas.
Magnoliaceæ.		Magnoliaceæ.
Anonaceæ.		Anonaceæ.
Menispermaceæ.		Menispermaceæ.
Nelumbiaceæ.		Nelumbiaceæ.
Cabombaceæ.		Cabombaceæ.
Calycanthaceæ.		Calycanthaceæ.
Melastomaceæ.		Melastomaceæ.
Passifloraceæ.		Passifloraceæ.
Hamamelaceæ.		Hamamelaceæ.
Sapotaceæ.		Sapotaceæ.
Bignoniaceæ.	Bignoniaceæ (Martynia) ?	Bignoniaceæ.
Nyctaginaceæ.	Nyctaginaceæ.	Nyctaginaceæ ?
Phytolaccaceæ.	Phytolaccaceæ.	Phytolaccaceæ.
Saururaceæ.	Saururaceæ.	Saururaceæ.
Podostemaceæ.		Podostemaceæ.
Burmanniaceæ.		Burmanniaceæ.
Hæmodoraceæ.		
Commelynaceæ.		Commelynaceæ.
Xyridaceæ.		Xyridaceæ.

Thus it appears, 1, that, of our 19 extra-European orders not peculiarly American, only 3 or 4 are represented on the western or Pacific side of the United States, while all but one are represented in the corresponding parts of Eastern Asia;—indicating a curious analogy in the vegetation of the eastern sides of the two great continental masses in the northern hemisphere, which is also borne out, though not so strikingly, in a comparison of the genera.

2. That the flora of the Northern United States is remarkably rich in ordinal types, as compared with Europe, which, (exclusive of the Mediterranean region, furnished with two or three), has only seven orders that we have not, while we have 26 that are wholly unknown to the European flora.

3. And it is worth noticing that our additional or characteristic orders are all of warm-temperature or sub-tropical general character (which is the more remarkable when the lower mean temperature of the year as compared with that of Western Europe is considered): all of these 26 orders have their principal development in the tropical regions, excepting six of the smaller ones; and three of these have tropical or sub-tropical representatives.

4. But the peculiar and extra-European families do not predominate, nor overcome the general European aspect of our vegetation, on account of the fewness of their species. Of the largest in our flora (*Hydrophyllaceæ*) we count only 11 species; and the whole 26 orders give us only 64, or barely three per cent of our phænogamous species.

Our Phænogamous genera, 681 in number, average three species apiece. Far the largest genus is *Carex*, with 132 species. On the other hand one half of our genera are represented by single species; and about 92 of these are *monotypic*, having only a single known species.

The genera which are strictly confined within the geographical limits of this work are only three, namely, *Napæa*, *Sullivantia*, and *Hemianthus* (the last a dubious genus); and all three are monotypic.

The number of our genera which have no indigenous representatives in Europe appears to be 353, or twelve more than half of our whole number, (the naturalized plants being of course excluded), belonging to 95 families. In the following table (which is hastily prepared, and likely to contain not a few errors), our extra-European Phænogamous genera are enumerated, under their respective families, and their distribution in longitude is attempted to be given in the two parallel columns.

Phænogamous Genera of the Flora of the Northern United States not common to Europe, with indications of their distribution westward, and in Eastern Temperate Asia.

Orders.	Extra-European Genera of Eastern N. America.	Also occurring in W. N. America, i. e., in Oregon and California.	Occurring in E Asia, i. e, in Japan, China, or Himalayas.
Ranunculaceæ.	Trautvetteria.	Trautvetteria.	Trautvetteria.
	Zanthorhiza.		
	Hydrastis.		
	Cimicifuga.	Cimicifuga.	Cimicifuga.
Magnoliaceæ.	Magnolia.		Magnolia.
	Liriodendron.		
Anonaceæ.	Asimina.		
Menispermaceæ.	Menispermum.		
	Cocculus.		Cocculus.
	Calycocarpum.		
Berberidaceæ.	Caulophyllum.		
	Diphylleia.		
	Jeffersonia.		
	Podophyllum.		Podophyllum.
Nelumbiaceæ.	Nelumbium.		Nelumbium.
Cabombaceæ.	Brasenia.		Brasenia.
Sarraceniaceæ.	Sarracenia.		
Papaveraceæ.	Stylophorum.		Stylophorum.
	Sanguinaria.		
Fumariaceæ.	Adlumia.		
	Dicentra.	Dicentra.	Dicentra.
Cruciferæ.	Iodanthus.		
	Leavenworthia.		
Capparidaceæ.	Polanisia.		Polanisia.
Violaceæ.	Solea.		
Cistaceæ.	Hudsonia.		
	Lechea.		
Hypericaceæ.	Ascyrum.		
	Elodea.		
Caryophyllaceæ.	Anychia.		
	Mollugo.	Mollugo.	Mollugo.
Portulaccaceæ.	Sesuvium.	Sesuvium.	
	Talinum.	Talinum.	
	Claytonia.	Claytonia.	
Malvaceæ.	Callirrhöe.		
	Napæa.		
	Sida.	Sida.	Sida.
	Kosteletzkya.	Kosteletzkya.	
Camelliaceæ.	Gordonia.		Gordonia.
	Stuartia.		Stuartia.
Limnanthaceæ.	Floerkea.		
Rutaceæ.	Zanthoxylum.		Zanthoxylum.
	Ptelea.		

Table continued.

Orders.	Extra-European Genera of Eastern N. America	Also occurring in W. N. America, i. e. in Oregon and California.	Occurring in E. Asia, i. e. in Japan, China, or Himalayas.
Vitaceæ.	Ampelopsis.		Ampelopsis?
Rhamnaceæ.	Berchemia.		Berchemia.
	Ceanothus.	Ceanothus.	
Sapindaceæ.	Æsculus.	Æsculus.	Æsculus.
	Negundo.	Negundo.	Negundo.
Leguminosæ.	Crotalaria.		Crotalaria.
	Dalea.	Dalea.	
	Petalostemon.	Petalostemon.	
	Amorpha.	Amorpha.	
	Robinia.		
	Wistaria.		Wistaria.
	Tephrosia.		Tephrosia.
	Æschynomene.		Æschynomene.
	Desmodium.		Desmodium.
	Lespedeza.		Lespedeza.
	Stylosanthes.		
	Apios.		
	Rhynchosia.		Rhynchosia.
	Galactia.		
	Amphicarpæa.		
	Clitoria.		Clitoria.
	Centrosema.		
	Baptisia.		
	Cladrastis.		
	Cassia.		Cassia.
	Gymnocladus.		
	Gleditschia.		Gleditschia.
	Desmanthus.	Desmanthus.	Desmanthus.
	Schrankia.		
Rosaceæ.	Gillenia.		
	Dalibarda.		
Calycanthaceæ.	Calycanthus.	Calycanthus.	
Melastomaceæ.	Rhexia.		
Lythraceæ.	Ammannia.	Ammannia.	Ammannia.
	Nesæa.		
	Cuphea.		
Onagraceæ.	Œnothera.	Œnothera.	
	Gaura.	Gaura.	
	Jussiæa.		Jussiæa.
	Proserpinaca.		
Loasaceæ.	Mentzelia.	Mentzelia.	
Cactaceæ.	Opuntia.	Opuntia.	
Cucurbitaceæ.	Sicyos.	Sicyos.	Sicyos.
	Echinocystis.		
	Melothria.		
Crassulaceæ.	Penthorum.		Penthorum.
Saxifragaceæ.	Astilbe.		Astilbe.

Table continued.

Orders.	Extra-European Genera of Eastern N. America.	Also occurring in W. N America, i. e. in Oregon and California.	Occurring in E. Asia, i. e. in Japan, China, or Himalayas.
	Boykinia.	Boykinia.	
	Sullivantia.		
	Heuchera.	Heuchera.	
	Mitella.	Mitella.	Mitella.
	Tiarella.	Tiarella.	Tiarella.
	Itea.		
	Hydrangea.		Hydrangea.
	Philadelphus.	Philadelphus.	Philadelphus.
Hamamelaceæ.	Hamamelis.		Hamamelis.
	Fothergilla.		
	Liquidambar.		Liquidambar.
Umbelliferæ.	Crantzia.		
	Polytænia.		
	Archemora.		Archemora.
	Tiedemannia.		
	Thaspium.	Thaspium.	
	Zizia.		
	Discopleura.		
	Cryptotænia.		Cryptotænia.
	Osmorhiza.	Osmorhiza.	Osmorhiza.
	Eulophus.		
	Erigenia.		
Cornaceæ.	Nyssa.		
Caprifoliaceæ.	Symphoricarpus.	Symphoricarpus.	
	Diervilla.		Diervilla(Weigela).
	Triosteum.		
Rubiaceæ.	Spermacoce.		
	Diodia.		
	Cephalanthus.	Cephalanthus.	
	Mitchella.		Mitchella.
	Oldenlandia.		Oldenlandia.
	Mitreola.		Mitreola.
	Spigelia.		
	Polypremum.		
Compositæ.	Vernonia.		Vernonia.
	Elephantopus.		Elephantopus.
	Sclerolepis.		
	Liatris.		
	Kuhnia.		
	Mikania.		
	Conoclinium.		
	Adenocaulon.	Adenocaulon.	
	Sericocarpus.	Sericocarpus.	
	Diplopappus.	Diplopappus.	Diplopappus.
	Boltonia.		
	Brachychæta.		
	Bigelovia.		

Table continued.

Orders.	Extra-European Genera of Eastern N. America.	Also occurring in W. N. America, i. e. in Oregon and California.	Occurring in E Asia, i. e in Japan, China, or Himalayas.
	Chrysopsis.	Chrysopsis.	
	Pluchea.		Pluchea.
	Baccharis.	Baccharis.	
	Polymnia.		
	Chrysogonum.		
	Silphium.		
	Parthenium.		
	Iva.		
	Tetragonotheca.		
	Eclipta.		Eclipta.
	Borrichia.		
	Heliopsis.		
	Echinacea.		
	Rudbeckia.	Rudbeckia.	
	Lepachys.		
	Helianthus.	Helianthus.	
	Actinomeris.		
	Coreopsis.	Coreopsis.	
	Verbesina.		
	Dysodia.		
	Hymenopappus.	Hymenopappus.	
	Helenium.	Helenium.	
	Leptopoda.		
	Baldwinia.		
	Marshallia.		
	Erechthites.		
	Cacalia.		Cacalia.
	Krigia.		
	Cynthia.		
	Nabalus.		
	Troximon.	Troximon.	
	Pyrrhopappus.		
Ericaceæ.	Gaylussacia.		
	Chiogenes.		
	Epigæa.		
	Gaultheria.	Gaultheria.	
	Leucothoë.		
	Oxydendrum.		
	Clethra.		Clethra.
	Kalmia.	Kalmia.	
	Menziesia.	Menziesia.	
	Rhodora.		
	Leiophyllum.		
	Pterospora.	Pterospora.	
	Schweinitzia.		
Galacineæ.	Galax.		
Aquifoliaceæ.	Nemopanthes.		

Table continued.

Orders.	Extra-European Genera of Eastern N. America.	Also occurring in W. N. America, i. e. in Oregon or California.	Occurring in E. Asia, i. e. in Japan, China, or Himalayas
Styracaceæ.	Halesia.		
	Symplocos.		Symplocos.
Sapotaceæ.	Bumelia.		
Primulaceæ.	Dodecatheon.	Dodecatheon.	
Bignoniaceæ.	Tecoma (also Catalpa.)		Tecoma (also Catalpa.)
	Bignonia.		
Orobanchaceæ.	Epiphegus.		
	Conopholis.		
	Aphyllon.	Aphyllon.	
Scrophulariaceæ.	Collinsia.	Collinsia.	
	Chelone.	Chelone.	
	Pentstemon.	Pentstemon.	
	Mimulus.	Mimulus.	
	Conobea.		
	Herpestis.	Herpestis.	Herpestis.
	Ilysanthes.		Ilysanthes.
	Hemianthus.		
	Synthyris.	Synthyris.	
	Buchnera.		Buchnera.
	Seymeria.		
	Gerardia.		
	Schwalbea.		
	Gelsemium.		Gelsemium.
Acanthaceæ.	Dianthera.		
	Dipteracanthus.		Dipteracanthus.
Verbenaceæ.	Lippia.		
	Callicarpa.		Callicarpa.
	Phryma.		Phryma.
Labiatæ.	Trichostema.	Trichostema.	
	Isanthus.		
	Cunila.		
	Pycnanthemum.	Pycnanthemum.	
	Hedeoma.		Hedeoma.
	Collinsonia.		
	Monarda.		
	Blephilia.		
	Lophanthus.	Lophanthus.	Lophanthus.
	Cedronella.		
	Synandra.		
	Physostegia.	Physostegia.	
Borraginaceæ.	Onosmodium.		
Hydrophyllaceæ.	Hydrophyllum.	Hydrophyllum.	
	Nemophila.	Nemophila.	
	Ellisia.	Ellisia.	
	Phacelia.	Phacelia.	
Polemoniaceæ.	Phlox.	Phlox.	Phlox.

Table continued.

Orders.	Extra-European Genera of Eastern N. America.	Also occurring in W. N America, i. e. in Oregon and California.	Occurring in E. Asia, i. e. in Japan, China, or Himalayas
	Pyxidanthera.		
Convolvulaceæ.	Stylisma.		
	Dichondra.		
Gentianaceæ.	Sabbatia.		
	Frasera.	Frasera.	
	Halenia.		Halenia.
	Bartonia.		
	Obolaria.		
Apocynaceæ.	Amsonia.		Amsonia.
	Forsteronia.		
Asclepiadaceæ.	Asclepias.	Asclepias.	
	Acerates.		
	Enslenia.		
	Gonolobus.		
Oleaceæ.	Chionanthus.		
	Forrestiera.		
Nyctaginaceæ.	Oxybaphus.	Oxybaphus.	Oxybaphus.
Phytolaccaceæ.	Phytolacca.		
Chenopodiaceæ.	Cycloloma.		
Amarantaceæ.	Montelia.		
	Acnida.		
	Iresine.		
	Frœlichia.		
Lauraceæ.	Persea.		
	Sassafras.		
	Benzoin,		Benzoin.
	Tetranthera.	Tetranthera.	Tetranthera.
Thymeleaceæ.	Dirca.		
Elæganaceæ.	Shepherdia.		
Santalaceæ.	Comandra.	Comandra.	
	Hamiltonia.		
Loranthaceæ.	Phoradendron.	Phoradendron.	
Saururaceæ.	Saururus.		Saururus.
Podostemaceæ.	Podostemon.		
Euphorbiaceæ.	Cnidoscolus.		
	Acalypha.	Acalypha.	Acalypha.
	Tragia.		
	Stillingia.		Stillingia.
	Croton.	Croton.	Croton.
	Crotonopsis.		
	Phyllanthus.		Phyllanthus.
	Pachysandra.		Pachysandra.
Urticaceæ.	Laportea.		
	Pilea.		
	Bœhmeria.		Bœhmeria.
	Planera.		
Juglandaceæ.	Carya.		

Table continued.

Orders.	Extra-European Genera of Eastern N. America.	Also occurring W. N. America, i. e. in Oregon and California.	Occurring in E. Asia, i. e. in Japan, China, or Himalayas
Myricaceæ.	Comptonia.		
Coniferæ.	Taxodium.		
	Thuja.	Thuja.	Thuja.
Araceæ.	Arisæma.		Arisæma.
	Peltandra.		
	Symplocarpus.	Symplocarpus.	Symplocarpus.
	Orontium.		
Alismaceæ.	Echinodorus.		
Hydrocharidaceæ.	Limnobium.		
Burmanniaceæ.	Burmannia.		Burmannia.
Orchidaceæ.	Arethusa.		
	Pogonia.		
	Calopogon.		
	Tipularia.		
	Bletia.		
	Aplectrum.		
Amaryllidaceæ.	Pancratium.		
	Agave.		
	Hypoxys.		
Hæmodoraceæ.	Lachnanthes.		
	Lophiola.		
	Aletris.		
Bromeliaceæ.	Tillandsia.		
Iridaceæ.	Sisyrinchium.	Sisyrinchium.	
Smiliaceæ.	Trillium.	Trillium.	Trillium.
	Medeola.		
Liliaceæ.	Clintonia.	Clintonia.	Clintonia.
	Yucca.	Yucca.	
Melanthaceæ.	Uvularia.		Uvularia ?
	Prosartes.	Prosartes.	
	Melanthium.		
	Zygadenus.		Zygadenus.
	Stenanthium.		
	Amianthium.		
	Xerophyllum.	Xerophyllum.	
	Helonias.		
	Chamælirium.		
Pontederiaceæ.	Pontederia.		
	Heteranthera.		
	Schollera.		
Commelynaceæ.	Commelyna.		Commelyna.
	Tradescantia.		Tradescantia.
Xyridaceæ.	Mayaca.		
	Xyris.		Xyris.
Ericaulonaceæ.	Pæpalanthus.		
	Lachnocaulon.		

Table continued.

Orders.	Extra-European Genera of Eastern N. America.	Also occurring in W. N. America, i. e. in Oregon and California.	Occurring in E. Asia, i. e. in Japan, China, or Himalayas.
Cyperaceæ.	Kyllingia.		Kyllingia.
	Dulichium.		
	Hemicarpha.		
	Fuirena.		Fuirena.
	Psilocarya.		
	Dichromena.		
	Ceratoschænus.		
	Scleria.		Scleria.
Gramineæ.	Zizania.		
	Vilfa.	Vilfa.	Vilfa.
	Sporobolus.	Sporobolus.	Sporobolus.
	Muhlenbergia.	Muhlenbergia.	
	Brachyelytrum.		
	Aristida.		Aristida.
	Ctenium.		
	Bouteloua.	Bonteloua.	
	Gymnopogon.		
	Leptochloa.		Leptochloa.
	Tricuspis.		
	Diarrhena.		
	Eatonia.		
	Bryzopyrum.	Brizopyrum.	
	Uniola.		
	Arundinaria.		Arundinaria.
	Gymnostichum.		
	Amphicarpum.		
	Paspalum.		Paspalum.
	Cenchrus.	Cenchrus.	Cenchrus.
	Tripsacum.		
	Sorghum.		Sorghum.
	353	87	101

That is, 87 of our 353 extra-European phænogamous genera, or 24 per cent are common to Western North America, and 101, or 28 per cent to Eastern temperate Asia. Four per cent more of our characteristic genera are shared with an antipodal region than with the neighboring district of W. N. America. And the number is likely to increase; for we know far less of the flora of Japan and China than of California and Oregon. Drs. Hooker and Thomson's large Himalayan collections, now in the course of distribution and publication, will probably add several more to the list. Twenty-nine of these genera, or 8 per cent, are common to all three of these regions.

Our 194 genera which are neither European, N. W. American, nor E. Asiatic in temperate regions, require further discussion to show which are characteristic of Eastern North America. We will here barely notice that:

3 Belong also to Western temperate Asia, viz., *Menispermum*, *Planera*, and *Zizania*; two of these being peculiar to that district and to ours.

73 Extend southward beyond the limits of the United States and into tropical regions, or recur in the southern hemisphere.

120 Are characteristic Eastern United States genera.

As already stated, only three genera are actually restricted to the geographical area comprised in our 'Botany of the Northern United States'. If, however, we allow our area to embrace Canada, which naturally belongs to it, and also include those plants which extend southward much beyond lat. 36° 30′ only in the Alleghanies or cool upper country of the Southern States, we may enumerate 37 genera peculiar to this flora; viz.—

Zanthorhiza.	Echinocystis.	Pyxidanthera.
Hydrastis.	Sullivantia.	Dirca.
Caulophyllum.	Zizia.	Hamiltonia.
Diphylleia.	Erigenia.	Comptonia.
Jeffersonia.	Brachychæta.	Arethusa.
Adlumia.	Chiogenes.	Tipularia.
Solea.	Oxydendrum.	Aplectrum.
Hudsonia.	Rhodora.	Medeola.
Napæa.	Leiophyllum.	Helonias.
Cladrastis.	Schweinitzia.	Chamælirium.
Gymnocladus.	Galax.	Amphicarpum.
Gillenia.	Nemopanthes.	
Dalibarda.	Hemianthus.	

To show, however, how slight an influence, after all, these 37 characteristic genera exert upon our flora, we have only to remark that they comprise altogether only 39 of our species:—that is, they have only one species apiece, except *Hudsonia* and *Gillenia*, which have two each. The characteristics of our flora of the Northern States merge in those of the flora of Eastern North America, and these again into those of the North American flora generally; and no idea can be formed of the real features of a flora like ours from such a dissection, and piecemeal presentation, or from an exhibition of what is strictly peculiar to each part, rather than what is predominant,—at least as respects generic forms.

Returning now to the species,—the real exponents of vegetation;—these have already been considered as regards their numerical proportions in the several classes and orders of the flora of the Northern States: it remains to note some facts respecting their geographical distribution.

As appears from the tabular view commencing on p. 208, there are common to Europe,

180	Dicotyledonous species out of 1490,	or	12 per cent.
141	Monocotyledonous species out of 601,	or	23·4 "
321	Phænogamous Species out of 2091	or	15·3 "
35	Acrogenous Cryptogamia out of 75	or	46·6 "
320	Musci and Hepaticæ out of 502	or	63·7 "
355	Cryptogamous species out of 577	or	61·5 "

in accordance with the general fact that the lower the class the wider the geographical area occupied by the species.

In the following table I have attempted to exhibit the particular range of our indigenous phænogamous species of each natural order in longitude, through the northern temperate zone. The table has been hastily prepared, and must be often erroneous in details; but the general results are probably very near the truth.

The Indigenous Phænogamous Species of the Northern United States, viewed as to their geographical distribution around the northern temperate zone.

Natural Orders.	Whole number of species in the northern United States.	East'n N. American: not extending westward beyond the Rocky Mountains.	Extending westward to the Pacific coast or near it.	Extending into Asia.	Inhabiting Asia, but not in N.W. America.	Inhabiting Asia, but not in Europe.	Extending into Europe.	Inhabiting Europe, but not in Eastern Asia.
Class I. DICOTYLEDONEÆ, seu EXOGENÆ.								
Ranunculaceæ,	49	26	20	13	1	5	10	2
Magnoliaceæ,	6	6						
Anonaceæ,	1	1						
Menispermaceæ,	3	3						
Berberidaceæ,	5	5						
Nelumbiaceæ,	1	1						
Cabombaceæ,	1			1	1	1		
Nymphæceæ,	3	1	2	1			1	
Sarraceniaceæ,	2	2						
Papaveraceæ,	2	2						
Fumariaceæ,	6	5	1					
Cruciferæ,	46	31	13	11	2		11	
Capparidaceæ,	1	1						
Violaceæ,	18	15	3	1			1	
Cistaceæ,	7	7						
Droseraceæ,	4	2	1	1			2	1
Parnassiaceæ,	3	2	1	1			1	
Hypericaceæ,	18	18						

CLASS I.—*continued.*

Natural Orders.	Whole number of species in the northern United States.	East'n N. American: not extending westward beyond the Rocky Mountains.	Extending westward to the Pacific coast or near it.	Extending into Asia.	Inhabiting Asia, but not in N. W. America.	Inhabiting Asia, but not in Europe.	Extending into Europe.	Inhabiting Europe, but not in Eastern Asia.
Elatinaceæ,	1	1						
Caryophyllaceæ,	30	14	15	12			13	1
Portulacaceæ,	4	4						
Malvaceæ,	9	9						
Tiliaceæ,	2	2						
Camelliaceæ,	2	2						
Linaceæ,	2	2						
Oxalidaceæ,	3	1	2	2			2	
Geraniaceæ,	3	1	1	1			1	
Balsaminaceæ,	2	2						
Limnanthaceæ,	1	1						
Rutaceæ,	3	3						
Anacardiaceæ,	6	5	1					
Vitaceæ,	7	7						
Rhamnaceæ,	6	6						
Celastraceæ,	3	2	1					
Sapindaceæ,	10	10						
Polygalaceæ,	13	13						
Leguminosæ,	91	84	7	4			4	
Rosaceæ,	71	43	23	17	3	2	16	1
Calycanthaceæ,	3	3						
Melastomaceæ,	3	3						
Lythraceæ,	7	5	1	1	1		1	
Onagraceæ,	36	26	10	10			10	
Loasaceæ,	1	1						
Cactaceæ,	1	1						
Grossulaceæ,	7	5	2	1			1	
Passifloraceæ,	2	2						
Cucurbitaceæ,	3	3						
Crassulaceæ,	5	5						
Saxifragaceæ,	22	15	4	4	2	2	5	3
Hamamelaceæ,	3	3						
Umbelliferæ,	37	28	9	4	3	2	2	
Araliaceæ,	6	5		1	1	1		
Cornaceæ,	11	10	1					
Caprifoliaceæ,	27	19	7	3	1		3	
Rubiaceæ,	22	18	4	3	1		4	1
Valerianaceæ,	7	6	1					
Compositæ,	273	233	29	11		2	9	
Lobeliaceæ,	12	11					1	1
Campanulaceæ,	5	3	2	1			1	
Ericaceæ,	62	35	21	18	2	1	19	2

CLASS I—*continued.*

Natural Orders.	Whole number of species in the northern United States.	East'n N. American: not extending westward beyond the Rocky Mountains.	Extending westward to the Pacific coast or near it.	Extending into Asia.	Inhabiting Asia, but not in N.W. America.	Inhabiting Asia, but not in Europe.	Extending into Europe.	Inhabiting Europe, but not in Eastern Asia.
Galacineæ,	1	1						
Aquifoliaceæ,	10	10						
Styracaceæ,	5	5						
Ebenaceæ,	1	1						
Sapotaceæ,	2	2						
Plantaginaceæ,	6	4	2	1			1	
Plumbaginaceæ,	1		1	1			1	
Primulaceæ,	16	8	8	6			6	
Lentibulaceæ,	12	8	2	4			4	
Bignoniaceæ,	2	2						
Orobanchaceæ,	5	2	3					
Scrophulariaceæ,	54	38	15	10	1		10	
Acanthaceæ,	3	3						
Verbenaceæ,	7	5	1	1	1	1		
Labiatæ,	49	42	7	4			4	
Borraginaceæ,	16	12	4	3			3	
Hydrophyllaceæ,	11	9	2					
Polemoniaceæ,	12	11	1	1			1	
Convolvulaceæ,	15	14	1	1			1	
Solanaceæ,	4	4						
Gentianaceæ,	24	22	2	2			2	
Apocynaceæ,	4	3	1					
Asclepiadaceæ,	21	21						
Oleaceæ,	9	9						
Aristolochiaceæ,	6	6						
Nyctaginaceæ,	1	1						
Phytolaccaceæ,	1	1						
Chenopodiaceæ,	10	4	5	5	1		6	6
Amarantaceæ,	5	5						
Polygonaceæ,	22	14	7	6	1		6	
Lauraceæ,	5	5						
Thymeleaceæ,	1	1						
Elæagnaceæ,	1		1					
Santalaceæ,	3	2	1					
Loranthaceæ,	1	1						
Saururaceæ,	1	1						
Ceratophyllaceæ,	1		1	1			1	
Callitrichaceæ,	3		3	3			3	
Podostemaceæ,	1	1						
Euphorbiaceæ,	28	25	3					
Empetraceæ,	2	1	1	1			1	
Urticaceæ,	15	13	2	1			1	

CLASS I—*continued.*

Natural Orders.	Whole number of species in the northern United States.	East'n N. American and extending west-ward to the Rocky Mountains.	Extending westward to the Pacific coast or near it.	Extending into Asia.	Inhabiting Asia, but not in N.W. America	Inhabiting Asia, but not in Europe.	Extending into Europe.	Inhabiting Europe but not in Eastern Asia.
Platanaceæ,	1	1						
Juglandaceæ,	9	9						
Cupuliferæ,	25	23	1	1	1		1	
Myricaceæ,	3	2	1	1			1	
Betulaceæ,	10	6	2	4	2		4	
Salicaceæ,	24	18	6	4	1		3	
Coniferæ,	20	13	7	2			2	
Class II. MONOCOTYLEDONÆ, seu ENDOGENÆ.								
Araceæ,	7	5		2	2		2	
Typhaceæ,	7	1	3	5			6	1
Lemnaceæ,	5	1		4			4	
Naiadaceæ,	16	4	4	9	5		12	3
Alismaceæ,	12	5	7	4			4	
Hydrocharidaceæ,	3	1		1	1		2	1
Burmanniaceæ,	1	1						
Orchidaceæ,	51	36	13	9	2	1	10	2
Amaryllidaceæ,	4	4						
Hæmodoraceæ,	4	4						
Bromeliaceæ,	1	1						
Iridaceæ,	6	5	1					
Dioscoreaceæ,	1	1						
Smilaceæ,	18	17	1					
Liliaceæ,	24	14	7	5	1	1	5	1
Melanthaceæ,	21	15	6	1			1	
Juncaceæ,	26	6	16	14	4		14	
Pontederiaceæ,	4	4						
Commelynaceæ,	6	6						
Xyridaceæ,	4	4						
Eriocaulonaceæ,	5	4					1	1
Cyperaceæ,	213	155	37	37	3	2	48	13
Gramineæ,	162	114	44	33	1	4	32	2
Total Monocotyledoneæ,	601	408	142	124	19	8	141	25
Dicotyledoneæ,	1490	1168	273	184	26	17	180	13
Phænogamia,	2091	1576	416	308	45	25	321	38

The data are not at hand for extending this table through the higher Cryptogamia, except for the highest class, and that imperfectly. The four orders of *Vascular* or *Acrogenous Cryptogamia* give the following results; the columns being homologous with those of the last table.

Equisetaceæ,	10	2	8	8			8	
Filices,	49	26	13	23	8	3	20	
Lycopodiaceæ,	12	4	6	7	1	2	6	1
Hydropterides,	4	2	1	1	1		1	
	75	34	28	39	10	5	35	1

These tables necessarily include the species of our small alpine region, which, being chiefly Arctic, might properly be regarded rather as intruded members of the Arctic flora. Being mostly diffused all round the world, they increase somewhat unduly the numbers of our species common to Europe and to Asia; but they are not sufficiently numerous with us to require to be formally eliminated. The following are all the Phænogamous species which, within our limits, are found *only* in our small alpine region, namely, on the summits of the White Mountains of New Hampshire, of Mount Katahdin, Maine, and the highest peaks of the Green Mountains, Vermont, and the Adirondack Mountains in Northern New York:—

Cardamine bellidifolia.
Viola palustris.
Silene acaulis.
Sibbaldia procumbens.
Dryas integrifolia, (fide Pursh).
Potentilla frigida.
Epilobium alpinum, var. majus.
Saxifraga rivularis.
Gnaphalium supinum.
Nabalus Boottii.
Nabalus nanus.
Vaccinium cæspitosum.
Arctostaphylos alpina.
Phyllodoce taxifolia.
Rhododendron Lapponicum.
Veronica alpina.
Diapensia Lapponica.
Oxyria reniformis.
Betula nana.
Salix phylicifolia.
Salix Uva-Ursi.
Salix repens.
Salix herbacea.
Luzula arcuata.
Luzula spicata.
Juncus trifidus.
Carex capitata.
Carex atrata.
Phleum alpinum.
Calamagrostis Pickeringii.
Poa laxa.
Aira atropurpurea.
Hierochloa alpina.

Of these 35 species, two, (*Nabalus Boottii* and *Calamagrostis Pickeringii*) are peculiar to our own alpine region, so far as is now known, but they are most likely to occur further north; and two (*Nabalus nanus* and *Vaccinium cæspitosum*) are peculiarly North American. All the rest are European, and with two or three exceptions also Asiatic. No one of our vascular Cryptogamous species is wholly alpine, *Lycopodium Selago* comes the nearest to being so.

The following are with us subalpine species; they occur in our alpine region (to which most of them properly belong), but also out of it, at least in one or two places.

Alsine Grœnlandica.
Geum radiatum.
Arnica mollis.
Vaccinium uliginosum.
Euphrasia officinalis.
Polygonum viviparum.
Empetrum nigrum.
Platanthera obtusata.
Scirpus cæspitosus.
Carex scirpoidea.
Carex capillaris.
Trisetum subspicatum. 12 − 3 = 9

All of these except *Geum radiatum*, *Arnica mollis*, and *Carex scirpoidea*, are also European. The last grows in Greenland.

The following European species have not been detected in any properly alpine habitat with us (where they might be expected to occur), but elsewhere, three of them (*Saxifraga aizoides* and *Carex gynocrates*) in stations not even subalpine:

Saxifraga oppositifolia.
Saxifraga aizoides.
Saxifraga Aizoon.
Artemisia borealis.
Juncus Stygius.
Carex gynocrates.

Two Ferns might be added to the subalpine list, viz:—*Woodsia glabella* and *Aspidium fragrans*.

The Phænogamous species whose range, so far as is now known, falls wholly within the limits of the 'Manual of the Botany of the Northern United States' are the following:

Dicotyledonous.	Monocotyledonous.
Dentaria maxima.	Lemna perpusilla.
Vesicaria Shortii.	Potamogeton Robbinsii.
Napæa dioica.	" Tuckermani.
Sida Napæa.	Trillium nivale.
Psoralea stipulata.	Veratrum Woodii.
Astragalus Robbinsii?	Helonias bullata.
Ludwigia polycarpa.	Narthecium Americanum.
Tillæa simplex.	Juncus Greenii.
Sullivantia Ohionis.	Cyperus Grayii.
Galium concinnum.	Eleocharis rostellata.
Fedia Fagopyrum.	" compressa.
" umbilicata.	" Robbinsii.
" patellaria.	Psilocarya scirpoides.
Eupatorium pubescens.	Rhynchospora capillacea.
" resinosum.	Carex exilis.
Solidago Ohioënsis.	" Sartwellii.
" Houghtonii.	" sychnocephala.
" neglecta.	" Crawei?
" Muhlenbergii.	" formosa.
" linoides.	" Careyana.
" Shortii.	" retrocurva.
" rupestris.	" Sullivantii.

DICOTYLEDONOUS.

Rudbeckia speciosa.
Coreopsis bidentoides.
Cirsium pumilum.
Nabalus Boottii.
Gaylussacia brachycera.
Utricularia clandestina.
" resupinata.
Hemianthus micranthemoides.
Pycnanthemum clinopodioides.
" Torreyi.
Asclepias Sullivantii.
" Meadii.
Blitum maritimum.
Polygonum Careyi.
Ulmus racemosa.

37 species.

MONOCOTYLEDONOUS.

Carex mirata.
" Grayii.
Sporobolus compressus.
" serotinus.
Calamagrostis confinis.
" Pickeringii.
" brevipilis.
Dupontia Cooleyi.
Glyceria acutiflora.
Poa alsodes.
" debilis.
Amphicarpum Purshii.

34 species = 71.

According to my supposed line of Migration, Europe & U. States ought to have fewer species in common than the intermediate Asia, & Asia & ~~Europe~~ America ought to have several not found in Europe — or Europe & Asia many in common not f[ound] in America — how the fact are the contrary, but then Europe far better known. —

But to judge we ought to know the number of each [illegible] species not many. number —

Certainly I might say that the facts are opposed to view of continuous land from America to Europe, there would be far more connection between these points than ~~with~~ between Eastern Asia & America

Dicotyledon agree best with my view.

ART. XXXVII.—*Statistics of the Flora of the Northern United States;* by ASA GRAY.

[Continued from p. 84.]

ALTHOUGH such details as I have to present are far from inviting to general readers, it is desirable to put them upon record, inasmuch as the facts they bring to view are useful to those philosophical naturalists who are discussing important problems respecting the present distribution of plants and animals over the world, and the causes which have determined the present state of things. This must be my excuse for continuing at such a length the present series of articles.

Having compared our flora with that of Europe in respect to closely allied species, it may be interesting to institute a similar comparison with that of Oregon and Northern California. The comparison might also be extended to Northwestern Asia, and especially to Japan, with which we have peculiarly interesting relations as to species; but this is better deferred until some recent collections from the northern part of Japan have been completely examined.

Comparison of the Flora of the Northern United States with that of the Pacific coast of North America (Oregon and North California) between lat. 46° and lat. 36°.

1. *As to Geographical Varieties.*

The following have been distinguished as species by excellent botanists, but in most cases, perhaps in all, they should rather be considered geographical varieties.

Natives of Eastern N. U. S.	*Natives of Oregon and California, lat. 46°–36°.*
Trautvetteria palmata,	T. grandis, *Nutt.*
Aquilegia Canadensis,	A. formosa, *Fisch.*
Actæa spicata,	A. arguta, *Nutt.*
Erysimum Arkansanum,	E. asperum and elatum, *Nutt.*
Honkenya peploides,	H. oblongifolia, *Torr. & Gr.*
Stellaria borealis,	S. crispa, *Cham.*
Euonymos atropurpureus,	E. occidentalis, *Nutt.*
Negundo aceroides,	N. Californicum, *Torr. & Gr.*
Vicia Americana,	V. Oregana, *Nutt.*
Astragalus Canadensis,	A. orthocarpus, *Dougl.*
Spiræa opulifolia,	S. capitata, *Pursh*, S. pauciflora, *Nutt.*
" Aruncus,	S. acuminata, *Dougl.*
Potentilla Pennsylvanica,	P. Hippiana, pulcherrima, bipinnatifida, &c.
Rubus Nutkanus (parviflorus, *Nutt.*),	R. Nutkanus,

Rubus occidentalis,	R. leucodermis, *Dougl.*
Rosa blanda,	R. fraxinifolia, *Lindl.*
Amelanchier Canadensis,	A. alnifolia, *Nutt.*
Heracleum lanatum,	H. Douglasii, *DC.*
Osmorrhiza brevistylis,	O. divaricata, *Nutt., &c.*
Sambucus Canadensis,	S. glauca, *Nutt.*
Galium boreale,	G. rubioides, *Linn.*
Chrysopsis villosa,	C. echioides, *Benth.*
Menziesia ferruginea, var. globularis,	M. ferruginea, *Smith.*
Pyrola rotundifolia,	P. bracteata, &c., *Hook.*
Plantago maritima, juncoides,	P. maritima.
Taxus baccata, var. Canadensis,	T. occidentalis, *Nutt.*
Xerophyllum setifolium,	X. tenax, *Pursh.*
Luzula campestris,	L. comosa, *Meyer.*

2. *Strictly Representative Species.*

The following are cases of species of our Flora of the Northern United States represented on the western side of the continent by *strictly representative species,* (including very *close representative species,*) many of which, although still admitted as distinct, are not unlikely to be regarded hereafter as geographical varieties. The very close representative species are printed in *italics.*

Natives of Eastern N. U. S.	*Natives of Oregon and California.*
Clematis Virginiana,	*C. ligusticifolia.*
Ranunculus recurvatus,	R. occidentalis.
" fascicularis,	R. orthorhynchus.
Myosurus minimus,	M. aristatus.
Isopyrum biternatum,	I. occidentale.
Delphinium exaltatum,	D. Californicum.
" tricorne,	D. Menziesii.
Aconitum uncinatum,	A. Napellus.
Cimicifuga Americana,	*C. fœtida.*
Dicentra eximia,	*D. formosa.*
Nasturtium obtusum,	*N. polymorphum.*
" sinuatum,	N. curvisiliqua.
Dentaria heterophylla,	D. tenella.
Cardamine rhomboidea,	C. purpurea.
" rotundifolia,	C. angulata.
Viola rotundifolia,	V. sarmentosa.
" *Muhlenbergii,*	*V. adunca.*
" *Canadensis,*	*V. ocellata.*
" *pubescens,*	*V. glabella.*
Parnassia asarifolia,	*P. fimbriata.*
Hypericum mutilum,	*H. anagalloides.*
Silene Virginica,	S. pulchra.
Alsine Michauxii,	A. tenella.
Mœhringia lateriflora,	M. umbrosa.
Claytonia Caroliniana,	*C. lanceolata.*

Oxalis Acetosella,	*O. Oregana* & trilliifolia.
Geranium maculatum,	*G. erianthum & Richardsonii.*
Rhus Toxicodendron,	*R. diversiloba.*
Rhamnus alnifolius,	*R. Purshiana.*
Frangula Caroliniana,	F. Californica.
Ceanothus Americanus,	C. Oreganus.
Lupinus perennis,	L. laxiflorus, &c.
Amorpha fruticosa,	*A. Californica.*
Cercis Canadensis,	C. occidentalis.
Prunus Virginiana,	*P. demissa.*
Spiræa corymbosa,	*S. betulæfolia.*
" *salicifolia,*	*S. Menziesii.*
" *tomentosa,*	*S. Douglasii.*
Geum radiatum,	*G. calthifolium.*
Potentilla arguta,	*P. glandulosa.*
Fragaria Virginiana,	F. Chilensis.
Rubus trivialis,	R. macropetalus.
Cratægus Crus-galli,	C. rivularis?
" tomentosa,	C. sanguinea?
Pyrus coronaria,	P. rivularis.
" Americana,	P. sambucifolia.
Calycanthus glaucus & lævigatus,	*C. occidentalis.*
Myriophyllum scabratum,	M. hippuroides.
Ribes rotundifolium,	*R. divaricatum & irriguum.*
" *prostratum,*	*R. laxiflorum.*
Tillæa simplex,	T. angustifolia.
Sedum pulchellum,	S. stenopetalum.
Saxifraga Virginiensis,	S. integrifolia.
Boykinia aconitifolia,	B. occidentalis.
Heuchera Americana,	H. glabra.
" villosa,	H. micrantha.
Tiarella cordifolia,	T. trifoliata.
Chrysosplenium Americanum,	*C. glechomæfolium.*
Philadelphus inodorus,	*P. Lewisii & Gordonianus.*
Cornus florida,	*C. Nuttallii.*
" *sericea,*	*C. Drummondii.*
" stricta,	C. glabrata.
Lonicera sempervirens,	L. ciliosa, &c.
Valeriana pauciflora,	*V. capitata.*
Baccharis glomeruliflora,	B. consanguinea & pilularis.
Gnaphalium decurrens,	*G. Californicum.*
Hieracium longipilum,	H. Scouleri.
Gaultheria procumbens,	G. Myrsinites.
Azalea viscosa & calendulacea,	*A. occidentalis.*
Rhododendron maximum,	R. Californicum.
Chimaphila maculata,	C. Menziesii.
Styrax grandifolia,	S. Californica.
Collinsia verna,	C. bicolor, &c.
Chelone glabra,	C. nemorosa.
Mimulus glabratus (Jamesii, *Torr.*)	M. luteus.

Gratiola Virginiana,	*G. ebracteata.*
Castilleia coccinea,	*C. Douglasii.*
Hydrophyllum macrophyllum,	*H. capitatum.*
Nemophila microcalyx,	N. parviflora.
Ellisia Nyctelea,	E. membranacea.
Frasera Carolinensis,	F. speciosa.
Gentiana Saponaria, &c.,	G. Menziesii, Sceptrum, &c.
Fraxinus sambucifolia,	F. Oregana.
Asarum Canadense,	*A. Hookeri.*
Aristolochia Sipho,	A. Californica, *Torr.*
Platanus occidentalis,	*P. Mexicanus.*
Quercus alba,	Q. Garryana & Douglasii.
Myrica cerifera,	*M. Californica.*
Betula nigra,	*B. occidentalis.*
Alnus serrulata,	*A. rubra.*
Pinus inops,	P. distorta.
" resinosa,	P. insignis.
" Strobus,	P. Lambertiana.
Abies balsamea,	A. grandis.
Larix Americana,	*L. Mertensiana,* &c.
Thuja occidentalis,	T. gigantea.
Cupressus thyoides,	C. Nutkatensis.
Symplocarpus fœtidus,	S. Kamtschaticus.
Platanthera dilatata,	P. leucostachys.
Goodyera pubescens,	G. decipiens.
Corallorhiza multiflora,	C. Mertensiana.
" *Macræi,*	*C. striata.*
Trillium sessile,	T. petiolatum.
" *erectum,*	*T. ovatum.*
" *grandiflorum,*	*T. obovatum.*
Clintonia borealis,	C. uniflora.
Scilla Fraseri,	S. esculenta.
Erythronium Americanum,	E. grandiflorum.
Prosartes lanuginosa,	*P. Hookeri* & Smithii.
Cyperus inflexus,	*C. occidentalis.*
Vilfa vaginæflora,	V. cuspidata.
Brizopyrum spicatum,	*B. boreale?*

About 114 of our phænogamous species are therefore represented by strict analogues on the western side of the continent, —to which might be added several from the foregoing list, which are generally deemed to be distinct species;—and the number might be considerably augmented, no doubt, by further examination.

An interesting list might also be drawn up of species which are represented on the western coast by congeners not so closely related, but yet characteristic: as our

Coptis trifolia, by C. asplenifolia.
Berberis Canadensis, by B. (Mahonia) Aquifolium.
Corydalis aurea and glauca, by C. Scouleri.

Claytonia Virginica and Caroliniana, by C. alsinoides, perfoliata, flagellaris, &c.
Æsculus Pavia and flava, by Æ. Californica.
Acer Pennsylvanicum and spicatum, by A. circinatum and macrophyllum.
Œnothera, by a much larger number of species of different sections of the genus.
Mitella diphylla and nuda, by M. caulescens and pentandra.
Sanicula Marilandica and Canadensis, by a different set of species.
Our few Pentstemons, by a large number of various kinds.
Our numerous Pycnanthemums by a peculiar Californian one.
Our Trichostema dichotomum by T. lanceolatum, oblongum, &c.
Our few Phacelias by a large number of Phacelias and Eutocas.
Our Chestnut by Castanea chrysophylla, of a Western Asian type, &c.

A list of remarkable representative genera of the two sides of the continent might also be drawn up: the following are some of the more striking.

Our Sarracenia represented on the western side by the equally curious Darlingtonia, *Torr.*
Stylophorum, by Meconopsis.
Callirhoë, by Sidalcea, *Gray.*
Flœrkea, by Limnanthes.
Lobelia, by Clintonia *Dougl.* (not of *Raf.*)
Leucothöe, by Gaultheria Shallon.
Schweinitzia, by Sarcodes, *Torr.*, and an unpublished genus, Hemitomes.
Conopholis, by Boschniakia.
Monarda, by Monardella.
Tetranthera, by Oreodaphne.
Saururus, by Anemiopsis, *Nutt.*
Taxodium, by Sequoia (including Wellingtonia of Lindley).
Najas, by Lilea (Heterostylus, *Hook.*).
Zostera, by Phyllospadix.

A proper discussion of the relations existing between the vegetation of the eastern and western sides of the continent would demand a notice of the remarkable *absence* west of the Rocky Mountains of a great variety of genera, tribes, and even orders, which are eminently characteristic of the flora of the Eastern States. For example, Oregon and California have no *Magnoliaceæ*, *Anonaceæ*, *Menispermaceæ*, nor *Cabombaceæ*, no *Nymphæa*, although a Nuphar is plentiful, no *Tilia* or Bass-wood, no *Camelliaceæ*, no indigenous Grape-vines, except one in California, only one *Polygala*, no Locust or other Leguminous trees, no Passion-flowers, no *Hydrangea*, no *Hamamelaceæ*, few *Rubiaceæ*, no *Vernoniaceæ*, and very few *Eupatoriaceæ*, very few *Asters* and *Solidagoes* (but the numerous *Compositæ* tend strongly to *Heleniæ*, and are mostly of genera which are neither Eastern

North American nor European in type), no *Lobelia*, no true Huckleberries (*Gaylussacia*) nor *Vaccinia* of the Blueberry type, (the section *Cyanococcus*), no *Clethra*, and few *Andromedeæ*, no *Aquifoliaceæ*, *Ebenaceæ*, nor *Sapotaceæ;* no true *Bignoniaceæ*, no *Acanthaceæ*, nor Gerardias, no *Sabbatia*, no *Dirca* nor *Podostemon*, solitary representatives here of their respective orders; no *Empetraceæ*, no Elms (although there is a *Celtis*), no Mulberry, no Walnuts, Hickories, or other *Juglandaceæ*, nor a Beech, Hornbeam nor Ironwood, no true *Araceæ*, *Hydrocharidaceæ*, *Hæmodoraceæ*, *Burmanniaceæ*, *Dioscoreaceæ*, *Pontederiaceæ*, *Commelynaceæ*, *Xyridaceæ*, or *Eriocaulonaceæ*, few *Orchidaceæ*, and still fewer *Cyperaceæ*, none of the latter either *Rhynchosporeæ* or *Sclerieæ*, and Paniceous and Andropogineous Grasses are altogether absent.

How these failures are made up by a large increase of peculiar generic and specific forms in a few families, I will not stop to illustrate. But it is worth noticing that, while our eastern flora possess so many orders which are not represented in the western, no order represented in Oregon or California is wanting in the flora of our Northern States, unless *Hydroleaceæ* and *Garryaceæ* be counted as independent orders; and both of these occur in the Atlantic states south of our geographical limits.

The Distribution through degrees of latitude of the Phænogamous Species generally of the Flora of the Northern United States.

Having devoted the greater part of our last article to the investigation of this subject as respects about 15 per cent of our species,—namely those common to this country and to Europe,—I shall not be expected to elaborate the range of our whole 2091 Phænogamous plants in the same detailed manner.

I have investigated, in this regard, the shrubs and trees separately from the herbaceous plants; the former being moderate in number, and those which extend into British America affording us the advantage of having had their northern limits laid down by Sir John Richardson, in the invaluable appendix to his Arctic Searching Expedition. Of our Phænogamous species about

1745, or 83·5 per cent, are herbaceous plants.
218, or 10·3 per cent, are shrubs or woody vines.
130, or 6·2 per cent, are trees.

Northward and Southward Range in this country of our Shrubs and Trees.

The average range in America of our 348 woody plants is through about 13½ degrees of latitude.

The 15 following species are those which appear to have the greatest range north and south, namely, through from 30 to 40 degrees of latitude.

	Northern limit.	Southern limit.	Range.
Prunus serotina, -	61°	29°	32°
" Virginiana, -	66	31	35
Rosa blanda,* -	69	39	30
Amelanchier Canadensis,*	66	30	36
Cornus stolonifera, -	69	38	31
Viburnum acerifolium,*	62	31	31
Arctostaphylos Uva-ursi,*	70	36	34
Cassandra calyculata,	67	34	33
Alnus viridis,* - -	68	35	33
Salix discolor, - -	67	36	31
" lucida,* - -	67	37	30
" longifolia,* -	68	35	33
Populus tremuloides, -	69	37	32
Abies nigra, - -	68	34	34
Juniperus Virginiana, -	67	26	41

All of these species, with four or five exceptions, extend into the Southern United States only along the Alleghany Mountains; consequently their climatic range is not so great as would at first appear. Those which have an extraordinary climatic range, being natives both of the Arctic and Subarctic regions and of the low country bordering the Gulf of Mexico are the following.

Viburnum acerifolium. In the Southern States this is not met with far from the Alleghany Mountains, and the few specimens I have seen from Middle Florida are of doubtful character.

Amelanchier Canadensis. The Shad-flower or Service-berry prefers the mountains or their vicinity, but is not unknown in some parts of the low country as far south as Florida.

Prunus serotina. The Wild Black Cherry ranges from near Great Slave Lake, at the north, well into Florida and Texas, and into the adjacent parts of Mexico. Although it varies from a moderate-sized shrub to a large tree, I have no idea that more than one species is covered by this name.

Prunus Virginiana. The Choke Cherry extends from the borders of the Arctic Circle to Louisiana, &c.; but in the Southern States it is chiefly restricted to elevated districts.

Juniperus Virginiana. The Red Cedar, with its immense range, in the United States inhabits the warmer rather than the colder districts of the country, and extends on the Gulf of Mexico quite to the mouth of the Rio Grande. As a tree it does not occur north of about lat. 54°, but the low and spreading or prostrate form, which, with Sir William Hooker I have not been able to distinguish specifically from J. Virginiana, advances a short distance within the Arctic Circle, where, according to Sir John Richardson, it bears fruit at an elevation of 1000 feet, Sir William Hooker unites not only this northern form, but the Red Cedar generally with *Juniperus Sabina* of Europe, which in this case ranges over nearly the whole extent of the northern hemisphere. I am not yet prepared to adopt this view.

If the high northern prostrate Savin is rightly referred to *Juniperus Virginiana*, this species extends from within the Arctic Circle to the Gulf of Mexico. It is the only woody plant which does so, except perhaps *Amelanchier*, which has been traced almost to the Arctic Circle, and possibly *Prunus Virginiana*.

Alnus viridis occurs southward only on the highest Alleghanies.

We naturally enquire whether these fifteen species range widely east and west. Seven of them, those to which an asterisk is annexed, extend from the Atlantic to the Pacific, or very nearly, south of lat. 46°; and of these only two (*Arctostaphylos Uva-Ursi* and *Alnus viridis*) are indigenous to the Old World. *Cornus stolonifera*, *Prunus serotina* and *P. Virginiana*, and probably *Salix discolor*, all peculiarly American, reach or cross the Rocky Mountains. *Cassandra* (of which I have some doubt about its reputed southern range to Georgia) is wholly eastern, and is also European. *Populus tremuloides* and *Abies nigra* are both exclusively Eastern North American in habitation.

The following 68 species of woody plants, range with us through between 20 and 29 degrees of latitude.

— * Tilia Americana.
  † Rhus glabra.
— † " aromatica.
— * Vitis cordifolia.
— † Ampelopsis quinquefolia.
— † Acer rubrum.
— † Negundo aceroides.
— * Amorpha fruticosa.
— * Prunus Americana.
— * Spiræa opulifolia.
  † " salicifolia.
  † Rubus occidentalis.
— † " villosus.
  ‡ Potentilla fruticosa.
— * Pyrus arbutifolia.
  † Ribes Cynosbati.
  † " hirtellum.
  ‡ " lacustre.
  ‡ " rubrum.
  ‡ Lonicera cærulea.
  † Sambucus pubens.
— † " Canadensis.
  ‡ Viburnum Opulus.
  † Gaylussacia resinosa.
  ‡ Vaccinium Vitis Idœa.
  ‡ " Oxycoccus.
  ‡ Vaccinum uliginosum.
  ‡ " Canadense.
  ‡ Arctostaphylos alpina.
— † Epigæa repens.
  ‡ ? Cassiope hypnoides.
  ‡ Andromeda polifolia.
— † " ligustrina.
  ‡ Phyllodoce taxifolia.
  ‡ Kalmia glauca.
  † Menziesia ferruginea.
  ‡ Rhododendron Lapponicum.
  ‡ Loiseleuria procumbens.
— † Fraxinus Americana.
  ‡ Shepherdia Canadensis.
  ‡ Empetrum nigrum.
— * Ulmus fulva.
— † " Americana.
— * Quercus obtusiloba.
— † " alba.
— † " rubra.
— * Fagus ferruginea.
— † Corylus Americana.
— † Ostrya Virginica.
  ‡ Myrica Gale.
  † Comptonia asplenifolia.
  ‡ Betula pumila.

‡ Betula nana.
‡ " papyracea.
‡ Alnus incana.
‡ Salix cordata.
‡ " rostrata.
‡ " phylicifolia.
‡ " pedicillaris.
‡ " Uva-Ursi.
‡ Salix repens.
‡ " herbacea.
‡ Pinus Banksiana.
† Abies balsamea.
‡ " alba.
‡ Larix Americana.
† Cupressus thyoides.
‡ Juniperus communis.

The mark — prefixed to the name indicates that the species extends southward to the borders of the Gulf of Mexico. The asterisk * denotes a range northward to the Great Lakes; †, to the basin of the Saskatchawan; ‡ to the Arctic Circle, or at least to lat. 67°.

It appears then that 34 species, or one half of this list, are of boreal or alpine character, ranging northward to or within the Arctic Circle. Fifteen of these are exclusively alpine or subalpine plants, and occur only on our higher mountains as far south as lat. 44°. Of the rest, those of greatest climatic range are, *Alnus incana*, ranging from about lat. 68° to 39°; *Salix cordata*, with an equally wide range and probably reaching further south; *Larix Americana*, with about the same southern limit, but in an elevated region only; *Juniperus communis*, not found south of lat. 40°; *Myrica Gale*, and *Ribes Cynosbati*, *Potentilla fruticosa*, *Kalmia glauca*, *Betula pumila*, and perhaps *Ribes lacustre*, each have a range of 28 or 29 degrees, but none of them are found south of lat. 40°.

Twenty-two species of the foregoing list extend northward into the Saskatchawan basin, and all but three of them (which cross the 60th parallel and occur in the basin of the Great Slave Lake) find their northern limit there.

On the other hand, 24 species extend southward to the borders of the Gulf of Mexico. Fourteen of these have their boreal limit in the Saskatchawan district, and nine about the Great Lakes.

The following species, 57 in number, range through from 15 to 19 degrees of latitude:

† Hudsonia tomentosa.
* Rhus typhina.
— * " venenata.
— * " Toxicodendron.
— * Ptelea trifoliata.
— * Vitis Labrusca.
† Rhamnus alnifolius.
— * Ceanothus Americanus.
† Acer Pennsylvanicum.
† " spicatum.
* Acer saccharinum.
* " dasycarpum.
* Amorpha canescens.
† Prunus Pennsylvanica.
† Spiræa tomentosa.
† Rubus odoratus.

† " strigosus.
— * Rosa setigera.
— * " lucida.
— * Cratægus coccinea.
— * Cratægus tomentosa.
† Ribes prostratum.
† " floridum.
— * Hamamelis Virginica.
* Cornus sericea.
† Symphoricarpus occidentalis.
† " racemosus.
† Lonicera parviflora.
† " ciliata.
† Diervilla trifida.
— * Viburnum nudum.
† " Lentago.
† " pubescens.
* " lantanoides.
† Vaccinium macrocarpon.
— * " corymbosum.
* Gaultheria procumbens.
— * Kalmia latifolia.
* " angustifolia.
— * Azalea viscosa.
— * " nudiflora.
† Nemopanthes Canadensis.
* Fraxinus pubescens.
— * " viridis.
— * Benzoin odoriferum.
— * Platanus occidentalis.
† Corylus rostrata.
— * Carpinus Americana.
— * Myrica cerifera.
* Salix eriocephala.
† " petiolaris.
— * " angustata.
— * Populus angulata.
† " balsamifera.
† Pinus resinosa.
† Thuja occidentalis.
— * Smilax rotundifolia.

The marks prefixed to the names have the same signification as in the preceding list.

Not one of these species are alpine, or even subalpine, nor found within several degrees of the Arctic Circle. Only two of them (viz., *Symphoricarpus occidentalis* and *S. racemosus*) reach the 60th parallel, or the great northern basin. Twenty-four of them have their boreal limit in the Saskatchawan or Hudson's Bay region; and all of them extend as far north at least as to the Great Lakes, although a few (such as *Ptelea trifoliata* and *Populus angulata*) barely touch their most southern borders, viz., the south shore of lakes Erie and Michigan.

Twenty-three species range southward to the borders of the Gulf of Mexico or very nearly, while their boreal limit is on or near the Great Lakes, between 41° and 49°.

Without carrying this analysis any farther, let us turn to the shrubs and trees of narrowest northern and southern range. Those whose range is not known to exceed six degrees of latitude are 33 in number, viz:

Magnolia macrophylla.
" Umbrella.
Berberis Canadensis.
Hypericum Kalmianum.
Æsculus glabra.
Robinia Pseudacacia.
" viscosa.
Cladrastis tinctoria.
Spiræa corymbosa.
Cratægus cordata.
Calycanthus glaucus.
Fothergilla alnifolia.
Lonicera hirsuta.
" oblongifolia.
Baccharis glomeruliflora.
Gaylussacia brachycera.

Vaccinium erythrocarpon.
Leucothoë Catesbæi.
" recurva.
Andromeda floribunda.
Clethra acuminata.
Azalea arborescens.
Rhododendron Catawbiense.
Styrax Americana.
Ulmus racemosa.
Juglans nigra.
Carya microcarpa.
" sulcata.
Quercus palustris.
Pinus pungens.
Abies Fraseri.
Smilax Walteri.
" hispida.

Fifteen, or 45½ per cent of these are trees; and out of 14 whose range is under four degrees of latitude, six are trees.

On the other hand, out of 140 species of wide or considerably more than average range, enumerated in the preceding lists, 42 (i. e. 30 per cent) may be counted as trees. Now, as almost 60 per cent of our woody plants attain under favoring circumstances the stature of trees, the general impression, that trees are more limited in range than shrubs, is not confirmed by the list last given, in which the percentage of trees is diminished instead of enlarged; but seems decidedly to be so by the list of wide-ranging species, even after the exclusion of the alpine plants, which of necessity are not trees. That is, local species are about as likely to be shrubs as trees, but shrubs are in general more widely distributed than trees.

A very few of our shrubs and trees, if rightly determined, extend southward much beyond the southern boundaries of the United States. Those which do so, principally, *Ascyrum stans* and perhaps *Zanthoxylum Carolinianum*, in the West Indies; and *Negundo aceroides*, *Sambucus Canadensis*, *Cephalanthus occidentalis*, *Vaccinium stamineum*, *Salix angustata*, and *Taxodium distichum*, in Mexico.

Northward and Southward range in this country of Herbaceous Plants.

Upon this subject my statements must be brief and general. Of the 1745 phænogamous herbaceous plants of the Flora of the Northern United States, diminished to about 1690 by the exclusion of the alpine and subalpine species, here left out of view—

843 species, or 50 per cent, range southward to the borders of the Gulf of Mexico.

538, or not quite 32 per cent, extend northward into the Saskatchawan basin or to Labrador.

107 of these reach or cross the Arctic circle.

24 species, or less than 1½ per cent, range from the Gulf of Mexico to the Arctic circle.

180, or 10½ per cent, range from the Gulf of Mexico to the Saskatchawan or Labrador.

248 species, or over 14½ per cent, range from the Gulf of Mexico to the Great Lakes or the St. Lawrence.

The twenty-four herbaceous plants of widest climatic range are

Ranunculus aquatilis.
" Cymbalaria.
" Purshii.
" sceleratus (a doubtful native southward).
Sarracenia purpurea.
Nasturtium palustre.
Cardamine hirsuta.
Barbarea vulgaris (not indigenous at the south?).
Sisymbrium canescens.
Viola cucullata.
Drosera rotundifolia.
Spergularia rubra.
Lupinus perennis (if the plant growing on the Arctic sea-coast is correctly referred to this species).
Galium trifidum.
" triflorum.
Erigeron Philadelphicum.
Achillea Millefolium (probably introduced southward).
Senecio aureus.
Taraxacum Dens-leonis.
Dodecatheon Meadia.
Chenopodina maritima?
Potamogeton pectinatus.
Luzula campestris.
Carex Novæ-Angliæ.

All except three or four of these species range westward to the Pacific; but one, *Sarracenia purpurea*, is remarkably restricted to the vicinity of the Atlantic. Only the seven printed in italics are indigenous to North America exclusively.

The Range of our Species compared with the size of the Genera they belong to.

The data before us may be used to test Mr. Darwin's surmise, that the species of large genera on the whole occupy a greater geographical area than those of small genera. Certainly almost half of the herbs of the last preceding list belong to very large genera; and all but four of them to genera of more than average size, that is, of more than ten or twelve species. I find, also, that 126 out of the 180 herbaceous species which range from the Gulf of Mexico to the Saskatchawan or Labrador, viz. 70 per cent, belong to genera containing above the average amount of species each, and about 112 of them belong to genera which are represented in the Flora of the Northern United States by above the average of indigenous species to genus.

And our woody plants of wide range tend more strongly to confirm this view, as the following table shows.

Woody plants ranging through	Whole No. of species.	Belonging to Genera, Of great size.	Of more than average size, i. e. of over 10 species.	Of a single species or nearly so.
30°–40° of latitude.	15	3	13	1
20° " "	68	20	48	6
15° " "	57	7	44	1
	140	30	105	8

That is, in the first list, or in the species of widest range, 86½ per cent; in the second, 70½ per cent; in the third, 76 per cent, or in all three together 75 per cent of the species belong to genera of above the average size.

The converse does not tell in the same way, so far as our list of 33 species of narrowest range shows; for at least 21 of them belong to genera of above the average size, and only two are monotypic. But here the particulars are too few to draw any useful induction from.

Species of the Northern United States which have some other and widely sundered habitation.

The plants which I here have in view belong to DeCandolle's category of *Disjoined Species* (Espèces Disjointes),* or those of which the individuals exist in two or more separated countries, and which cannot reasonably be regarded as having been conveyed from one to the other by any existing means of transport, whether on account of their mode of life, the character of their seeds, the extreme distance of their habitations, or any other reason. I restrict myself, however, to only one, and that a small, portion of the numerous species which DeCandolle treats of under this head. For in this view almost all the undoubtedly indigenous phænoganous plants common to this country and to the Old World are disjoined species. I exclude both those species which are rather widely distributed in Northern Europe or Asia as well as in this country, and those which are dispersed over a very considerable portion of the terrestrial surface of the globe,† and consider only those of remarkably isolated as well as distant habitats.

The following are the principal cases of the kind with which we have to do.

Anemone multifida. North America, from lat. 42° northward. South America from Chili, and perhaps Peru, southward.

Trautvetteria palmata. Illinois to Tennessee. Oregon on the Pacific: no intermediate station known.

Myosurus minimus. Florida and Georgia to Illinois, and west to Oregon and California. Europe, north to Finland.—It is remarkable that along with the common Mousetail in Oregon grows the only other species of the genus, *M. aristatus, Benth.;*

* *Géographie Botanique*, 2, p. 993.

† DeCandolle (*Géogr. Bot.*, 1, p. 564) gives a catalogue of 117 Phænogamous species which are now dispersed (whether by naturalization or otherwise) over at least one-third of the terrestrial surface of the globe,—a number which he supposes might be raised to 200. Some botanists, uniting nominal species, would add considerably to the number. Our *Flora of the Northern United States* comprises 103 of these, and perhaps should have comprised two or three more. Of this number 58 are reckoned as indigenous plants, and 45 as introduced species. A few species are probably to be transferred from the indigenous to the naturalized list, viz., *Galium Aparine, Gnaphalium uliginosum, Juncus bufonius*, and perhaps *Poa annua*.

which elsewhere occurs only in Chili, where it is the *M. apetalus* of Gay.

Brasenia peltata. Canada to Florida and Eastern Texas. Eastern Himalayas, Japan (*fide* Planchon), Eastern Australia. The only known species of the genus. The other genus of this group, *Cabomba*, was once thought to furnish another case of great disjunction; the original species inhabiting Cayenne and Brazil being long supposed to be identical with the species of the Southern United States. The latter I distinguished twenty years ago, chiefly by the form of the floating leaves, under the name of *C. Caroliniana;* but I should not be surprised if it were eventually reunited to *C. aquatica.*

Subularia aquatica. As already stated in a former article (vol. 23, p. 65), the only known stations of this plant in the New World are at most two, one in Maine, the other in New Hampshire. But it is a plant very likely to be overlooked. Northern Europe to lat. 70°, and Siberia.

Silene Antirrhina. United States, south to the borders of Mexico, and perhaps farther. South Brazil and Northern Patagonia.

Cerastium arvense. Northern parts of N. America and in the Old World. South Brazil and Chili to the Falkland Islands, according to Dr. Hooker.

Sagina procumbens. Northeastern States, rare. Falkland Islands. Perhaps not indigenous in the New World. Europe.

? *Elatine Americana.* New Hampshire to Kentucky. New Zealand! according to Dr. Hooker. But a further comparison is desirable.

? *Lathyrus maritimus.* Coasts of N. America north of lat. 40°, and in corresponding parts of the Old World. Southern border of Chili, lat. 47° S. Needs fuller confirmation.

Potentilla anserina. Pennsylvania to California and northward, and northern part of the Old World. Chili. New Zealand.

Potentilla frigida. Alpine region of the White Mountains of New Hampshire. Greenland. Swiss Alps.

? *Potentilla tridentata.* Alleghany Mountains to Arctic America, lat. 64°; generally subalpine, but found on the Coast of Massachusetts (Cape Cod, H. J. Clark,) and Maine; Labrador and Greenland. Clova Mountains, Scotland; found many years since by G. Don but by no one else. I had omitted to mention this as a European species, having the impression that it was supposed to have been wrongly introduced into the Flora of Great Britain. Hooker and Arnott, however, still retain it, although marking it as extinct. If it was really found indigenous in Scotland, then it is (as Prof. Tuckerman has aptly remarked to me) an exact counterpart to *Carex fulva*, which was first detected in this country, and once gathered in Massachusetts, but never found again in America, although it has proved to be not uncommon in

Western Europe. These indications of the extinction of a species on one side of the Atlantic, while it flourishes on the other, are very significant.

Circæa Lutetiana. This is not recorded from any station north of lat. 46°, nor west of the Mississippi. In Europe it ranges north to Scotland and Finland and east to Altai. Hence De Candolle includes it in his list of remarkably disjoined species.

Hippuris vulgaris. Rare in this country, but extending from far north to lat. 36° along the Rocky Mountains, and reappearing in Patagonia.

Sium lineare. Florida to the Saskatchawan and northern Oregon. Siberia.

Cryptotænia Canadensis. Eastern United States and Canada. Japan, *fide* Zuccarini.

Heracleum lanatum. Northern United States to Newfoundland; Oregon and Sitcha. Japan.

Hydrocotyle Americana. Eastern United States. Brazil. New Zealand, (*fide* Dr. Hooker.)

Crantzia lineata. Massachusetts to Texas. Buenos Ayres to the Falkland Islands. New Zealand.

Osmorrhiza longistylis. Northern United States and Canada to Oregon. Japan! (*O. Japonica*, Zucc.)

Aralia quinquefolia (*Panax quinquefolium*, Linn.). Canada to Georgia along the mountains. China? and Himalayas, (*P. Pseudo-Ginseng*, Wall.)

Viburnum lantanoides. Northern States, not crossing the Alleghanies, and Canada. Japan! (*V. plicatum*, Thunberg.)

Matricaria discoidea. St. Louis, Missouri. Probably a recent immigrant from Oregon, although thoroughly established. California to Unalaschka and adjacent parts of Asia. Sweden! Doubtless of recent introduction, but how introduced is unknown.

Monotropa uniflora. Canada to Louisiana; Oregon. Falls of Tequendama, New Granada, *Prof. Holton!* Sikkim and Khasian Himmalayas, *Dr. Hooker!* This isolated occurrence of a plant so peculiar in appearance and mode of life, in these districts so widely separated from each other, furnishes far the most remarkable case of anomalous distribution I know. The species is unknown north of Canada, and must be rare west of the Mississippi, as Nuttall alone mentions it from Oregon. But I should not be surprised to hear of it from Japan on the one hand, and the Mexican Andes on the other.

Plantago maritima, var., *juncoides*, &c. Northern hemisphere; on the Atlantic coast of North America south to lat. 40°; on the Pacific coast to lat. 36°. Straits of Magellan.

Primula farinosa. Northern hemisphere; in the United States south to lat. 42°, and in the Rocky Mountains to lat. 39°. Straits of Magellan and Falkland Islands!

Centunculus minimus. Florida to Illinois and Oregon, Southern Brazil! Europe, north to Norway. Perhaps introduced into Brazil?

Phryma Leptostachya. Canada to Florida; not found west of the Rocky Mountains. Nepal!

Veronica Anagallis. Around the northern hemisphere, in the temperate zone. New Zealand, *fide Dr. Hooker.*

Veronica serpyllifolia. Around the northern hemisphere. Quito and Falkland Islands, &c. Cape of Good Hope. Perhaps introduced in the southern hemisphere.

Dichondra repens. Virginia to Chili. New Zealand. Tasmania to Eastern Africa. Cape of Good Hope.

? *Salicornia mucronata.* Coast of New England; also on the coast of Spain, if the plant of Lagasca under this name is the same as ours. The two have never been compared; and the main object in the present mention of them is to ask that this may be done.

? *Castanea vesca.* Eastern United States, north to lat. 44°. Southern and Eastern Europe. (Vide vol. 23, p. 65.)

Betula alba. Northeastern United States, from lat. 40° to 46°. Northern Europe to the Arctic regions, and Siberia.

Convallaria majalis. Mountains of Virginia and Carolina. Europe and Northern and Eastern Asia. Japan.

? *Polygonatum latifolium.* Pennsylvania. Central and Southern Europe.

Smilacina stellata. Northern States to California, Oregon and Labrador. Norway.

Smilacina trifolia. Northern States, and from Labrador to Bear Lake, and the Rocky Mountains. Siberia.

Trillium erectum var. *album.* Northern States and Canada. Japan!

Vallisneria spiralis. United States east of the Mississippi, and Canada to lat. 46°. France to Italy; near St. Petersburgh? also on the Wolga. India?

Anacharis Canadensis. Eastern part of Canada and the United States. New Granada to Chili. Probably in intermediate stations.

Zannichellia palustris. Northern hemisphere, only in temperate regions; neither arctic nor tropical. New Zealand.

? *Spiranthes cernua.* United States, Canada, and Oregon. Western coast of Ireland.

Xerophyllum asphodelioides. New Jersey to Carolina; but nowhere west of the Alleghanies, except in Oregon and California.

Juncus stygius. Northern New York at one station. Newfoundland. Scandinavia; Bavaria and Switzerland.

? *Juncus maritimus.* Coast of the Atlantic United States south of lat. 40°. Europe, &c.

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Eriocaulon septangulare. Eastern United States, north of lat. 40°, to the Saskatchawan and Newfoundland. Western Coast of Ireland, Isle of Skye, and the Hebrides.

Hemicarpha subsquarrosa. United States from Maine? to Texas. Brazil.

Rhynchospora fusca. Northeastern United States, lat. from 40° to 44½°. Europe south of Sweden.

Carex flacca. New Jersey, lat. 40°. Europe from Finland southward.

Carex lævigata. Massachusetts? England to Portugal.

Carex fulva. Massachusetts; found only once. Newfoundland; where it was first detected, but has not been found again. W. Europe from Finland southward.

Carex canescens, Linn., (*C. curta*, Good.) Colder parts of the Northern hemisphere, south to lat. 40° in this country. Antarctic America.

Carex stellulata. Same general northern range as the last. New Zealand, *fide* Dr. Boott.

Carex teretiuscula. Same general range as the last. New Zealand, *fide* Dr. Boott.

Phleum alpinum. Alpine and Arctic regions in the northern hemisphere. Antarctic America, *fide* Hooker.

Agrostis canina. Only subalpine in the United States. Falkland Islands, *fide* Hooker.

? *Spartina juncea.* Atlantic coast of the United States. French coast of the Mediterranean, at one station only, near Fréjus. A chance introduction?

Spartina stricta (*S. glabra* and *S. alterniflora*). Atlantic coast of the United States to Guadeloupe and Cayenne. Coast of England to the Adriatic; at few stations. A case of accidental or oceanic transport?

Kœleria cristata. Temperate and colder regions of the northern hemisphere. New Zealand and Tasmania, *fide* Hooker.

Glyceria fluitans. Same general range as the last. Australia.

Poa nemoralis. Northern and colder parts of North America; more common in Europe. Antarctic America, *fide* Hooker.

Poa pratensis. Same general distribution as the last. Antarctic America, *fide* Hooker.

Festuca ovina. Same distribution as the preceding. New Zealand, *fide* Hooker.

Triticum repens. Same distribution generally as the preceding. Antarctic America, *fide* Hooker.

Hordeum jubatum. Atlantic and Pacific coasts of North America, chiefly northward on this side, and south to California on the other; also along the Great Lakes. Chili? Straits of Magellan, *fide* Hooker.

Aira flexuosa. Northern hemisphere, throughout the cooler parts. Patagonia and Falkland Islands.

Aira cæspitosa. Colder parts of the northern hemisphere. Antarctic America and New Zealand, *fide* Hooker.

Trisetum subspicatum. Alpine and arctic exclusively in Europe, Asia and N. America (except the var. *molle*, which is rarely ever subalpine in the Northern States); advancing south along the Rocky Mountains to about lat. 40°. Andes of Mexico, Colombia, and Peru, *fide* Hooker. Antarctic America and Campbell Islands: also Tasmania, *fide* Hooker.

Hierochloa borealis. Around the colder parts of the northern hemisphere. New Zealand, and Tasmania, *fide* Hooker.

To this list of 69 phænogamous species of our flora inhabiting very widely sundered stations, the following Ferns should be appended, namely:

Scolopendrium officinarum. Banks of a deep ravine in Madison County, New York, where it abounds; the only American habitat known. Europe and Northern Asia.

? *Camptosorus rhizophyllus.* Atlantic United States, chiefly along the Alleghanies, and north to the Saskatchawan. Siberia and Kamtschatka?

Adiantum pedatum. Eastern United States and Canada to Oregon and Unalaschka. Kamtschatka, Japan, Nepal.

Aspidium Lonchitis. Lake Superior, Rocky Mountains. Unalaschka, Northern Europe and Asia from Lapland to Altai.

Schizæa pusilla. Pine barrens of New Jersey, lat. 39½°–40°; very local, but abundant. Newfoundland; lat. 49°; and not elsewhere.

I do not include in this enumeration *Saururus cernuus* and *Stachys aspera*, adduced by DeCandolle as species extraordinarily disjoined and isolated. The latter I have considered as merely a variety of the polymorphous and widely diffused *S. palustris*. The second DeCandolle mentions on the authority of Hooker and Arnott, who were unable to distinguish Chinese specimens from our *Saururus cernuus*. But Japanese specimens of what I take to be *S. Loureiri*, Decaisne, seem to be marked by good specific characters. An analogous case, still needing examination is that of *Penthorum Chinense*, which the elder DeCandolle, however, distinguishes from our *P. sedoides* by its seeds.

These species of widely sundered habitation arrange themselves, for the most part, under three heads, viz:

1. Those which re-appear in high southern or antarctic latitudes. These, the most remarkable of all, are about 34 in number, or nearly half of our list. And to this number might be added several other species, common to our northern and to high southern regions, but not occurring in our Flora; such as *Draba*

incana, *Montia fontana*, *Saxifraga exarata*, *Erigeron alpinum*, *Statice Armeria*, *Carex festiva*, and *Alopecurus alpinus*, enumerated in Hooker's Flora Antarctica, as both Arctic and Antarctic American as well as European species.

2. Those which re-appear in Japan, the Himalaya, or some part of Northern Asia, but are not European; of which the following are the principal: viz, *Boussenia pellata*, *Sium lineare*, *Cryptotænia Canadensis*, *Heracleum lanatum*, *Osmorhiza longistylis*, *Aralia quinquefolia*, *Viburnum lantanoides*, *Monotropa uniflora*, *Phryma leptostachya*, *Smilacina trifolia*, *Trillium erectum*, var., *Camptosorus rhizophyllus*, and *Adiantum pedatum*. A goodly number of species common to Northwestern America and Japan, and of others common to the Himalayas, Europe, and North America, although as yet known from but few stations throughout large parts of this belt (such as *Spiræa Aruncus*, *Pyrola rotundifolia*, &c.,) and whose dispersion is scarcely more explicable than that of the foregoing by any existing agencies, serve nearly to bridge over the wide gap which, at first view, appears so markedly to separate these extraordinarily sundered plants from the generality of species.*

3. Species of Western Europe and (chiefly) Eastern North America, not reaching here to high latitudes, and mostly of limited range on one or the other side of the Atlantic. Of this sort are *Myosurus minimus* (in this country remarkably southern, but also far western in range), *Subularia aquatica*, *Circæa Lutetiana*, *Betula alba*, var., *Convallaria majalis*, *Juncus Stygius*, *Carex flacca*, *lævigata*, and *fulva*, *Scolopendrium officinarum*, and *Aspidium Lonchitis*, all much more local in this country than in Europe; and on the other hand, *Potentilla tridentata*, *Smilacina stellata*, *Vallisneria spiralis*, *Spiranthes cernua*, *Spartina stricta*, and *Eriocaulon septangulare*, all common and for the most part rather widely distributed plants in this country, but very local in Europe. All but four species on this list belong exclusively to the Atlantic border of North America. Cases of this kind are naturally regarded by some as indications of a former terrestrial connection between North America and Europe.

Only three or four of these species of widely sundered stations are maritime, and of these only *Spartina* and the *Salicornia* (if the latter be the same on both sides of the Atlantic, which there is no evidence of) could owe their present dispersion to oceanic currents. The light fruits of *Circæa* are provided with minute hooks; those of *Heracleum* and *Betula* are winged; the spike of

* Out of 45 species belonging to these first and second heads, as many as 10 belong to monotypic genera, and 21 to genera of less than ten good species;—six of the species belong to the vast genus Carex;—on the whole rather militating against the idea that the geographical extension of species bears some proportion to the size of the genus they belong to.

Hordeum jubatum breaks up into short joints, and the persistent glumes and the paleæ enclosing the seed are long-awned. But no others of the 69 phænogamous species above enumerated enjoy peculiar facilities for, or are endowed with any appliances favorable to adventitious transport.

Such cases, accordingly are much relied upon by its advocates in proof of the doctrine of the double or multiple origin of species. Even DeCandolle, who formerly maintained that doctrine, but whose matured opinion favors the idea that species of plants generally originated each in a single birth-place, is still inclined to view such cases as exceptions to the general rule. A fuller investigation will probably do away with this intermediate hypothesis. If the dispersion of other plants generally could be accounted for by existing agencies acting under the present state of things, and if there were really any marked line of difference to be drawn between these and other widely dispersed but less isolated species, the supposition of a double birth-place for the exceptional species would be the most natural; although one would then be inclined to regard them as mostly cases of closely related species whose points of difference are still unascertained or undervalued. For we no more know how nearly alike two species may appear and yet be specifically distinct, than we know how widely they may differ and yet own a common origin. The botanist's best conclusions regarding the limitation of species are seldom more than judgments on imperfect data, constantly liable to be questioned and revised.

But both these most striking cases, and the transitional ones between them and those of ordinary distribution, are becoming too numerous to bear this exceptional mode of explanation. DeCandolle lays much stress upon the isolated occurrence of a single peculiarly United States species, *Phryma leptostachya*, in Nepal. Now the foregoing catalogue includes three or four additional cases of the same kind, which Drs. Hooker and Thomson's Himalayan collections may probably double; and the considerable number of North American species which meet Himalayan ones in Japan already indicates the line of connection between these two distant floras. We should therefore look in one and the same direction for the explanation of these extraordinary no less than of the more ordinary cases of distribution, and, adopting the conclusion to which DeCandolle himself arrives, and maintains on various and convincing grounds,—viz., that plants must have been created at different epochs, and that the greater part of the existing species are older than the present configuration of our continents,—should refer such anomalous distribution to very ancient dispersion; and all the more confidently as the known examples of the kind increase in number.

As the discussion of this most difficult problem proceeds, the two antagonistic positions only seem likely to be tenable;—the one attributing much to changes of station, etc., occurring during a long lapse of time, and the other looking upon the whole actual area of each species as its original home. The supporters of the first view regard each species as having spread from a single and local birth-place, or even, as the more thorough-going (like Dr. Hooker) maintain, from a single individual or pair. The opposing view finds its hardiest and most consistent advocate in Agassiz, who contends, if I rightly apprehend him, that each species probably originated in as many individuals, and covering from the first as large an area as it subsequently possessed.

Of the first-named theory, the only question is whether it will sufficiently explain all the facts of distribution; the second supersedes the necessity of such explanation, by assuming the actual distribution to be essentially the original state. The first theory is based upon the natural idea of species as consisting of kindred individuals descended from a common stock, which, whether demonstrable or not as a fact, gives us a clear and distinct conception of *species*, and the only one we possess. The second theory, being incompatible with this conception, leaves species no objective basis in nature, and seems to make even the ground of their limitation a matter of individual opinion.

The Distribution of our Phænogamous Species, and of the Individuals which represent them, within the limits of our Flora.

The distribution of the materials of our flora over the surface included within its limits, is a subject which I have not room nor time left for discussing with anything of the fullness it deserves. Properly to discuss this and kindred topics would require a great amount of detailed investigation, and would expand these articles into a treatise.

Viewed as to its amount or prominence, the importance of each species as a constituent of our flora depends upon the extent of country it ranges over, and the relative abundance of its individuals. To get some general idea of both points, I have gone over the pages of the *Flora of the Northern United States*, and indicated by peculiar marks, 1, those species which are very local, either absolutely so, or because they barely enter within our borders, however widely they may range beyond them on any side; 2, those of narrow or restricted range within our limits, not extending over more than a tenth or an eighth part of our territory; and 3, wide-spread species, which have been found over nearly the whole length and breadth of our territory. Then, by a different set of marks I have indicated, 1, those species which are very scarce in individuals in their proper habitat; 2, those which are not abundant in individuals; and 3,

those which ordinarily are very abundant in individuals wherever they occur. The latter includes our *social plants*, as well as a larger number which could not properly be so called. I should have distinguished the really social plants from the others if I knew how to draw any line between the two. It would be very difficult to fix upon any precise standard of scarcity or abundance: another botanist might give a considerably different estimate; and the same species must vary in abundance in different parts of so large an area. No great accuracy is therefore to be expected in the numbers. The introduced plants are of course left out of view: and the whole following statement may be taken to refer rather to the country in its wild state, than as now gravely modified in its botanical features by the agency of civilized man.

1. *As to the area occupied*, I compute that there are of

	Exogenæ	Endogenæ excl. Glumaceæ.	Cyperaceæ and Gramineæ.	Total.
1. Very local species, - -	228	26	44	298
2. Species of small or narrow range, compared with the extent of country embraced in the Flora, - - - - -	542	92	144	778
3. Species ranging over an area equal to between $\frac{1}{8}$th and $\frac{4}{4}$ths of our territory, i. e. all not included in No. 1, 2 and 4. - -	397	49	92	538
4. Species of widest range over our territory. - -	323	59	95	477

2. *As to the abundance of individuals* where the species occurs:

	Exogenæ.	Endogenæ.	Total.
1. Very scarce, - - - - - -	11	10	21
2. Not abundant, - - - - -	66	20	86
3. Moderately abundant (as far as known), - - - - -	493	47	540
4. Very abundant, - - - -	920	524	1444

To exhibit the distribution according to the genera, or even the natural orders, would require too much room.

In the last table I have not distinguished the Glumaceous from the Non-Glumaceous *Endogenæ*, because, in fact, all our *Gramineæ* and *Cyperaceæ* are abundant in individuals wherever they occur, so that I have thrown in the whole 375 under the fourth head; although probably one quarter of them might be better placed under the third. Of the 20 *Endogenæ* which are not abundant in their habitats, but yet not very scarce, all but four are *Orchidaceæ*. The 21 scarcest species are

Exogenæ.

Sibbaldia procumbens.
Saxifraga rivularis.
Nardosmia palmata.
Coreopsis bidentoides (a very obscure plant).
Gnaphalium supinum.
Nabalus Bootii.
Arctostaphylos alpina.
Pterospora Andromedea.
Schweinitzia odorata.
Hemianthus micranthemoides (?)
Obolaria Virginica.*

Endogenæ.

Limnobium Spongia.
Platanthera rotundifolia.
Listera cordata.*
" australis.
" convallarioides.
Calypso borealis.
Tipularia discolor.
Liparis liliifolia.*
" Lœselii.*
Aplectrum hyemale.*

Five of the plants in the first column (printed in *italics*) are alpine, and with us peculiarly local, species; and four of the remainder are very local, the two of considerable range being *Pterospora Andromedea* and *Obolaria Virginica*. Of the ten species in the second column all but one are *Orchidaceæ*, and all but one (*Aplectrum*) either very local species or of narrow range. None of the 21 species are known at many stations within our limits; only five of them (marked with an asterisk) have probably been collected at more than half a dozen places; and most of the rest are known at only two or three stations.

And generally, that our species of widest range are most abundant in individuals is shown by the fact, that, of our 477 most widely spread species, 420 (or 96 per cent) are marked as belonging to this category. These are distributed among the natural orders as follows.

Number of Species of each Natural Order which are both of widest Geographical Range in the Northern United States, and most abundant in Individuals where they occur.

Ranunculaceæ,	49	12	Anacardiaceæ,	6	5
Berberidaceæ,	5	1	Vitaceæ,	7	4
Cabombaceæ,	1	1	Rhamnaceæ,	6	1
Nymphæaceæ,	3	2	Celastraceæ,	3	1
Papaveraceæ,	2	1	Aceraceæ,		2
Fumariaceæ,	6	1	Polygalaceæ,	13	2
Cruciferæ,	46	5	Leguminosæ,	91	14
Violaceæ,	18	6	Rosaceæ,	71	20
Cistaceæ,	7	2	Lythraceæ,	7	1
Droseraceæ,	4	1	Onagraceæ,	36	5
Hypericaceæ,	18	5	Cucurbitaceæ,	3	1
Caryophyllaceæ,	30	4	Crassulaceæ,	5	1
Tiliaceæ,	2	1	Saxifragaceæ,	22	1
Oxalidaceæ,	3	1	Umbelliferæ,	37	6
Geraniaceæ,	3	2	Cornaceæ,	11	2
Balsaminaceæ,	2	2	Caprifoliaceæ,	27	4
	199	47		345	68

Rubiaceæ,	23	Urticaceæ,	15 — 6
Compositæ,	273 — 57	Plantanaceæ,	1 — 1
Lobeliaceæ,	13 — 3	Juglandaceæ,	9 — 3
Ericaceæ,	62 — 6	Cupuliferæ,	25 — 7
Aquifoliaceæ,	10 — 1	Betulaceæ,	10 — 2
Primulaceæ,	16 — 2	Salicaceæ,	24 — 11
Lentibulaceæ,	12 — 1	Coniferæ,	20 2
Orobanchaceæ,	5 — 1		
Scrophulariaceæ,	54 15	Araceæ,	7 — 2
Verbenaceæ,	7 — 1	Typhaceæ,	7 — 3
Labiatæ,	49 — 11	Lemnaceæ,	5 — 3
Borraginaceæ,	16 — 2	Naiadaceæ,	16 — 6
Hydrophyllaceæ,	11 — 1	Alismaceæ,	12 — 3
Convolvulaceæ,	15 — 2	Hydrocharidaceæ,	3 — 2
Solanaceæ,	4 — 1	Orchidaceæ,	31 — 7
Gentianaceæ,	24 — 1	Amaryllidaceæ,	4 — 1
Apocynaceæ,	4 — 2	Iridaceæ,	8 — 2
Asclepiadaceæ,	21 — 6	Dioscoreaceæ,	1 — 1
Oleaceæ,	9 — 2	Smilaceæ,	18 — 3
Phytolaccaceæ,	1 — 1	Liliaceæ,	24 — 4
Polygonaceæ,	22 — 10	Melanthaceæ,	21 — 2
Lauraceæ,	5 — 1	Juncaceæ,	26 — 8
Saururaceæ,	1 — 1	Pontederiaceæ,	4 — 2
Ceratophyllaceæ,	1 — 1	Cyperaceæ,	213 — 53
Callitrichaceæ,	3 1	Gramineæ,	162 — 39
Euphorbiaceæ,	28 3		664 — 173
Exogenæ,	279	Endogenæ,	141 = 420

These 420 species must form the most conspicuous elements of our flora taken as a whole; and if there were room to spare, it would be worth while to enumerate them. If we arrange the families they belong to in the order of the number of these common species they respectively contain, the largest ten will stand as follows:—

Compositæ,	57	Leguminosæ,	14
Cyperaceæ,	53	Ranunculaceæ,	12
Gramineæ,	39	Labiatæ,	11
Rosaceæ,	20	Salicaceæ,	11
Scrophulariaceæ,	15	Polygonaceæ,	10

On comparing this with the table on p. 213 of vol. 22, we perceive that the orders hold nearly the same relative rank, except that the *Rosaceæ* and *Leguminosæ* have interchanged places (the former having a much larger number both of wide-spread and of social plants than the latter); that the *Ericaceæ* and *Orchidaceæ* fall to a low position, and that in their stead the *Salicaceæ* and the *Polygonaceæ* are among the largest orders. This is owing to the general absence of *Ericaceæ* in our open or prairie country west of the Alleghanies, and to the small number of *Orchidaceæ* which endure much diversity of climate.

Moreover, seven orders comprise half of these plants; whereas it takes between nine and ten orders to embrace a moiety of all our indigenous species.

The species which I have counted as those of widest range are simply those which are known to occur along or not far distant from our frontiers on the four sides, without reference to the frequency of their occurrence within the area. And the species designated as very abundant in individuals are merely those which occur copiously wherever the species occurs at all, in a congenial station, even if only a single station be known, as is the case with *Sullivantia Ohioensis*, *Calamagrostis Pickeringii*, &c. It might well happen, therefore, that some of the foregoing 420 species of widest range within our territory, and of greatest abundance in their localities, should after all be uncommon plants, on account of the sparseness of the habitats. And on turning over the lists, indeed, I find that they contain species of very various degrees of abundance, above a certain point (which I am unable to express numerically), and of quite various degrees of frequency of occurrence, i. e. of the number and extent of the stations, throughout the country. But so true is it as a general rule, that species of wide range in our country are species of frequent occurrence, that I have not noticed any strongly marked exceptions to it in the lists from which the foregoing statements were deduced, viz., those which are also abundant in individuals,—meaning, of course, of frequent occurrence at the proper stations for each species; for very few plants are sown broad-cast over the land, and few occur under any wide diversity of physical circumstances. I was inclined to draw up a catalogue of those widely-ranging species which are most abundant generally throughout our district, and another of the least abundant. But I find, on trial, that this demands a critical consideration which I have not time to give, as well as a particular knowledge of the details of the vegetation of the different parts of so wide a country, which I am far from possessing. The area is much too large, and the climate, soil, &c., too diversified for the proper elaboration of such a mass of details. I conjecture that about two-thirds of the foregoing 420 species would find a place in a list of the 500 commonest plants of each of the eighteen States within our limits.

It may be mentioned that about 350 of these both widespread and abundant species are herbs, 42 are shrubs or woody vines, and 28 may be reckoned as trees. The latter, forming as they do an important feature in the vegetation of a country which was naturally for the most part forest-clad, are here enumerated:—

Tilia Americana.
Acer rubrum.
" dasycarpum.
Prunus Americana.
" Virginiana.
" serotina.
Cratægus coccinea.
" tomentosa.
Amelanchier Canadensis.
Fraxinus Americana.
" viridis.
Sassafras officinale.
Ulmus Americana.
Celtis occidentalis.
Platanus occidentalis.
Carya alba.
" glabra.
" amara.
Quercus obtusilòba.
" alba.
" coccinea.
" rubra.
Carpinus Americana.
Ostrya Virginica.
Salix nigra.
Populus tremuloides.
Pinus mitis.
Juniperus Virginiana.

The foregoing list, after all, includes none of our *most social* forest trees. The latter I should rank in the following order as to sociability:—

Abies nigra and alba.
Abies balsamea and Fraseri.
Thuja occidentalis.
Larix Americana.
Abies Canadensis.
Pinus Strobus.
Pinus Tæda, rigida, and the rest.
Taxodium distichum.
Cupressus thyoides.
Salix nigra.
Populus monilifera and angulata.
Fagus ferruginea.
Fraxinus sambucifolia.
Betula alba.
" papyracea.
Acer saccharinum.
Quercus nigra, obtusiloba, aquatica, &c.

The most social of the larger shrubs, rising occasionally to small trees, are:

Rhododendron maximum.
Kalmia latifolia.
Salix, various species.
Alnus incana and serrulata.
Myrica cerifera.
Quercus ilicifolia.
Rhus typhina, glabra, and venenata.
Amorpha fruticosa.
Zanthoxylum Americanum.
Pyrus Americana.
Cephalanthus occidentalis.
Vaccinium corymbosum.
Clethra alnifolia.
Azalea viscosa, &c.

Characteristics of the Vegetation of the principal Districts comprised in our Flora.

The main botanical districts, into which the territory embraced in our Flora is naturally divided, are three, with two subordinate ones. These are unmistakably defined by the general features of the country, and pretty strongly marked by their vegetation. They are,

1. The Southeastern low border (naturally wooded).
2. The great Middle and Northern Wooded Region.

3. The Western Unwooded or Sparsely wooded Region, characterized by prairies, oak-openings, &c. To which are appended,

4. The Alpine and Subalpine Region, forming a few isolated patches in the second district.

5. The line of Sea-coast, or Maritime District.

I. *The Southeastern District.*—If, from the intersection of the 80th parallel of longitude with the southern boundary of Virginia a line be drawn northeast to Washington and the city of New York, it will very nearly mark the inland limits of this district, except that a narrow prolongation of it, somewhat modified in character, skirts the coast as far as to Cape Ann, and vanishes at the southern point of Maine. The Pine-Barrens of New Jersey represent this district fully. Its prevalent forest-growth consists of Pitch Pines and Oaks, especially of the Spanish Oak, Post Oak, and Black Jack, and in low grounds of Red and White Maples and Birch. Few of the forest trees probably were ever large and stately, at least at the north. The characteristic trees and largest shrubs are *Pinus rigida* and *P. inops*, and at the south *P. Tæda* and *Taxodium distichum*, *Cupressus thuyoides*, *Betula alba* and *nigra*, *Castanea pumila*, *Quercus falcata*, *Phellos*, and *aquatica*, *Ilex opaca* (which at the south passes inland to the flanks of the mountains), *Liquidambar styraciflua*, *Chionanthus Virginica*, *Itea Virginica*, *Clethra alnifolia*, *Azalea viscosa*, *Cratægus parvifolia*, *Acer dasycarpum*, *Magnolia glauca*, and at the south *Persea Carolinensis*, with several southern trees (such as *Quercus virens*, *Olea Americana*, &c.) which however occur only on the coast of Virginia. Other most characteristic shrubs are *Gaylussacia dumosa* and *frondosa*, *Leucothoë racemosa*, and at the south *L. axillaris*, *Andromeda Mariana*, *Ilex* (*Prinos*) *glabra*, *Corema Conradi* and *Comptonia asplenifolia* at the north, and *Myrica cerifera* along the whole line of coast. The two species of *Ascyrum* and *Smilax laurifolia* may also be mentioned.

As to herbs, out of about 120 either wholly peculiar or otherwise characteristic species, I must barely mention *Drosera filiformis*, *Polygala lutea* and *ramosa*, *Clitoria Mariana*, three species of *Rhexia*, *Opuntia vulgaris*, *Eryngium Virginianum*, *Eupatorium leucolepis*, *resinosum*, *album* and *aromaticum*, *Aster Radula*, *surculosus*, *spectabilis*, and especially *A. concolor*, with *Solidago virgata*, *puberula*, and *pilosa*, four species of *Chrysopsis*, *Coreopsis trichosperma*, *Nabalus virgatus*, *Utricularia inflata*, *clandestina*, *striata*, *purpurea* and *resupinata*, *Schwalbea Americana*, *Pyxidanthera barbulata*, *Stylisma Pickeringii*, four species of *Sabbatia*, *Euphorbia Ipecacuanha*, *Gymnadenia flava* and *Platanthera cristata*, *Lachnanthes*, *Lophiola*, *Yucca filamentosa*, *Xerophyllum* and *Helonias bullata*, *Tofieldia pubens*, *Narthecium Americanum*, and *Amphicarpum*, the last two peculiar to the Pine-barrens of New Jersey.

II. *The Middle and Northern Wooded District* takes in the whole breadth of our territory along its northern boundary, but narrows rapidly towards the south into a wedge-like shape. A line drawn from Fond du Lac to the western end of Lake Erie, and thence south to the Tennessee line, would serve tolerably well for its western boundary. This vast tract naturally divides into three provinces, viz: the *Southern*, comprising all south of Pennsylvania and the Ohio River; the *Northeastern*, comprising all north and east of Pennsylvania, and all except the southwestern corner of that state; and the *Northwestern*, including all west of Pennsylvania. With some local and inconsiderable exceptions, this tract was originally covered with dense forest, composed in the higher and cooler or moister portions partly of Spruces, and in the valleys of White Pines, and partly of Beech, Maples and other deciduous trees, or in sandy tracts of Pitch Pines, Post Oaks, &c., and in the lower portions with stronger and deeper soil, of several kinds of Oak, of Hickories, Chestnut, &c.

The most characteristic and important tree of the whole region doubtless is, or rather was, *Pinus Strobus*, the White Pine, which everywhere at the north once filled the principal intervales with a most stately growth. Other prominent forest-trees of the whole district are the White, Red, Scarlet and Chestnut Oaks, the Chestnut, the Beech, three Hickories (*Carya alba*, *glabra* and *amara*), the Butternut, the White and Slippery Elm, the White, Red and Green Ash, the Sugar Maple, and of course the widespread Red Maple, as well as the common Lime-tree or Basswood; also, as we verge southward or westward, the Tulip-tree and the Cucumber-tree. Trees which belong wholly or characteristically to the southern province are *Abies Fraseri*, *Magnolia Umbrella* and *Fraseri*, *Asimina triloba*, *Tilia heterophylla*, *Negundo*, the Sweet Buckeye, the Common and the Clammy Locust-trees, the Red-bud, the Sorrel-tree, and *Rhododendron maximum;* which last, with *Kalmia latifolia*, rising into small trees in many places, form almost impassable thickets along the steep sides of the Alleghany Mountains. The Ohio Buckeye (*Æsculus glabra*), the Kentucky Coffee-tree, the Honey Locust, the American Crab-apple, the Black Walnut and *Carya sulcata* are characteristic of the western province. *Pinus resinosa*, *Abies balsamea*, *Canadensis*, *nigra* and *alba*, *Larix Americana*, *Thuja occidentalis*, with *Betula papyracea*, *excelsa* and *lenta*, *Quercus palustris*, the Black Ash, and among small trees, *Pyrus Americana*, *Prunus Pennsylvanica*, *Acer Pennsylvanicum*, and *Rhus typhina*, are characteristic northern species. I must not stop to enumerate the characteristic shrubby and herbaceous plants.

III. *The Western District*, comprised between the boundary last mentioned and the Mississippi River, consists of glades, 'Oak-openings,' 'barrens,' and at length of prairies or open

plains. Its trees, where these occur, are principally some of those of the foregoing districts, especially *Quercus nigra, imbricaria, rubra* and *obtusiloba* with *Q. macrocarpa, Carya olivæformis,* and along rivers the Cotton-wood, Blue Ash, &c. I can hardly enumerate any peculiar shrubs of the district, excepting *Amorpha canescens,* which is local this side of the Mississippi. The characteristic herbs of the prairies, &c., would seem to be *Compositæ,* especially Helianthoid Compositæ, such as *Helianthus rigidus, lætiflorus, occidentalis, mollis, hirsutus,* and in the river bottoms *H. doronicoides, Actinomeris helianthoides, Coreopsis aristosa* and *palmata, Echinacea purpurea* and *angustifolia,* and especially *Silphium laciniatum* (the Compass plant), *terebinthinaceum, integrifolium,* &c.; to which may be added *Cacalia tuberosa, Nabalus racemosa, asper* and *crepidineus, Ambrosia bidentata* and *psilostachya, Veronica fasciculata, Liatris pycnostachya, Eupatorium serotinum, Solidago Ohioensis, Riddellii,* and *Missouriensis, Aster oblongifolius, azureus, turbinellus,* and *sericeus.* As herbs peculiar to this district and its immediate borders, I may mention *Isopyrum biternatum, Delphinium tricorne, Stylophorum diphyllum, Hypericum sphærocarpum* and *dolabriforme, Psoralea Onobrychis* and *stipulata, Gillenia stipulacea, Geum vernum, Gaura filipes, Ludwigia polycarpa, Erigenia bulbosa, Solidago Shortii* and *rupestris, Monarda Bradburiana, Symeria macrophylla, Lithospermum latifolium, Phlox bifida, Gentiana puberula, Platanthera leucophæa, Cypripedium candidum, Trillium recurvatum* and *nivale.* The only Grasses I know which are peculiar to the district, and not found east of the Alleghanies, are *Poa sylvestris, Diarrhena Americana,*—neither of them prairie-grasses,—and *Lepturus paniculatus,* which mainly belongs to salt-licks and to the dry plains farther west.

In fact,—looking at North American botany comprehensively, —this district cannot claim to be distinguished as a separate one. It is only a broad border along which the great naked plains of the west and the eastern forest region meet and blend through the most diversified gradations. And so, likewise our southeastern district is only a narrow extension of the botany of the warm-temperate region of the Southern United States, prolonged northward upon the low coast, just as the botany of our cool-temperate region is prolonged southward along the Alleghanies.

IV. *The Alpine and Subalpine District* has been sufficiently illustrated already (vol. 22, pp. 207, 230, vol. 23, p. 62).

V. *The Maritime District* is inhabited by the following 60 species.

Ranunculus Cymbalaria.
Cakile Americana.
Hudsonia tomentosa.
Lechea thymifolia.
Honkenya peploides.
*Spergularia rubra.
Sesuvium Portulacastrum.
*Hibiscus Moscheutos.

Lathyrus maritimus.
*Prunus maritima.
Crantzia lineata.
Ligusticum Scoticum.
Archangelica peregrina.
*Aster flexuosus.
* " linifolius.
*Solidago sempervirens.
Pluchea camphorata.
Baccharis halimifolia.
*Iva frutescens.
Borrichia frutescens.
Plantago maritima.
*Statice Limonium.
Glaux maritima.
Limosella aquatica.
Gerardia maritima.
Mertensia maritima.
Sabbatia calycosa.
" stellaris.
" gracilis.
" chloroides.
Blitum maritimum.
*Atriplex hastata.
*Obione arenaria.
*Salicornia herbacea.
Salicornia mucronata.
" ambigua.
*Chenopodina maritima.
*Salsola Kali.
Euxolus pumilus.
*Acnida cannabina.
*Rumex maritimus.
*Euphorbia polygonifolia.
*Zostera marina.
*Ruppia maritima.
Triglochin palustre.
" maritimum.
Juncus maritimus.
" bulbosus.
Scirpus Olneyi.
* " maritimus.
Vilfa Virginica.
Calamagrostis arenaria.
Spartina polystachya.
* " juncea.
* " stricta.
Glyceria maritima.
" distans.
*Brizopyrum spicatum.
Uniola paniculata.
*Hordeum jubatum.

A little less than half of these maritime species occur also in Europe; and one not found in Europe (*Ranunculus Cymbalaria*) occurs in Northern Asia. Four of them are exclusively southern, not extending northward to the Delaware Bay; viz. *Borrichia frutescens*, *Sabbatia calycosa*, *Vilfa Virginica*, and *Uniola paniculata*, and nine others (including *Juncus maritimus*) are prevailingly southern, and find their boreal limit south of Massachusetts Bay. Four species (*Ligusticum Scoticum*, *Archangelica peregrina*, *Glaux maritima*, and *Mertensia maritima*) are exclusively northern, not occurring south of New England; and 23 species (those with an asterisk prefixed) range along the coast from Maine to Virginia, or nearly so. Several maritime species still linger on the shores of our Great Lakes, mementoes of their former saltness, viz. *Hudsonia tomentosa*, *Cakile Americana*, *Lathyrus maritimus*, *Calamagrostis arenaria*, and *Hordeum jubatum;* while *Ranunculus Cymbalaria*, *Glaux maritima*, &c. occur in saline soil far beyond the Mississippi, and the former, with *Hibiscus Moscheutos*, *Salicornia herbacea*, *Scirpus maritimus*, and the two species of *Triglochin*, spring up at most of our salt springs in the interior of the country, as at Salina, New York. Singularly enough, what seems to be truly *Triglochin maritimum* (the *T. elatum* of Nuttall) is of no uncommon occurrence throughout Western New

York, Ohio, Wisconsin, &c., in high sphagnous bogs which have not the least trace of saltness.

Only one of our maritime plants is a true shrub, viz. *Baccharis halimifolia*. *Iva frutescens* is more or less woody; and *Hudsonia tomentosa* is a heath-like under-shrub: the rest are herbs.

On the whole, I should say that the range of our maritime plants through degrees of latitude is not sensibly greater than that of our herbaceous species generally.

The Prominent Characteristics of the Flora of the Northern United States.

To answer the question as to what are the leading characteristics of the vegetation of the Northern United States, taken as a whole, we should have to consider, first: What are the more remarkable peculiarities of our flora, as discovered by the instructed botanist with the whole field systematically displayed to his mental view; and secondly, what are the plants or the forms of vegetation which, by their abundance or their prominence, impart to our flora its dominant features. The first is a matter of deduction from a variety of facts, many of which would never arrest the attention of the casual observer: the second relates to points which would most attract the notice of the passing botanical traveller or the ordinary observer. The answer to the former no less than to the latter enquiry, would depend upon the point of view. To the traveller from our Southern States, or from the great plains of the West, the novel features of our vegetation are those which it has in common with Europe. To the European visitor the striking peculiarities are those which we share with the southern part of the country, and these would increase in prominence as he proceeded southward and westward. And, in forming his idea of a flora, the botanist naturally, if not inevitably, takes that of Europe as his standard of comparison.

In comparing, as the botanist naturally would, our flora with that of Northern and Western Europe, the following would appear to be leading characteristices.

1. Our comparative richness in ordinal types;—our flora having, as already remarked (vol. xxii, p. 216), 26 orders which are absent from that of Europe, while the latter (exclusive of the Mediterranean basin) has only seven orders which are wanting here.

2. The prevalent subtropical character of our extra-European orders;—which has been already referred to, and which will be manifest to the botanist inspecting the list of such orders given in a former article (vol. xxii, p. 215).

3. Our richness in species of woody plants, and especially of trees; as already alluded to (p. 84). This will strikingly appear

from a comparison of our flora with an equivalent European one,—with the German flora, for example. In Koch's *Flora Germanica* (excluding the Adriatic region), I count 60 indigenous species of trees, belonging to 27 genera, and comprised in 14 orders. In our own *Flora of the Northern United States*, adopting the same estimate as to what constitutes a tree, I count 132 trees, in 56 genera, and belonging to 25 orders; as follows:—

Magnoliaceæ,	2	genera,	and	6	species	of	trees.
Anonaceæ,	1	"	"	1	"	"	
Tiliaceæ,	1	"	"	2	"	"	
Camelliaceæ,	1	"	"	1	"	"	
Anacardiaceæ,	1	"	"	1	"	"	
Sapindaceæ,	3	"	"	8	"	"	
Leguminosæ,	6	"	"	7	"	"	
Rosaceæ,	4	"	"	15	"	"	
Hamamelaceæ,	1	"	"	1	"	"	
Araliaceæ,	1	"	"	1	"	"	
Cornaceæ,	2	"	"	4	"	"	
Caprifoliaceæ,	1	"	"	1	"	"	
Ericaceæ,	2	"	"	2	"	"	
Aquifoliaceæ,	1	"	"	1	"	"	
Ebenaceæ,	1	"	"	1	"	"	
Sapotaceæ,	1	"	"	2	"	"	
Oleaceæ,	3	"	"	8	"	"	
Lauraceæ,	2	"	"	2	"	"	
Urticaceæ,	4	"	"	8	"	"	
Platanaceæ,	1	"	"	1	"	"	
Juglandaceæ,	2	"	"	9	"	"	
Cupuliferæ,	5	"	"	21	"	"	
Betulaceæ,	1	"	"	5	"	"	
Salicaceæ,	2	"	"	7	"	"	
Coniferæ,	7	"	"	18	"	"	

The only natural order containing trees in the German flora and not in ours is the *Rhamnaceæ;* the only order in which the German flora exceeds ours in arboreous genera is that of *Betulaceæ* (which comes from our not counting any of our Alders as trees); the only order in which the German flora has more species of trees than ours is that of the *Salicaceæ* (10 to 7), we counting but one truly arboreous indigenous Willow. On the other hand, our flora surpasses the German not only in the twelve additional orders (one of which is represented by nine species and another by six), but also having a greater number of species in ten out of the thirteen orders common to the two countries, and of genera likewise in all but three of them. That is, we possess of

Sapindaceæ (including Hippocastanaceæ and Aceraceæ),	2 more genera and 3 more species of trees.						
Leguminosæ,	5	"	"	"	6	"	"	"
Rosaceæ,	0	"	"	"	2	"	"	"

Cornaceæ,	1	more	genus	and	3	more	species of trees.
Ericaceæ,	1	"	"	"	1	"	" "
Oleaceæ,	2	"	"	"	6	"	" "
Urticaceæ,	2	"	"	"	5	"	" "
Cupuliferæ,	0	"	"	"	11	"	" "
Betulaceæ,	0	(—1)	"	"	3	"	" "
Coniferæ,	3		"	"	10	"	" "

4. Our flora, it may be seen, accordingly predominates in its species of Pine, Fir, Oak, Birch, Elm, Ash, arboreous as well as shrubby *Cornaceæ, Cratægi*, and of arboreous *Leguminosæ;* and its characteristic trees are the *Taxodium*, the Overcup, Willow and Chestnut-Oaks, the Hickories and Walnuts, the Planer-tree and two *Sapotaceæ*, which barely reach us from the South, the Persimmon, the Gum-trees (both *Nyssa* and *Liquidambar*), the Common and Honey Locusts, *Cladrastis*, and the Kentucky Coffee-tree, the Negundo and three species of Buckeye, the Sumac, the Loblolly Bay of our southeastern border, the Papaw-tree, the Tulip-tree, and our five species of Magnolia. We might have added *Zanthoxylum*, but no Prickly Ash fairly forms a tree within our geographical limits.

5. Our flora is equally rich in shrubs, of a great variety of families, especially in those which make an undergrowth in forests; and, among them, in *Vaccineæ*, *Andromedeæ* and *Rhodoreæ*, while it has no *Arbuteæ* rising above the surface of the ground, and no *Ericeæ* or Heaths at all.

6. It is also rich in *Compositæ*, especially Helianthoid *Compositæ*, *Eupatorinæ*, Asters, and Solidagoes, in the latter genera outnumbering any other region; but is poor in *Anthemideæ*, true *Senecioneæ*, and in *Cynareæ*, and especially so in *Cichoraceæ*.

7. It has an unusual number of *Cyperaceæ*, which is owing partly to the remarkable number of extra-European genera, and partly to the number of species of *Cyperus*, *Rhynchospora*, and *Carex*.

8. From the position of *Rosaceæ* on the list of the larger orders, our flora would be supposed to be unusually rich in that order also; but this result happens in consequence of our remarkable comparative poverty in *Cruciferæ*, *Umbelliferæ*, *Labiatæ*, and *Caryophylleæ*. Other orders in which our flora is much deficient, as compared with Europe, are *Borraginaceæ*, *Campanulaceæ*, *Liliceæ* in the larger sense, and *Iridaceæ*, *Crassulaceæ*, *Chenopodiaceæ*, *Primulaceæ*, and *Geraniaceæ*. Those in which we are correspondingly rich are *Asclepiadaceæ*, *Polemoniaceæ*, *Smilaceæ*, *Melanthaceæ*, *Araliaceæ*, and *Onagraceæ*.

9. To present the elements of the 26 orders represented in our flora but wanting in that of Europe, and in which characteristic features are necessarily comprised, would still further extend

an article already inconveniently protracted. The botanist can readily gather the needful details respecting them, and respecting our extra-European genera generally, from the data given in a former article.

As regards the plants most striking and important in the physiognomy of our vegetation, the first rank is undoubtedly held by the trees of social growth; and of these the principal are *Coniferæ*. The characteristic tree of the proper Northern States is, therefore, *Pinus Strobus*. This, the tallest and once the most plentiful of our trees, when the country lay in all the wildness of nature, must have given the dominant feature to a great part of the landscape. White Pines may probably be distinguished by their port and aspect from a greater distance than any other of our forest-trees, except perhaps the *Taxodium* of our Southern "Cypress" swamps, and the long-leaved Pine which so strikingly marks a belt of low and barren country stretching from the southeastern borders of Virginia to the Gulf of Mexico and the Mississippi.

Pinus Tæda near our southern limits, and, more northward, *P. rigida* and the other Pitch Pines, give a predominant feature to the "pine-barrens" of the Northern States.

Our Arbor Vitæ (*Thuja occidentalis*) of intensely social growth, is the physiognomic tree of our cold swamps at the North, and of Canada. Large tracts of cold and poor marshy land at the north, and on the mountains, are occupied with the well-marked Balsam Fir, or, where less damp, with the more sombre and stiff Black Spruce, or, with the closely related White Spruce; the latter, however, only along our northern frontier. *Abies Fraseri* replaces the common Balsam Fir in the Alleghanies south of Pennsylvania, and has just the same aspect. Hemlock Spruce woods (*Abies Canadensis*) cover hill-sides and sharp ridges of a light and thin soil, where water never stands, throughout the northern part of the country, with a truly characteristic forest-growth. Larch or "Tamarack" swamps are strongly marked in aspect, but are never large.

No other species of forest trees that I know monopolize the ground in so marked a manner, and impress their single features upon a tract of country. The Beech woods of elevated tracts, and the Sugar Maple in richer and lower ground, make the nearest approach to it: but ordinarily our woods of deciduous trees consist of a mixture of several species, in which different kinds predominate according to the situation. In enumerating, as I have done farther back, the trees most characteristic of our three principal districts, I have mentioned those which more than any other give character to our arboreous vegetation. As trees which possess marked individuality, and which may be known from far, I barely mention the common American Elm of our

intervales, the Button-wood or *Platanus* on the banks of rivers and streams, the Sugar Maple, the various Hickories, the Black Walnut, and several Oaks, the White and the Paper Birch, conspicuous from the ghastly white bark of their trunks, as well as by their light and handsome foliage, the Sassafras, the Cucumber-tree, the Tulip-tree, the Honey Locust with its remarkably light and feathery foliage, and the *Gymnocladus* or Kentucky Coffee-tree, with its thick and stout branchlets, and its remarkably decompound foliage, rendered the more striking in aspect by the oblique or almost vertical position which the leaflets generally assume.

Of trees conspicuous in blossom, *Cornus Florida*, the two Umbrella-leaved Magnolias, the Locust, the *Cladrastis*, the Red-Bud, and the Crab-Apple hold the first place, and the Umbrella-trees with their rose-colored cones are equally conspicuous in fruit. The Loblolly-Bay, *Rhododendron maximum*, and the *Chionanthus* or Fringe-tree are equally showy, but they are generally shrubs rather than trees.

Considering our great variety of trees and shrubs, there is a remarkable absence of broad-leaved evergreens. The American Holly is our only tree of the sort of considerable size, and that is not a common one. Of large shrubs or small trees, *Rhododendron maximum* and *Kalmia latifolia*—our "Laurels,"—are our principal and truly characteristic evergreens, as they are among the most social of our woody plants.

The herbaceous plants which most strike the eye are of course the *Compositæ*, especially toward the close of summer, when golden Solidagoes and purple, blue, and white Asters are everywhere conspicuous. Of vernal flowers,—peculiarly delightful to us after a winter which destroys all herbaceous vegetation,—the most common species which strike the eye over the whole country (in their appropriate stations) are *Caltha palustris, Aquilegia Canadensis, Anemone nemorosa,* with *Thalictrum anemonoides, Sanguinaria Canadensis, Saxifraga Virginiensis, Viola cucullata, sagittata* or one or two other stemless Violets, *Claytonia*, one or the other species, *Oldenlandia* (*Houstonia*) *cærulea, Senecio aurens, Smilacina bifolia, Erythronium Americanum, Uvularia sessilifolia,* and, a little later, *Geranium maculatum.*

The part which introduced plants take in our flora, with some kindred topics, must be considered in a future article.

Art. XXXVIII.—*On the Meridian Instruments of the Dudley Observatory;* by Dr. B. A. Gould, of Cambridge.

Proceedings of the American Association for the Advancement of Science at Albany, July, 1856.

Mr. Gould described the meridian-circle and transit-instrument, now nearly completed for the Dudley Observatory, and gave some account of the principles adopted in their construction.

The meridian instruments now in use in the several observatories of the world may be classified in two divisions,—which may be designated as the German and the English styles,—and perhaps be justly described, the one as the instrument of the engineer, the other as that of the artist. For the former the circles are large and massive, frequently having a diameter equal to the entire focal length of the attached telescope; in the latter they are smaller and slighter. The new transit-circle of Professor Airy, at Greenwich, typifies the English style, and this instrument, with its counterpart at the Cape of Good Hope, presents the merits in the most conspicuous and impressive form. It is of iron, cast in a single piece; incapable of reversal, for which the observation of collimators is substituted; without a striding or hanging level, this apparatus being superseded by observations of the meridian thread as reflected from the surface of mercury; the circle is eight feet in diameter, and read by diverging microscopes firmly imbedded in a massive pier; and the pivot-forms are investigated by means of a collimating apparatus, of which the axis of rotation itself forms a part.

The instruments of the German school are of an entirely different order,—lighter and more mobile. Their circles are small in comparison with the length of the tube; the microscopes are supported upon a frame concentric with the axis, and form one system, the position of which is known by means of an attached level, whose indications furnish a correction to be applied to the mean of their several readings. The level is used, indeed, whenever its use is possible, and a great part of the precision of the results of observation is dependent upon the delicacy with which this highly trusted instrument may be constructed and used. Frequent reversals of the instrument are deemed indispensable; and in general the structure is devised with a view to easy, rapid and frequent changes in the relative position of all those parts which may be rendered movable. To sum up,—the one class of instruments is designed for securing absolute uniformity of circumstances in all observations; the other, for attaining as great diversity of circumstance as is consistent with the retaining of the same degree of accuracy.

p 380. Large genera have species with widest ranges.— (2)

p 381 Disjointed Ranging species (Glacial chapter)

p 387. — Disjointed i ~~genera~~ species belong to distinct genera — & ½ to genera have less than 10 species i.e. small genera (2 wh*)

391. widest rangers most abundant in individuals p 393 &c (2)

STATISTICS

OF THE

FLORA OF THE NORTHERN UNITED STATES.

By ASA GRAY.

FROM THE AMERICAN JOURNAL OF SCIENCE AND ARTS, VOL. XXIII.

ON THE FLORA OF THE NORTHERN STATES.

THE Catalogues of the alpine and subalpine species of our Flora of the Northern States, given on pp. 230 and 231, in the former part of this communication, are found to be very imperfect, through some unaccountable omissions. They are here reproduced in a corrected form.

1. *List of Phænogamous Species found only in our small Alpine Region.*

Cardamine bellidifolia.
Viola palustris.
Silene acaulis.
Sibbaldia procumbens.
Potentilla frigida.
Epilobium alpinum, var. majus.
Saxifraga rivularis.
Saxifraga stellaris, var. comosa.*
Gnaphalium supinum.
Nabalus Boottii.
Nabalus nanus.
Vaccinium cæspitosum.
Arctostaphylos alpina.
Cassiope hypnoides.
Phyllodoce taxifolia.
Loiseleuria procumbens.
Rhododendron Lapponicum.
Veronica alpina.
Castilleia septentrionalis.
Diapensia Lapponica.
Oxyria reniformis.
Betula nana.
Salix phylicifolia.
Salix Uva-Ursi.

* This is a recent discovery, on Mount Katahdin, Maine, by Joseph Blake, Esq. Pursh had given *Saxifraga stellaris* as a native of Canada, but this was hardly credited: it has long been known from Labrador. But the *S. foliolosa*, which is plainly a state of *S. stellaris*, was known in this country only from the Arctic Islands, and from Sitcha on the northwest coast. With this species I replace *Dryas integrifolia* of the former list, which I think cannot have been really found on the White Mountains or elsewhere within our limits: Pursh must have mistaken something else for it in Prof. Peck's herbarium, as well as for *Alchemilla alpina*. Moreover, it is wrongly marked in the Manual of Bot. N. States, as also European.

The following points likewise need correction:

On p. 207, line 24, the Alleghany Mountains are said, in round numbers, to rise to an elevation of about 6300 feet. My excellent and accurate friend, Professor Guyot, informs me that the results of his barometrical measurements made during the past summer assign to the Black Mountain an elevation of fully 6710 feet above the level of the sea. Yet the summit was covered with trees (mostly *Abies Fraseri*), which, however, are now being cut away.

Page 217, et seq. The following additions may be made to the table, in their proper places. To the second column, i. e. Extra-European genera of E. North America, *Phaseolus* and *Aralia*. To the fourth column, of temperate E. Asia, including the Himalayas, *Elodea*, *Stylosanthes*, *Phaseolus*, *Galactia*, *Amphicarpæa*, *Centrosema*, *Itea*, *Fothergilla*, *Aralia*, *Triosteum?* *Spermacoce*, *Nabalus*, *Gaultheria*, *Mimulus*, *Phytolacca*, *Sassafras?* *Podostemon* (and others remain to be added),—essentially increasing the remarkable number of Eastern Northern American genera which are represented in an antipodal region, of analogous extreme climate, but not in the less distant regions of Western Europe and Western North America, the greater parts of which are endowed with a more equable climate.

Page 239. In the heading of the third column, second line, occurs a misprint of "and" for "not."

Page 232, line 4, "*Cirsium pumilum*" is to be erased, as it occurs in Missouri, according to Dr. Engelmann.

Salix repens.
Salix herbacea.
Luzula arcuta.
Luzula spicata.
Juncus trifidus.
Carex capitata.
Carex atrata.
Carex rigida.
Phleum alpinum.
Calamagrostis Pickeringii.
Poa laxa.
Aira atropurpurea.
Hierochloa alpina.

They are 37 species in number. Of these all but the five printed in *italic* are natives likewise of Europe.

2. *List of Subalpine Phænogamous Species, which occur mainly in our Alpine Region, but are also found decidedly out of it.*

Alsine Grœnlandica.
Geum radiatum.
Rubus Chamæmorus.
Solidago thyrsoidea.
Solidago Virga-aurea.
Arnica mollis.
Vaccinium uliginosum.
Vaccinium Vitis-Idæa.
Euphrasia officinalis.
Polygonum viviparum.
Empetrum nigrum.
Platanthera obtusata.
Scirpus cæspitosus.
Carex scirpoidea.
Carex capillaris.
Trisetum subspicatum.

Making 16 species; of which all but the five printed in italic are likewise European; and two of these occur in Greenland.

3. *List of Species not found in our Alpine Region, and half of them not even in Subalpine Stations, although they are all Subalpine or Arctic in Europe.*

Saxifraga tricuspidata.
Saxifraga oppositifolia.
Saxifraga aizoides.
Saxifraga Aizoon.
Artemisia borealis.
Juncus Stygius.
Carex gynocrates.

The last two of these seven species are likewise remarkable for not having been found in continental British or Arctic America nor in Labrador; but one of them occurs in Newfoundland, and the other in Greenland.

It would be in order now to consider the range of our species generally north and south. But I will for the present restrict the inquiry to a special and small part of them, namely, to the species which we possess in common with Europe.

The Northward Range in this country of the Phænogamous Species which are common to us and to Europe.

This is an interesting point of inquiry, from its bearings upon the mooted question of the single or multiple origin of the species:—upon whether they may have been diffused each from a common centre, or were originally given to two or more widely separated parts of the world. The arctic regions form one botanical province. The greater part of their plants are com-

mon to the Old and the New Worlds; and the same species is as likely to occur at any two stations within the arctic circle as at any other two stations equally distant. We naturally look northward for the connection of our flora with that of the Old World; and as we meet with United States plants identical with those of Europe, we are interested to know whether they range northward into or near to the area of common northern vegetation. The *data* now in our possession furnish the following results.

Of our species common to Europe, we know only five which do not occur north of the 40th parallel of latitude, or which barely cross this line. These are

Callitriche pedunculata.
Juncus maritimus.
Convallaria majalis.
Cyperus rotundus.
Carex flacca.

The first of these has doubtless been overlooked. The second is a little-known plant with us, and the identification is not perfect. The fourth is a tropical species, and evidently an immigrant into the southern United States as well as into southern Europe, nor is it impossible that our Nut-Grass may again be specifically distinguished from *Cyperus rotundus*. The fifth is here found only in New Jersey, between lat. 40° and 41°. Unless it has been overlooked in the Northern States (which seems unlikely), or unless our plant has been wrongly referred to the variable *Carex flacca*, it affords a remarkable instance of the local occurrence here of a species which is widely diffused in the Old World. It seems not likely to have been introduced from Europe. The third is the most remarkable case; that of the Lily of the Valley (*Convallaria majalis*). This species—or one which I could not in any respect distinguish from it on a comparison of living specimens—abounds in the higher Alleghanies of North Carolina, I believe also in those of Georgia, and it extends north to the Peaks of Otter in Virginia, lat. 37½°, at an altitude of 4000 feet; but it is not known to occur anywhere beyond this; while in Western Europe it extends nearly to lat. 70°. It is not a plant which could well have escaped observation in the Northern States.

The following 15 species are not known to occur north of lat. 45°:

Myosurus minimus.
Subularia aqnatica.
Centunculus minimus.
Veronica officinalis.
Myosotis arvensis.
Salicornia mucronata?
Polygonum dumetorum.
Castanea vesca, var.
Polygonatum latifolium.
Rhynchospora fusca.
Carex vulpina.
" muricata.
" lævigata.
Spartina juncea.
" stricta.

Myosurus minimus occurs with us only in the valley of the Mississippi,—thence south to Texas and west to the Pacific, but not extending northward beyond lat. 45°. It has all the appearance of being indigenous; and in Oregon it is accompanied by a second species which is also a native of Chili. In Europe it occurs as far north as Finland.

Subularia aquatica seems to be a very rare plant in North America, found only in the northeastern corner of the United States.* From its size, aspect, and place of growth it is exceedingly liable to be overlooked. It is to be sought in Nova Scotia, Newfoundland and Canada East. It reaches lat. 70° in Europe.

Centunculus minimus, which extends northward to lat. 60 in Europe here scarcely passes the 41st parallel in the valley of the Mississippi, where alone it occurs in the Northern States.

Veronica officinalis is certainly indigenous in the Alleghany Mountains south of Pennsylvania, and apparently so in the western part of New York. It is not known north of lat. 44°, and in Europe it does not reach the Arctic circle.

Myosotis arvensis is not common here, and has probably been introduced.

Salicornia mucronata, Bigel., is most probably not identical with its homonym on the coast of Spain.

Polygonum dumetorum (if our P. scandens really belongs to it,) does not pass the 45th parallel with us, while in northern Europe it crosses the Arctic circle.

Our Chestnut is one of the few American trees which can anyhow be identified or confounded with European species. It nowhere occurs north of lat. 44° or 45° in this country; and as the European Chestnut is perhaps not really indigenous in any higher latitude in the Old World, we have here either a very anomalous case in geographical distribution, or else must regard our chestnut as specifically distinct. Analogy would favor the latter view, and (which is more directly to the purpose) so also would some little differences in the fruit, such, however, as would be of small account in case the trees were natives of the same district.

Polygonatum latifolium. This is a case of imperfect identification; the American plant so called being known to us only by specimens sent from Pennsylvania by Muhlenberg to Willdenow.

* In the *Genera of N. American Plants Illustrated*, i, p. 164, no less than in the *Manual*, I have made a mistake in respect to the habitat of this plant, which has kindly been pointed out by Prof. Tuckerman. Nuttall long ago gathered it in the ponds of Paris, Maine. I had supposed that Nuttall's station was rediscovered by Messrs. Tuckerman and Oakes; but I am informed that the locality and the only one now known in this country, is Echo Lake, in the Franconia Notch, New Hampshire, where it was detected in 1844 by Prof. Tuckerman, as is recorded by that accurate botanist, indeed, in the pages of this Journal, for September, 1848.

Rhynchospora fusca, and the three species of *Carex* would certainly be expected to have a more northern range. *C. lævigata* has been found but once. What is called *C. vulpina* is probably not distinct enough from *C. alopecoidea;* and *C. muricata*, if rightly identified, may have been introduced, at least into New England, where it occurs only in suspicious situations, and rarely.

The two species of *Spartina* belong properly to America, being found only in a few places on the coast of Europe, where they seem to have effected a chance lodgment.

The following species, 36 in number, are not known to reach in this country, or at least sensible to pass, the 50th parallel of latitude.

Ranunculus repens.
Nuphar Kalmiana.
Draba verna.
Drosera longifolia.
Sagina procumbens.
Oxalis acetosella.
" stricta.
Geranium Robertianum.
Vicia Cracca.
Geum strictum.
" rivale.
Potentilla argentea.
Lythrum Salicaria.
Circæa Lutetiana.
Myriophyllum verticillatum.
Xanthium strumarium.
Samolus Valerandi.
Scrophularia nodosa.
Atriplex hastata.
Salsola Kali.
Humulus Lupulus.
Betula alba, var.
Taxus baccata, var.
Typha angustifolia.
Vallisneria spiralis.
Spiranthes cernua,
Microstylis monophyllos.
Juncus Stygius.
" effusus.
Lemna gibba.
Najas flexilis.
Zannichellia palustris.
Ruppia maritima.
Cyperus flavescens.
Carex fulva.
Milium effusum.

Upon this list I remark, first, that two of the species, although admitted as indigenous in the *Manual of the Botany of the Northern United States*, were probably introduced from Europe since the settlement of the country; namely *Draba verna* and *Potentilla argentea*. At least the expression of doubt which in the work just mentioned is thrown upon the former, I now think equally applies to the latter. I never saw either of them growing in other than suspicious situations. They are found only in the Eastern United States and in the long-settled parts of Canada; while in Europe the first falls short of, and the second barely enters Lapland.

Lythrum Salicaria has better claims to citizenship, at least in Eastern New England, but it is not clear from suspicion. Douglas gathered it in wet meadows of Upper Canada; but if really indigenous to this country it is surprising that it does not extend farther north.

Some of the forms which I have felt obliged to join with *Xanthium strumarium* seem to be indigenous in the northwestern por-

tion of our district; and so, along the coasts and great rivers, does the variety *echinatum* (which most botanists will still fancy to be very distinct); but the latter, more widely dispersed over the world, is probably an immigrant from farther south. The real home of the species is uncertain: it could not be expected to occur much north of lat. 46°.

Betula alba and *Taxus baccata*, var. *Canadensis* are the only woody plants upon the list. As to the first, I have followed Spach in considering our White Birch identical with the European. It occurs only from the eastern part of Pennsylvania and New Jersey to Maine, and not far from the coast, reaching barely to about the 46th parallel, one or two degrees beyond the Chestnut. In Western Europe *B. alba* extends into the arctic regions. The American tree should be critically compared anew with the European. At present the White Birch and the Chestnut are our only trees here considered as specifically identical with European ones; unless we add our low and procumbent representative of the Yew (*Taxus baccata*, var. *Canadensis*). If a striking difference in habit or mode of growth alone may be relied upon for characters, then our Yew must be specifically distinct from that of Europe. Other differences, however, have not been detected. Our Yew, according to Richardson, merely reaches the southern borders of the Saskatchawan basin, say about lat. 50°. In Oregon there are Yew trees with the port of the ordinary *T. baccata*, which appears not to occur in Northern Asia, although Dr. Hooker recognizes it in the Himalayas.

Drosera longifolia (*intermedia*), *Circæa Lutetiana*, and *Myriophyllum verticillatum* might be expected to extend farther north than lat. 47°, but they do not occur in Lapland.

Juncus Stygius is the most remarkable member of this list. Its only known habitat on the North American *continent* is a bog adjoining a small lake in Jefferson county, New York, lat. 44°, where I found it in great abundance twenty-four years ago. But it has been collected in Newfoundland, probably south of lat. 49°. This is a mainly Scandinavian species, of high northern range, not found in Denmark, according to Fries, but extending to Bavaria and the Alps. It has been said to occur in Northeastern Siberia, but Trautvetter corrects this in his *Florula Ochotensis:* what he had taken for it, he finds on reëxamination, to be *J. castaneus*. In all probability it grows in Lower Canada: but if in Northern British America it could hardly have been overlooked by Richardson and Drummond.

Carex fulva is another species unknown in Northern British America, found at only one station in the United States, and elsewhere only in Newfoundland, whence Goodenough received the specimens on which he founded the species. In Europe, it is scarcely found north of lat. 60.

Spiranthes cernua, if really European, is found only on the west coast of Ireland, and belongs to the same remarkable category as *Eriocaulon septangulare*, of the next list.

For the rest of the list, no particular remarks are needed. Their northern range in this country corresponds generally with that in Europe, making allowance for the difference in climate; that is, they range ten or fifteen degrees farther north in Western Europe than in North America. This is true even of *Vallisneria spiralis*, a plant of temperate climates, with a wide southern range, and neither Scandinavian nor North German. In North America it extends to about lat. 46° : in Russia it is recorded as occurring near St. Petersburg, lat. 60°.

The following species, 56 in number, range north of lat. 50, and many of them have been traced up to lat. 55°, but not much if any beyond the latter parallel.

Anemone nemorosa.
Cerastium arvense.
Trifolium repens.
Ludwigia palustris.
Sium angustifolium.
Bidens cernua.
Gnaphalium uliginosum.
Chimaphila umbellata.
Monotropa Hypopitys.
Statice Limonium.
Utricularia vulgaris.
" minor.
Lycopus Europæus.
Myosotis palustris.
Calysegia sepium.
Salicornia herbacea.
Rumex maritimus.
Ceratophyllum demersum.
Acorus Calamus.
Sparganium ramosum ?
" angustifolium.
Lemna trisulca.
" polyrhiza.
Potamogeton pectinatus.
" prælongus.
" lucens.
" heterophyllus.
Scheuchzeria palustris.
Alisma Plantago.
Anacharis Canadensis.
Liparis Lœselii.
Platanthera bracteata.
Eriocaulon septangulare.
Eleocharis acicularis.
Scirpus maritimus.
Eriophorum alpinum.
Carex teretiuscula.
" tenella.
" tenuiflora.
" maritima.
" irrigua.
" pallescens.
" flava.
" filiformis.
" Pseudo-Cyperus.
" ampullacea.
Leersia oryzoides.
Calamagrostis arenaria.
Kœleria cristata.
Glyceria aquatica.
" fluitans.
Poa serotina.
" compressa.
Phragmites communis.
Triticum caninum.
Aira flexuosa.

Concerning two plants on this list, doubts may fairly be raised whether they are indigenous to this continent, viz. *Gnaphalium uliginosum* and *Poa compressa*. The former is one of our commonest plants, but is only found along damp road-sides and in ground which is or has been tilled. It is found on the Saskatchawan :

but if there restricted to similar situations, I should consider it one of the species unwittingly introduced by man from Europe. *Poa compressa* here has wholly the appearance of a naturalized plant. Richardson and Drummond gathered it also on the Saskatchawan, I know not in what stations. E. Meyer records it as in Labrador.

Triticum caninum, like the common Couch-Grass (*T. repens*), as it generally occurs with us, is evidently of European derivation; but both species are indigenous from our northern borders northward and westward.

The White Clover (*Trifolium repens*) which springs up so copiously and promptly wherever forests are destroyed and the land turned into pasture, is in the same category, being wild at the north and the far West, and undoubtedly imported likewise at the settlement of the country.

Of *Cerastium arvense*, and probably of *Acorus Calamus* also, we have within our limits both an indigenous and an introduced stock.

With *Anacharis Canadensis* it is not certain that the German and Russian plant is identical, the flowers being unknown there: nor, if so, are we sure that the plant is truly indigenous on the continent of Europe any more than in England, although it is very likely to be so.

Platanthera bracteata is placed upon the list, although with doubt, Dr. Lindley and Sir Wm. Hooker having expressed the opinion that it is identical with *P. viridis* of Europe.

Eriophorum alpinum, a Scandinavian plant of high range,—also found on mountains in Western Europe as far south as the Alps, but scarcely extending into Siberia,—is not rare with us in cold peat bogs, from Pennsylvania to Lake Superior and Maine. It is also a native of Newfoundland, although not mentioned as such by Hooker. I think I have seen specimens from Lower Canada. But no more northern habitats are known except Michaux's, i. e. Lake Mistassins and Hudson's Bay, say lat. 51°. It surely ought to grow in Labrador; but it is nowhere recorded from that region, nor from Greenland.

Eriocaulon septangulare, an Eastern North American plant not ranging beyond lat. 55°, but singularly reappearing only in a few stations in the nearest part of Europe, requires some notice in a different connexion.

It is worth remarking that it is in the interior of the continent, namely, in the Saskatchawan country (long. 95° to 105°,) and not along the coast, that most of the plants of this list attain their highest latitude. We should expect this, as regards the eastern coast, from the rise of the isothermal lines and of the limit of trees on passing westward, and from the great rise of the isotheral lines in the district referred to. Still it will appear singular that only three of these 56 species are recorded as natives of Labrador,

(namely, *Poa compressa*, already mentioned, *Statice Limonium*, and *Chimaphila umbellata*), until it is noted that the principal Labrador collections known were made between lat. 56° and 58°. Many Newfoundland and Canadian plants doubtless inhabit southern Labrador: but I can add only one of these on the present list, namely, *Calamagrostis arenaria*. Only about a dozen of these 57 species appear to occur north of the 50th parallel on the Pacific coast: but this number includes much the larger part of the species on this list which extend westward to the Pacific at all, even in a lower latitude.

The following 42 species range north of lat. 55°, but do not, as far as we know, cross the 60th parallel:

† Hepatica triloba.
†* Coptis trifolia.
Spiræa salicifolia.
† " Aruncus.
Agrimonia Eupatoria.
† Geum macrophyllum.
† Circæa alpina.
* Saxifraga Aizoon.
† Galium trifidum.
† Galium Aparine.
† " triflorum.
†* Plantago maritima.
† Glaux maritima.
Limosella aquatica.
† Veronica Anagallis.
† " serpyllifolia.
† Brunella vulgaris.
Calla palustris.
Lemna minor.
Potamogeton pusillus.
" compressus.
Potamogeton perfoliatus.
† " natans.
†* Triglochin maritimum.
†* Listera cordata.
†* Streptopus amplexifolius.
Scirpus lacustris.
† " sylvaticus.
† Rhynchospora alba.
† Carex pauciflora.
† " * canescens.
† " stellulata.
† " limosa.
† " Buxbaumii.
" * panicea.
" Œderi.
† Agrostis canina.
" vulgaris.
† Cinna arundinacea.
† Glyceria maritima.
† " distans.
† Poa annua.

Only 8 of these 42 species are recorded as natives of Labrador; namely, those marked with an asterisk in the list; while 29 of them are in Bongard's Florula of the Island of Sitcha (lat. 57°–58°) on the North West coast. These are marked with a (†). Among them are six of the eight Labrador species, namely, all except *Saxifraga Aizoon* and *Carex panicea*.

Two species only of the above list are doubtful natives of the United States; viz. *Galium Aparine*, which here is not found beyond Canada, and only in doubtful situations, but it seems to be truly indigenous on the Northwest coast; and *Poa annua*, a cosmopolite plant, found all round the world in high latitudes. *Agrostis vulgaris* and *A. canina* are in the same category with *Triticum caninum* and *T. repens*,—represented at the north by an indigenous, but generally by an imported stock.

Spiræa Aruncus claims a place in the list of disjoined species. It occurs in the Catskill mountains, New York, and southward along the whole extent of the Alleghanies; but here it ranges no farther northward. It is not a Scandinavian plant; but from France it extends eastward through Northern Asia to Kamtschatka, and thence to Sitcha and the mouth of the Oregon.

The following 63 species cross the 60th parallel, but so far as I can ascertain, are not known to cross the arctic circle on this continent.

* Caltha palustris.
Actæa spicata (rubra).
Turritis glabra.
Draba memorosa.
†Stellaria longifolia.
†Spergularia rubra.
Lathyrus palustris.
Fragaria vesca.
* Epilobium palustre.
†* Ligusticum Scoticum.
†* Linnæa borealis.
* Lonicera cærulea.
Galium boreale.
†Achillea Millefolium.
Artemisia Canadensis.
Lobelia Dortmanna.
* Campanula rotundifolia.
†* Ledum latifolium.
* Pyrola chlorantha.
†* Moneses uniflora.
* Primula farinosa.
Naumburgia thyrsiflora.
Utricularia intermedia.
†* Pinguicula vulgaris.
Veronica scutellata.
* Rhinanthus Crista Galli.
Scutellaria galericulata.
Stachys palustris.
†* Menyanthes trifoliata.
Blitum capitatum.
Polygonum amphibium.
†* " aviculare.
Callitriche verna.
" autumnalis.
†* Myrica Gale.
* Alnus incana.
Typha latifolia.
Sparganium simplex.
" natans.
* Triglochin palustre.
Goodyera repens.
Calypso borealis.
Corallorhiza innata.
Smilacina stellata.
†* " bifolia.
* Allium Schœnoprasum.
Juncus filiformis.
" Balticus.
" articulatus.
" bufonius.
Eleocharis palustris.
Scirpus pungens.
†Eriophorum vaginatum.
Carex chordorrhiza.
" aquatilis.
" salina.
† " livida.
† " vesicaria.
Alopecurus aristulatus.
Poa nemoralis.
* " pratensis.
Aira cæspitosa.
Phalaris arundinacea.

Twenty of these marked (*) are in the flora of Labrador; fifteen, marked (†) in that of Sitcha; and nine are common to the two.

It would appear, therefore, that of our Phænogamous plants common to Europe, only

5 do not range north of lat. 40°.
20, or 6 per cent, do not range north of lat. 45°.
56, or 17½ per cent, do not range north of lat. 50°.

113, or 35 per cent, do not pass north of lat. 55°.
155, or 48½ per cent, do not pass north of lat. 60°.
218, or 68 per cent, scarcely, if at all, cross the Arctic circle.

In this inquiry we have thus far left our alpine and even subalpine species, common to Europe, wholly out of view, as not properly belonging to our temperate flora, and as expected to extend northward beyond the Arctic circle. In a few cases, however, this expectation is not exactly borne out. For instance,

Viola palustris is found only in the alpine region of the White Mountains, in Labrador, and perhaps in the Rocky Mountains about lat. 42°, but has not been noticed in arctic America proper. It occurs, however, in Greenland as well as in Kamtschatka.

Potentilla frigida,* or the plant of the White Mountains which I take for it, has not been elsewhere found in this country (unless confounded with some other species) except in Greenland, between lat. 73° and 80°, by Dr. Kane; nor is it known in the north of Europe!

Sibbaldia procumbens, although found in Labrador and Greenland on one side, and on the northern Rocky Mountains and at Unalaschka on the other, has not been detected in Arctic America within the Arctic circle.

Gnaphalium supinum, a rare plant of the White Mountains, has been elsewhere detected upon the continent only at Labrador: and it also occurs in Greenland.

Cassiope hypnoides, found on all our alpine summits, elsewhere occurs only in Labrador and Greenland, on the one hand, and at Unalaschka, below the Arctic circle, on the other.

Phyllodoce taxifolia occurs only on the White Mountains, in Labrador, and in Greenland.

Veronica alpina, although approaching the Arctic circle both east and west, is not recorded as crossing it, though it probably does so.

Salix phylicifolia occurs only on the White Mountains and in Labrador.

Juncus trifidus, an abundant plant in our alpine districts, is not recorded from any other part of North America, excepting Newfoundland!

Carex capitata, although found on Hudson's Bay and on the Rocky Mountains, is not recorded from within the Arctic circle.

Phleum alpinum, found in Labrador, Greenland, and Unalaschka, is not recorded from within the Arctic circle. On the other hand *Aira atropurpurea*, a Lapland species found on the

* The habitat of this rare plant has been casually left out of the Manual of Botany of N. U. States, p. 118. It was discovered, out of flower, by Dr. Robbins (who has long been one of the most zealous and successful explorers of New England botany), at a single station in the alpine region of the White Mountains of New Hampshire, where it is still rather abundant. Later the indefatigable Prof. Tuckerman detected it on Mount LaFayette, of the Franconia range. These are the only stations known on this continent.

White Mountains, is remarkable for not being found in Labrador, nor in Greenland that I am aware of, while it occurs on the Northwest Coast below lat. 60°, but nowhere in Siberia, Kamtschatka, &c., nor was it known in Arctic America until lately collected between Point Barrow and Mackenzie river, by Capt. Pullen, according to Mr. Seemann.

As to our subalpine list: *Alsine Grœnlandica* is wrongly said in the Manual to be European, as it has not been found beyond Greenland. It also occurs in Labrador, and with us as far south as the low Shawangunk Mountains in the southern part of New York; but is entirely unknown in Canada and in Arctic America.

Carex gynocrates, which we should expect to be alpine and arctic, but which is not known as either in this country, is connected with Lapland by the intermediate station of Greenland. Excepting this and *Juncus stygius* (which has already been commented on), and perhaps also *Euphrasia officinalis*, all our strictly subalpine species, as well those enumerated as to have been expected to be so, which are common to us and to Europe, extend northward along the central region of the continent quite to the Arctic sea-coast. While, curiously enough, eleven, or one-third of our strictly alpine species common to Europe,—all but one of them arctic in the Old World,—are not known to cross the arctic circle on this continent. This, however, might perhaps have been expected, as it seems almost certain that the interchange of alpine species between us and Europe must have taken place in the direction of Newfoundland, Labrador and Greenland, rather than through the polar regions; and this a critical study of the distribution of our plants northward would be likely to show.

Adding accordingly a dozen alpine or subalpine species, we have about 230 Phænogamous species common to Europe, or 72 per cent, which have not been detected within the Arctic circle upon the American continent.

Our species common to Europe which do extend into the Arctic zone,—exclusive of all those enumerated in the three lists of alpine, subalpine, and the seven *should-be* alpine or subalpine species given on p. 3, are these (52 in number):

Dicotyledoneæ.

Ranunculus aquatilis, var.
" flammula, var.
" sceleratus,
Nasturtium palustre.
Cardamine pratensis.
" hirsuta.
Arabis hirsuta.
Barbarea vulgaris.
Erysimum cheiranthoides.
Drosera rotundifolia.
Parnassia palustris.
Honkenya peploides.
Mœhringia lateriflora.
Stellaria longipes.
" uliginosa.

Stellaria crassifolia.
" borealis.
Sagina nodosa.
Lathyrus maritimus.
Potentilla Norwegica.
" Anserina.
" fruticosa.
" palustris.
Epilobium angustifolium.
Myriophyllum spicatum.
Hippuris vulgaris.
Ribes rubrum.
Viburnum Opulus.
Artemisia Canadensis.
Taraxacum Dens-leonis.
Vaccinium Oxycoccus.
Arctostaphylos Uva-Ursi.
Cassandra calyculata.
Andromeda polifolia.
Pyrola rotundifolia.
Pyrola minor.
Primula Mistassinica.
Mertensia maritima.
Gentiana detonsa.
Chenopodina maritima (?)
Alnus viridis.
Juniperus communis.

Monocotyledoneæ.

Luzula pilosa.
" parviflora.
" campestris.
Juncus bulbosus.
Eriophorum polystachyon.
" gracile.
Carex vulgaris.
Festuca ovina.
Triticum repens.
Hierochloa borealis.

If any interesting relation is to be traced between the more or less boreal range of our temperate species common to Europe, and the natural classes or orders they severally belong to, the means of instituting the comparison are at hand in the various foregoing lists. The subjoined columns give a comparison in this respect between our 52 non-alpine plants which extend into the Arctic zone, and the almost equal number whose northern limit is between the 40th and the 50th parallels. It shows nothing, however, except the diminution of the number of the orders, and of non-glumaceous Endogens, in high latitudes.

Non-alpine species of the above list with their boreal limit with the Arctic circle.		Non-alpine species with their boreal limit between lat. 40° and 50°.	
Ranunculaceæ,	3	Ranunculaceæ,	2
Cruciferæ,	6	*Nymphæaceæ*,	1
Droseraceæ,	1	Cruciferæ,	2
Parnassiaceæ,	1	Droseraceæ,	1
Caryophyllaceæ,	7	Caryophyllaceæ,	1
Leguminosæ,	1	*Oxalidaceæ*,	2
Rosaceæ,	4	*Geraniaceæ*,	1
Onagraceæ,	3	Leguminosæ,	1
Grossulaceæ,	1	Rosaceæ,	3
Caprifoliaceæ,	1	*Lythraceæ*,	1
Compositæ,	2	Onagraceæ,	2
Ericaceæ,	6	Compositæ,	1
Primulaceæ,	1	Primulaceæ,	2
Borraginaceæ,	1	*Scrophulariaceæ*,	2
Gentianaceæ,	1	Borraginaceæ,	1
Chenopodiaceæ,	1	Chenopodiaceæ,	3

Betulaceæ,	1
Coniferæ,	1
Dicotyledoneæ,	42
Juncaceæ,	4
Cyperaceæ,	3
Gramineæ,	3
Monocotyledoneæ,	10
21 orders,	52 species.

Polygonaceæ,	1
Urticaceæ,	1
Cupuliferæ,	1
Betulaceæ,	1
Coniferæ,	1
Dicotyledoneæ,	31
Typhaceæ,	1
Lemnaceæ,	1
Naiadaceæ,	3
Hydrocharidaceæ,	1
Orchidaceæ,	2
Liliaceæ,	1
Juncaceæ,	2
Cyperaceæ,	6
Gramineæ,	3
Monocotyledoneæ,	20
30 orders,	51 species.

Considered as to size and duration of the plants in connection with geographical range, our 320 species common to Europe, are divided as follows:

Only 3 of them are trees, namely, the Chestnut, White Birch, and Yew; and the latter is no tree in this country. All three have been and generally are still taken for peculiar American species, perhaps correctly. None of them extend north quite to lat. 50°, the Chestnut not beyond 45°. Two of them range a little south of lat. 40°, and one, the Chestnut, considerably south of lat. 36°. Their geographical distribution, taken in connexion with the comparatively restricted area of trees, favors the suspicion that these are specifically different from the European species.

Only 15 species are shrubs. All of them occur as far north as lat. 60°, or else are alpine, and 10 grow within the arctic circle.

Then 12 are suffruticose or suffrutescent plants, all of them arctic-alpine or subalpine, and with their southern limit under lat. 40°, except two; namely, *Arctostaphylos Uva-ursi*, which ranges from the arctic shores to lat. 35° and across the whole breadth of the continent at its widest part; and *Chimaphila umbellata*, which, from its northern limit of about 55°, is equally broadly distributed over the continent, and extends southwards even into Mexico.

The remaining 290 species are all herbs; and about 260 of them are perennials. Of the 30 annuals and biennials, few have a high boreal range, but at least 20 of them are among our species of widest southern range.

The Southward Range in this Country of our Phænogamous Species common to Europe.

This is not a subject of so much interest as the northern range. The subjoined table exhibits the main facts of the case, as well as I can now determine them, as respects our species which are neither alpine nor subalpine.

No. of species.	Whose boreal limit is	Of these the southern limit is beyond			Found on DeCandolle's list of species of *vast area*; out of the whole No. (column 1.)	those rang'g S. of 40° (columns 3, 4, 5).
		Lat. 30°.	Lat. 36° 30'.	Lat. 40°.		
52	+66° 30′	6 spec.	11 spec.	16 spec.	10 spec.	9 species.
63	+60°–66°	9 "	16 "	8 "	11 "	9 "
42	+55°–60°	16 "	9 "	7 "	10 "	10 "
57	+50°–55°	17 "	12 "	16 "	10 "	10 "
36	+45°–50°	10 "	10 "	8 "	7 "	7 "
15	+40°–45°	4 "	3 "	4 "	1 "	1 "
5	+40°	2 "	2 "	1 "	0 "	0 "

DeCandolle's list (in Geogr. Bot. p. 564, et seq.) of Phænogamous species of vast area comprises those which, in their actual dispersion, are estimated to be diffused over at least one-third of the terrestrial surface of the globe. It therefore rarely includes maritime plants, although these are so wide-spread. Nor does it include several of our species which as wild plants have better claim than some which are admitted. Indeed a large proportion of those common to Europe which range south of lat. 36° 30′ are very widely spread species.

For example, the six *amphigæan* species which range from within the arctic circle to south of the 30th parallel, or to the Gulf of Mexico, are *Ranunculus aquatilis*, *Nasturtium palustre*, *Cardamine hirsuta*, *Drosera rotundifolia*, *Taraxacum Dens-leonis*, (probably introduced southward) and *Luzula campestris*, all but one nearly cosmopolite, and that one (*Drosera*) diffused over most northern temperate regions.

And the 9 which range from near the arctic circle to the same low latitude are *Spergularia rubra*, *Polygonum amphibium* and *aviculare*, *Callitriche verna* and *autumnalis*, *Typha latifolia*, *Juncus bufonius*, *Eleocharis palustris*, and *Scirpus pungens*. (*Caltha palustris*, which is on DeCandolle's list, does not extend quite so far south.) And among the 16 which range from lat. 55°–60° down to lat. 30° are such plants as *Agrimonia Eupatoria*, *Veronica Anagallis* and *serpyllifolia*, *Limosella subulata*, *Brunella vulgaris*, *Lemna minor*, *Potamogeton perfoliatus* and *natans*, *Scirpus lacustris*, and *Poa annua*,—a few of them not really indigenous there. One hardly to be expected is *Hepatica triloba*, which occurs in Florida.

Of our alpine species common to Europe, of course none occur south of Northern New York. And as to the eleven on the sub-

alpine list, only two have been observed anywhere in the Alleghanies, (and these only south of lat. 36° 30′), viz. *Scirpus cæspitosus* and a form of *Trisetum subspicatum*. None of the rest are known in the Eastern United States so far south as lat. 40°.

The re-appearance of some northern species in high southern latitudes is another matter, and to be considered under the head of *disjoined species*.

The range of our amphigæan species might be considered in reference to the stations they affect or the medium in which they grow; but this would be likely to bring out no important results beyond the familiar ones that aquatic, palustrine and maritime species are among those of widest range in latitude. The lists already given enable any botanist to do it.

The Species common to this Country and to Europe in respect to the size of the Orders and Genera they belong to.

The species which we possess in common with Europe, being generally speaking those of widest geographical range, form good materials ready to our hands, as far as they go, for the enquiry whether there is any assignable relation between the size of a natural group and the area occupied by the species;—a subject which DeCandolle has briefly discussed, as regards families. By gathering the *data* from the table which begins on p. 208, it will be seen that our nine largest families (as enumerated in order on p. 213) come a little nearer to comprising half our amphigæan species than they do to half our whole number of species: i. e., they contain 158 species, or two less than half. But the tenth family, *Labiatæ*, being very poor in these common species, brings up the number to only 162, or barely two above half of the 320. And our different large families present such marked differences in the ratio of their amphigæan species,* that it is clear no results of the least moment are to be obtained in this way.

To be of any value, at least upon our limited scale, the comparison should be made with genera, as Mr. Darwin suggests; and from some investigations of his own, this sagacious naturalist inclines to think that species in large genera range over a wider area than the species of small genera do. Our 320 amphigæan species evidently tend to confirm this view. They belong to 171

* Compositæ,	out of	273	species,	9	are common to Europe.	
Cyperaceæ,	"	213	"	48	"	"
Gramineæ,	"	162	"	32	"	"
Leguminosæ,	"	91	"	4	"	"
Rosaceæ,	"	71	"	16	"	"
Ericaceæ,	"	62	"	19	"	"
Scrophulariaceæ,	"	54	"	10	"	"
Orchidaceæ,	"	51	"	10	"	"
Ranunculaceæ,	"	49	"	10	"	"
Labiatæ,	"	49	"	4	"	"

genera. Of these only 18, or 10·5 per cent, are monotypic, while 13·3 per cent of our whole number of genera are monotypic: 23 genera or almost 13 per cent contain only two or at most three good species apiece, and about as many more have only four or five good species. Therefore 64 of the smaller genera, or 37 per cent, fully come up to the general average of species to genus in our Phænogamous plants generally, viz. three each (supra, p. 216); while on the other hand, 15, or 8 per cent, are very large genera, such as *Carex*, *Solidago*, *Cyperus*, *Salix*, *Allium*, *Galium*, *Trifolium*, *Gentiana*, *Ranunculus*, &c. Though many of these are not very large genera in our region, nor do those that are large particularly abound in amphigæan species.

Comparison of the Flora of the Northern United States with that of Europe in respect to the Similar or Related Species.

Two floras may be, perhaps, as nearly related through their allied as through their identical species: at any rate, the comparison in this respect is equally important to be made. Such comparisons, however, are much more difficult, owing to the impossibility of estimating the degrees of resemblance among species, or at least of expressing them in any precise or definite way, or of bringing shades of difference to any common standard. In theory, indeed, only one grade of resemblance is supposed to be expressed in genera. But genera,—even those whose circumscription is either clearly defined in nature (which is far from being always the case) or is generally agreed upon, are by no means groups of equal value throughout; and the species of every genus, when several or numerous, resemble each other in very unequal degrees.

Still no two analogous but geographically separated floras of any size are so well known, as to their Phænogamia, and afford generally such facilities for the comparison of their related species, as those of the Northern United States and of Northern Europe.

If we judge of their relationship from the large proportion of the genera common to the two, we might infer it to be very close. After correcting a little the numbers published in the former article, on p. 216 *et seq.*, we count 326, or not much less than one-half of the 681 genera as belonging also to Europe. This indicates a great *amount* of related vegetation in the two floras, no doubt; but of the *degree* of relationship, taken comparatively, it gives us no correct idea, until we know how many of the genera common to the two are almost cosmopolite, or are wide-spread over the cooler parts of nearly the whole northern hemisphere; and how many are peculiar or strictly characteristic. Now, on going over the list, I find that an extraordinarily large proportion of the genera common to our flora and to Europe belong also

to the floras of almost all the temperate regions of the world. Out of the 326 genera,

284, or 87 per cent are diffused around the northern hemisphere, or over the greater part of it;

201, or 61 per cent, extend into the tropics or cross the equator.

177, or considerably over half, are both widely diffused over the northern temperate zone and extend into or beyond the tropics:—leaving

18, or only 5½ per cent, as nearly peculiar to Eastern North America and to Europe; and very few even of these are strictly peculiar.

A simple enumeration of them will show how trivial a part these 18 American-European genera play in the two floras. They are:

Bellis,
Cakile.
Calla,
Carpinus,
Cassandra,
Cercis,
Convallaria,
Corema,
Dupontia.
Fedia,
Hottonia,
Liparis,
Melampyrum,
Narthecium,
Ostrya,
Scheuchzeria,
Subularia,
Waldsteinia.

Most of these are very small genera, four if not five of them having only a single species each. *Cercis* actually extends to California, and south to near the tropical line. *Dupontia* is a purely arctic genus, to which our species, so called, is referred with much misgiving. *Hottonia* is said to have a third species in Java, which would exclude it from the present list. Moreover, five of these genera are represented only by identical species.

The special resemblance of our flora to that of Europe, it is clear, is not owing simply either to the large proportion of genera in common, or to any thing striking or important in the few genera nearly or quite peculiar to the two. The latter, indeed, are insignificant in our flora, and not to be compared, as to any features they impart, with the much more numerous and really characteristic genera which are shared by the Eastern United States and Eastern temperate Asia. We must look for it in the species, partly in the identical ones (already noticed), and partly in those which closely answer to each other in the two floras.

The citation of *representative species*, to be of much value, should be more critical than it generally is in such comparisons. The degrees of affinity should be classified as strictly as the subject admits of, under several heads; beginning with the plants so closely related in each that they form a sort of *limbo* between

the regions of identical and of allied species on either side, and which may or may not be reckoned specifically the same, according to our varying knowledge, and according to the views which different authors take respecting species. A good analysis of the subjects of comparison might perhaps be made into,

1. *Geographical Varieties*, or those cases in which the American plant is always or generally distinguishable from the European in some point or other, and is not unlikely to be reckoned specifically different even by sound botanists.

2. *Very Close Representative Species*, admitted as distinct, but not unlikely many of them to be reduced to geographical varieties.

3. *Strictly Representative Species*, pretty exactly answering to each other in the two floras, but of which there can be little if any question of specific identity.

4. *Strictly Congeneric Species*, but not falling into either of the former categories.

5. *Divergent Congeneric Species*, where the American type belongs to a different section or subgenus from the European.

To which these might be added, 6th, species of strictly analogous or representative genera.

I must not attempt here anything beyond an enumeration, made *currente calamo*, of such examples in question as occur to me under the first three heads:

1. *American Geographical Varieties, which not only have been, but are not unlikely to be again distinguished as Species, and therefore to be merged in No. 2.*

Ranunculus repens, Amer.:	formerly R. Marilandicus, &c.
Actæa spicata, vars. alba and rubra:	A. alba and rubra.
Nasturtium palustre, fructu brevi:	N. hispidum, &c.
Ribes rubrum, Amer.:	R. albinervium.
Solidago virgaurea, Amer., vars.:	S. humilis and multiradiata.
Monotropa Hypopitys, Amer.:	M. lanuginosa.
Statice Limonium, var.:	S. Caroliniana.
Samolus Valerandi, var. Amer.:	S. floribundus.
Lycopus Europæus, var. sinuatus:	L. sinuatus.
Stachys palustris, vars:	S. aspera, glabra, cordata, &c.
Myosotis palustris, var. laxa:	M. laxa.
Castanea vesca, var. Americana:	C. Americana.
Betula alba, var. populifolia:	B. populifolia.
Taxus baccata, var. Canadensis:	T. Canadensis.
Trisetum subspicatum, var. molle:	T. molle.

2. *Very Close Representative Species, almost all of them more or less liable to be reduced to Geographical Varieties.*

Northern United States.	*Northern Europe.*
Pulsatilla Nutalliana,	P. vulgaris.
Delphinium exaltatum,	D. elatum.
Berberis Canadensis,	B. vulgaris.
Nymphæa odorata,	N. alba.
Nuphar Kalmiana,	N. lutea.
Arabis lyrata,	A. petræa.
Sisymbrium canescens,	S. Sophia.
Cakile Americana,	C. maritima.
Viola Muhlenbergii,	V. canina.
Elatine Americana,	E. triandra.
Geranium Carolinianum,	G. dissectum.
Impatiens pallida and fulva,	I. noli-tangere.
Geum album,	G. urbanum.
Potentilla paradoxa,	P. supina.
Rubus strigosus,	R. Idæus.
Amelanchier Canadensis,	A. vulgaris.
Epilobium coloratum,	E. tetragonum.
Tillæa simplex,	T. aquatica.
Sedum telephioides,	S. Telephium.
Chrysosplenium Americanum,	C. oppositifolium.
Cornus Canadensis,	C. Suecica.
Sambucus pubens,	S. racemosa.
Galium trifidum.	G. palustre.
Valeriana sylvatica,	V. dioica.
Nardosmia palmata,	N. frigida.
Antennaria plantaginifolia,	A. dioica.
Ledum latifolium,	L. palustre.
Veronica Americana,	V. Beccabunga.
Melampyrum Americanum,	M. pratense.
Lithospermum latifolium,	L. officinale.
Euphorbia obtusata,	E. platyphylla.
" commutata,	E. Peplus.
Fagus ferruginea,	F. sylvatica.
Juniperus Virginiana,	J. Sabina.
Allium Canadense,	A. vineale.
Veratrum viride,	V. album.
Narthecium Americanum,	N. ossifragum.
Eleocharis rostellata,	E. multicaulis.
Scirpus pungens, &c.,	S. triqueter.
Hordeum pusillum,	H. maritimum.
Elymus striatus,	E. Europæus.
" mollis,	" arenarius.

3. *Strictly Representative Species, probably few of them to be confounded.*

Northern United States.	*Europe.*
Atragene Americana,	A. alpina.
Clematis ochroleuca,	C. integrifolia.
Ranunculus alismæfolius,	R. Lingua.
" abortivus,	R. auricomus.
Isopyrum biternatum,	I. thalictroides.
Aconitum reclinatum,	A. Lycoctonum.
Nasturtium lacustre,	N. amphibium.
Draba arabisans,	D. incana.
Lepidium intermedium,	L. ruderale.
Senebiera didyma,	S. Coronopus.
Tilia Americana,	T. Europæa,
" heterophylla,	T. argentea.
Staphylea trifolia,	S. pinnata.
Acer spicatum,	A. Tartaricum.
" saccharinum,	A. platanoides.
Hedysarum boreale,	H. obscurum.
Cercis Canadensis.	C. Siliquastrum.
Prunus Virginiana,	P. Padus.
Rubus triflorus,	R. saxatilis.
Pyrus (Sorbus) Americana,	P. aucuparia.
Ribes floridum,	R. nigrum.
Saxifraga Virginiensis,	S. nivalis.
" Pennsylvanica.	S. hieracifolia.
Hydrocotyle interrupta,	H. vulgaris.
Sium lineare,	S. latifolium.
Cornus sericea and stolonifera,	C. sanguinea.
Lonicera grata,	L. Caprifolium.
Sambucus Canadensis,	S. nigra.
Viburnum lantanoides,	V. Lantana.
Fedia radiata,	F. olitoria, &c.
Aster flexuosus,	A. Trifolium.
Bidens connata,	B. tripartita.
" chrysanthemoides,	B. cernua.
Artemisia Ludoviciana,	A. vulgaris.
Gnaphalium purpureum,	G. sylvaticum.
Hieracium Canadense,	H. prenanthoides, &c.
Azalea calendulacea,	A. Pontica.
Ilex opaca,	I. Aquifolium.
Diospyros Virginiana,	D. Lotus.
Androsace occidentalis,	A. elongata.
Trientalis Americana,	T. Europæa.
Hottonia inflata,	H. palustris.
Mentha Canadensis,	M. arvensis.
Myosotis verna,	M. stricta.
Gentiana Saponaria,	G. Pneumonanthe.
Asarum Canadense,	A. Europæum.
Corema Conradii,	C. alba.
Ulmus Americana,	U. pedunculata.

Ulmus fulva,	U. montana.
Celtis occidentalis,	C. australis.
Morus rubra,	M. nigra.
Urtica gracilis,	U. dioica.
Parietaria Pennsylvanica,	P. officinalis.
Platanus occidentalis,	P. orientalis.
Corylus Americana,	C. Avellana.
Carpinus Americana,	C. Betulus.
Ostrya Virginica,	O. vulgaris.
Alnus serrulata,	A. glutinosa.
Salix lucida, &c.,	S. pentandra, &c.
Populus tremuloides,	P. tremula.
Abies balsamea,	A. pectinata.
" nigra and alba,	" excelsa.
Larix Americana,	L. Europæa.
Sagittaria variabilis,	S. sagittifolia.
Cypripedium pubescens,	C. Calceolus.
Smilax rotundifolia, &c.,	S. aspera.
Polygonatum biflorum,	P. multiflorum.
" giganteum,	" officinale.
Erythronium Americanum and albidum,	E. dens-canis.

I omit, for the most part, the large genera, in which it becomes a nice question rightly to pair off representative species.

In all these lists it is sometimes the case that the species or forms of the second column also are indigenous to the United States, or to North America.

Adding now our about 115 closely representative species (of the second and third lists) to the 320 identical ones, we have a total of 435, or over one-fifth of our Phænogamous species, as the same as, or very much like European plants; and enough more of good representative forms might be selected from the large genera (Carex, Salix, Quercus, Juncus, &c.) to bring the proportion up to nearly one-third.

Equally prominent European features of our flora might be traced in the fourth list, if filled out. Here the greater number of allied species would fully make up for the somewhat less close affinity, and so exhibit an equal amount of resemblance. And this brings me to remark that,

Finally, it is in the number of familiar European forms,—especially of those most striking to the eye and most effective in the landscape,—that the general likeness of the vegetation, and the preponderant share of the botanical affinity of our flora to that of northern Europe consists. This might be illustrated in a variety of ways.

A very large part of the more conspicuous and popularly well-known European genera are represented here;—if not in indigenous, at least in naturalized plants, which the common observer never thinks of eliminating. Illustrations of so familiar a fact are superfluous.

Of trees and shrubs,—the most conspicuous members of a flora, and many of them among the most abundant in individuals,—I find only eleven genera in the British flora which are not in ours likewise; and five of these are probably not truly indigenous to Great Britain. Of the remainder we have here genera strictly analogous to each, except to *Erica*, *Daphne*, and *Ulex*. On the other hand, indeed, we have 46 extra-European genera of trees and shrubs, showing our superior richness in this respect, which has often been remarked upon: but, excepting Heaths, Furze, and Tamarisks, we lack scarcely any North European arborescent or woody type.

As to glumaceous plants,—likewise so prolific in individuals,—only three British genera of *Cyperaceæ* and 9 of Grasses are wanting here.

A vast preponderance of our species throughout belong to genera common to Europe. This has already been noted, as respects the orders, in my former article (p. 216). It is equally true as to the genera, as the following data serve to show.

The Phænogamous genera in our flora, as has been already stated, average three species apiece; and fully half of them are represented by more than one species. But of the 353 extra-European genera, as many as 234, or 66 per cent are represented in our flora by only one species; and of the remaining 34 per cent only 34 genera exceed the general average of 3 species. Only eleven of these, I believe, have as many as 9 species, and six of them have from 10 to 18, which is the maximum. On the other hand 40 of our genera common to Europe are represented in our flora by 9 or more species (not excluding the naturalized ones), and the 34 larger genera average as much as ten indigenous species apiece.

As to the relative number of species in our 34 largest amphigæan genera, it may be interesting to note that their sum in our flora is 637 species; in the Flora Germanica of Koch, 621;—the naturalized plants not being excluded; but these are quite as numerous in the German flora as in ours. Also 20 of these genera are larger in our flora than in the German. If the admitted species were brought to a common standard, the numbers would tell more decidedly in our favor. The large genera of which we possess the superior number of species are *Carex* (132 in our flora to 109 in the German), *Aster* (38 to 8), *Solidago* (35 to 1), *Panicum* (20 to 7), *Polygonum*, *Cyperus* (19 to 7), *Quercus* (18 to 5), *Eupatorium* (16 to 1), *Platanthera* (16 to 2), *Eleocharis* (16 to 7), *Hypericum*, *Polygala*, *Vaccinium* (11 to 5), *Utricularia* (11 to 4), *Scutellaria* (10 to 4), *Rhynchospora* (10 to 2), *Glyceria*, *Rubus*, *Viburnum* (10 to 3), and *Smilax* (10 to 1).

Although such details as I have to present are far from inviting to general readers, it is desirable to put them upon record, inasmuch as the facts they bring to view are useful to those philosophical naturalists who are discussing important problems respecting the present distribution of plants and animals over the world, and the causes which have determined the present state of things. This must be my excuse for continuing at such a length the present series of articles.

Having compared our flora with that of Europe in respect to closely allied species, it may be interesting to institute a similar comparison with that of Oregon and Northern California. The comparison might also be extended to Northwestern Asia, and especially to Japan, with which we have peculiarly interesting relations as to species; but this is better deferred until some recent collections from the northern part of Japan have been completely examined.

Comparison of the Flora of the Northern United States with that of the Pacific coast of North America (Oregon and North California) between lat. 46° and lat. 36°.

1. *As to Geographical Varieties.*

The following have been distinguished as species by excellent botanists, but in most cases, perhaps in all, they should rather be considered geographical varieties.

Natives of Eastern N. U. S.	*Natives of Oregon and California, lat. 46°–36°.*
Trautvetteria palmata,	T. grandis, *Nutt.*
Aquilegia Canadensis,	A. formosa, *Fisch.*
Actæa spicata,	A. arguta, *Nutt.*
Erysimum Arkansanum,	E. asperum and elatum, *Nutt.*
Honkenya peploides,	H. oblongifolia, *Torr. & Gr.*
Stellaria borealis,	S. crispa, *Cham.*
Euonymos atropurpureus,	E. occidentalis, *Nutt.*
Negundo aceroides,	N. Californicum, *Torr. & Gr.*
Vicia Americana,	V. Oregana, *Nutt.*
Astragalus Canadensis,	A. orthocarpus, *Dougl.*
Spiræa opulifolia,	S. capitata, *Pursh*, S. pauciflora, *Nutt.*
" Aruncus,	S. acuminata, *Dougl.*
Potentilla Pennsylvanica,	P. Hippiana, pulcherrima, bipinnatifida, &c.
Rubus Nutkanus (parviflorus, *Nutt.*),	R. Nutkanus,
Rubus occidentalis,	R. leucodermis, *Dougl.*
Rosa blanda,	R. fraxinifolia, *Lindl.*
Amelanchier Canadensis,	A. alnifolia, *Nutt.*

Heracleum lanatum,	H. Douglasii, *DC.*
Osmorrhiza brevistylis,	O. divaricata, *Nutt., &c.*
Sambucus Canadensis,	S. glauca, *Nutt.*
Galium boreale,	G. rubioides, *Linn.*
Chrysopsis villosa,	C. echioides, *Benth.*
Menziesia ferruginea, var. globularis,	M. ferruginea, *Smith.*
Pyrola rotundifolia,	P. bracteata, &c., *Hook.*
Plantago maritima, juncoides,	P. maritima.
Taxus baccata, var. Canadensis,	T. occidentalis, *Nutt.*
Xerophyllum setifolium,	X. tenax, *Pursh.*
Luzula campestris,	L. comosa, *Meyer.*

2. *Strictly Representative Species.*

The following are cases of species of our Flora of the Northern United States represented on the western side of the continent by *strictly representative species,* (including very *close representative species,*) many of which, although still admitted as distinct, are not unlikely to be regarded hereafter as geographical varieties. The very close representative species are printed in *italics.*

Natives of Eastern N. U. S.	*Natives of Oregon and California.*
Clematis Virginiana,	*C. ligusticifolia.*
Ranunculus recurvatus,	R. occidentalis.
" fascicularis,	R. orthorhynchus.
Myosurus minimus,	M. aristatus.
Isopyrum biternatum,	I. occidentale.
Delphinium exaltatum,	D. Californicum.
" tricorne,	D. Menziesii.
Aconitum uncinatum,	A. Napellus.
Cimicifuga Americana,	*C. fœtida.*
Dicentra eximia,	*D. formosa.*
Nasturtium obtusum,	*N. polymorphum.*
" sinuatum,	N. curvisiliqua.
Dentaria heterophylla,	D. tenella.
Cardamine rhomboidea,	C. purpurea.
" rotundifolia,	C. angulata.
Viola rotundifolia,	V. sarmentosa.
" *Muhlenbergii,*	*V. adunca.*
" *Canadensis,*	*V. ocellata.*
" *pubescens,*	*V. glabella.*
Parnassia asarifolia,	*P. fimbriata.*
Hypericum mutilum,	*H. anagalloides.*
Silene Virginica,	S. pulchra.
Alsine Michauxii,	A. tenella.
Mœhringia lateriflora,	M. umbrosa.
Claytonia Caroliniana,	*C. lanceolata.*
Oxalis Acetosella,	*O. Oregana* & trilliifolia.

Geranium maculatum,	*G. erianthum & Richardsonii.*
Rhus Toxicodendron,	*R. diversiloba.*
Rhamnus alnifolius,	*R. Purshiana.*
Frangula Caroliniana,	F. Californica.
Ceanothus Americanus,	C. Oreganus.
Lupinus perennis,	L. laxiflorus, &c.
Amorpha fruticosa,	*A. Californica.*
Cercis Canadensis,	C. occidentalis.
Prunus Virginiana,	*P. demissa.*
Spiræa corymbosa,	*S. betulæfolia.*
" *salicifolia*,	*S. Menziesii.*
" *tomentosa*,	*S. Douglasii.*
Geum radiatum,	*G. calthifolium.*
Potentilla arguta,	*P. glandulosa.*
Fragaria Virginiana,	F. Chilensis.
Rubus trivialis,	R. macropetalus.
Cratægus Crus-galli,	C. rivularis?
" tomentosa,	C. sanguinea?
Pyrus coronaria,	P. rivularis.
" Americana,	P. sambucifolia.
Calycanthus glaucus & lævigatus,	*C. occidentalis.*
Myriophyllum scabratum,	M. hippuroides.
Ribes rotundifolium,	*R. divaricatum & irriguum.*
" *prostratum*,	*R. laxiflorum.*
Tillæa simplex,	T. angustifolia.
Sedum pulchellum,	S. stenopetalum.
Saxifraga Virginiensis,	S. integrifolia.
Boykinia aconitifolia,	B. occidentalis.
Heuchera Americana,	H. glabra.
" villosa,	H. micrantha.
Tiarella cordifolia,	T. trifoliata.
Chrysosplenium Americanum,	*C. glechomæfolium.*
Philadelphus inodorus,	*P. Lewisii & Gordonianus.*
Cornus florida,	*C. Nuttallii.*
" *sericea*,	*C. Drummondii.*
" stricta,	C. glabrata.
Lonicera sempervirens,	L. ciliosa, &c.
Valeriana pauciflora,	*V. capituta.*
Baccharis glomeruliflora,	B. consanguinea & pilularis.
Gnaphalium decurrens,	*G. Californicum.*
Hieracium longipilum,	H. Scouleri.
Gaultheria procumbens,	G. Myrsinites.
Azalea viscosa & calendulacea,	*A. occidentalis.*
Rhododendron maximum,	R. Californicum.
Chimaphila maculata,	C. Menziesii.
Styrax grandifolia,	S. Californica.
Collinsia verna,	C. bicolor, &c.
Chelone glabra,	C. nemorosa.
Mimulus glabratus (Jamesii, *Torr.*)	M. luteus.
Gratiola Virginiana,	*G. ebracteata.*

Castilleia coccinea,	*C. Douglasii.*
Hydrophyllum macrophyllum,	*H. capitatum.*
Nemophila microcalyx,	N. parviflora.
Ellisia Nyctelea,	E. membranacea.
Frasera Carolinensis,	F. speciosa.
Gentiana Saponaria, &c.,	G. Menziesii, Sceptrum, &c.
Fraxinus sambucifolia,	F. Oregana.
Asarum Canadense,	*A. Hookeri.*
Aristolochia Sipho,	A. Californica, *Torr.*
Platanus occidentalis,	*P. Mexicanus.*
Quercus alba,	Q. Garryana & Douglasii.
Myrica cerifera,	*M. Californica.*
Betula nigra,	*B. occidentalis.*
Alnus serrulata,	*A. rubra.*
Pinus inops,	P. distorta.
" resinosa,	P. insignis.
" Strobus,	P. Lambertiana.
Abies balsamea,	A. grandis.
Larix Americana,	*L. Mertensiana,* &c.
Thuja occidentalis,	T. gigantea.
Cupressus thyoides,	C. Nutkatensis.
Symplocarpus fœtidus,	S. Kamtschaticus.
Platanthera dilatata,	P. leucostachys.
Goodyera pubescens,	G. decipiens.
Corallorhiza multiflora,	C. Mertensiana.
" *Macræi,*	*C. striata.*
Trillium sessile,	T. petiolatum.
" *erectum,*	*T. ovatum.*
" *grandiflorum,*	*T. obovatum.*
Clintonia borealis,	C. uniflora.
Scilla Fraseri,	S. esculenta.
Erythronium Americanum,	E. grandiflorum.
Prosartes languinosa,	*P. Hookeri* & Smithii.
Cyperus inflexus,	*C. occidentalis.*
Vilfa vaginæflora,	V. cuspidata.
Brizopyrum spicatum,	*B. boreale?*

About 114 of our phænogamous species are therefore represented by strict analogues on the western side of the continent, —to which might be added several from the foregoing list, which are generally deemed to be distinct species;—and the number might be considerably augmented, no doubt, by further examination.

An interesting list might also be drawn up of species which are represented on the western coast by congeners not so closely related, but yet characteristic: as our

Coptis trifolia, by C. asplenifolia.
Berberis Canadensis, by B. (Mahonia) Aquifolium.
Corydalis aurea and glauca, by C. Scouleri.

Claytonia Virginica and Caroliniana, by C. alsinoides, perfoliata, flagellaris, &c.
Æsculus Pavia and flava, by Æ. Californica.
Acer Pennsylvanicum and spicatum, by A. circinatum and macrophyllum.
Œnothera, by a much larger number of species of different sections of the genus.
Mitella diphylla and nuda, by M. caulescens and pentandra.
Sanicula Marilandica and Canadensis, by a different set of species.
Our few Pentstemons, by a large number of various kinds.
Our numerous Pycnanthemums by a peculiar Californian one.
Our Trichostema dichotomum by T. lanceolatum, oblongum, &c.
Our few Phacelias by a large number of Phacelias and Eutocas.
Our Chestnut by Castanea chrysophylla, of a Western Asian type, &c.

A list of remarkable representative genera of the two sides of the continent might also be drawn up: the following are some of the more striking.

Our Sarracenia represented on the western side by the equally curious Darlingtonia, *Torr.*
Stylophorum, by Meconopsis.
Callirhoë, by Sidalcea, *Gray.*
Flœrkea, by Limnanthes.
Lobelia, by Clintonia *Dougl.* (not of *Raf.*)
Leucothöe, by Gaultheria Shallon.
Schweinitzia, by Sarcodes, *Torr.*, and an unpublished genus, Hemitomes.
Conopholis, by Boschniakia.
Monarda, by Monardella.
Tetranthera, by Oreodaphne.
Saururus, by Anemiopsis, *Nutt.*
Taxodium, by Sequoia (including Wellingtonia of Lindley).
Najas, by Lilea (Heterostylus, *Hook.*).
Zostera, by Phyllospadix.

A proper discussion of the relations existing between the vegetation of the eastern and western sides of the continent would demand a notice of the remarkable *absence* west of the Rocky Mountains of a great variety of genera, tribes, and even orders, which are eminently characteristic of the flora of the Eastern States. For example, Oregon and California have no *Magnoliaceæ*, *Anonaceæ*, *Menispermaceæ*, nor *Cabombaceæ*, no *Nymphæa*, although a Nuphar is plentiful, no *Tilia* or Bass-wood, no *Camelliaceæ*, no indigenous Grape-vines, except one in California, only one *Polygala*, no Locust or other Leguminous trees, no Passion-flowers, no *Hydrangea*, no *Hamamelaceæ*, few *Rubiaceæ*, no *Vernoniaceæ*, and very few *Eupatoriaceæ*, very few *Asters* and *Solidagoes* (but the numerous *Compositæ* tend strongly to *Helenieæ*, and are mostly of genera which are neither Eastern

North American nor European in type), no *Lobelia*, no true Huckleberries (*Gaylussacia*) nor *Vaccinia* of the Blueberry type, (the section *Cyanococcus*), no *Clethra*, and few *Andromedeæ*, no *Aquifoliaceæ*, *Ebenaceæ*, nor *Sapotaceæ;* no true *Bignoniaceæ*, no *Acanthaceæ*, nor Gerardias, no *Sabbatia*, no *Dirca* nor *Podostemon*, solitary representatives here of their respective orders; no *Empetraceæ*, no Elms (although there is a *Celtis*), no Mulberry, no Walnuts, Hickories, or other *Juglandaceæ*, nor a Beech, Hornbeam nor Ironwood, no true *Araceæ*, *Hydrocharidaceæ*, *Hæmodoraceæ*, *Burmanniaceæ*, *Dioscoreaceæ*, *Pontederiaceæ*, *Commelynaceæ*, *Xyridaceæ*, or *Eriocaulonaceæ*, few *Orchidaceæ*, and still fewer *Cyperaceæ*, none of the latter either *Rhynchosporeæ* or *Scleriеæ*, and Paniceous and Andropogineous Grasses are altogether absent.

How these failures are made up by a large increase of peculiar generic and specific forms in a few families, I will not stop to illustrate. But it is worth noticing that, while our eastern flora possess so many orders which are not represented in the western, no order represented in Oregon or California is wanting in the flora of our Northern States, unless *Hydroleaceæ* and *Garryaceæ* be counted as independent orders; and both of these occur in the Atlantic states south of our geographical limits.

The Distribution through degrees of latitude of the Phænogamous Species generally of the Flora of the Northern United States.

Having devoted the greater part of our last article to the investigation of this subject as respects about 15 per cent of our species,—namely those common to this country and to Europe,—I shall not be expected to elaborate the range of our whole 2091 Phænogamous plants in the same detailed manner.

I have investigated, in this regard, the shrubs and trees separately from the herbaceous plants; the former being moderate in number, and those which extend into British America affording us the advantage of having had their northern limits laid down by Sir John Richardson, in the invaluable appendix to his Arctic Searching Expedition. Of our Phænogamous species about

1745, or 83·5 per cent, are herbaceous plants.
218, or 10·3 per cent, are shrubs or woody vines.
130, or 6·2 per cent, are trees.

Northward and Southward Range in this country of our Shrubs and Trees.

The average range in America of our 348 woody plants is through about 13½ degrees of latitude.

The 15 following species are those which appear to have the greatest range north and south, namely, through from 30 to 40 degrees of latitude.

	Northern limit.	Southern limit.	Range.
Prunus serotina, -	61°	29°	32°
" Virginiana, -	66	31	35
Rosa blanda,* -	69	39	30
Amelanchier Canadensis,*	66	30	36
Cornus stolonifera, -	69	38	31
Viburnum acerifolium,*	62	31	31
Arctostaphylos Uva-ursi,*	70	36	34
Cassandra calyculata,	67	34	33
Alnus viridis,* - -	68	35	33
Salix discolor, - -	67	36	31
" lucida,* - -	67	37	30
" longifolia,* -	68	35	33
Populus tremuloides, -	69	37	32
Abies nigra, - -	68	34	34
Juniperus Virginiana, -	67	26	41

All of these species, with four or five exceptions, extend into the Southern United States only along the Alleghany Mountains; consequently their climatic range is not so great as would at first appear. Those which have an extraordinary climatic range, being natives both of the Arctic and Subarctic regions and of the low country bordering the Gulf of Mexico are the following.

Viburnum acerifolium. In the Southern States this is not met with far from the Alleghany Mountains, and the few specimens I have seen from Middle Florida are of doubtful character.

Amelanchier Canadensis. The Shad-flower or Service-berry prefers the mountains or their vicinity, but is not unknown in some parts of the low country as far south as Florida.

Prunus serotina. The Wild Black Cherry ranges from near Great Slave Lake, at the north, well into Florida and Texas, and into the adjacent parts of Mexico. Although it varies from a moderate-sized shrub to a large tree, I have no idea that more than one species is covered by this name.

Prunus Virginiana. The Choke Cherry extends from the borders of the Arctic Circle to Louisiana, &c.; but in the Southern States it is chiefly restricted to elevated districts.

Juniperus Virginiana. The Red Cedar, with its immense range, in the United States inhabits the warmer rather than the colder districts of the country, and extends on the Gulf of Mexico quite to the mouth of the Rio Grande. As a tree it does not occur north of about lat. 54°, but the low and spreading or prostrate form, which, with Sir William Hooker I have not been able to distinguish specifically from J. Virginiana, advances a short distance within the Arctic Circle, where, according to Sir John Richardson, it bears fruit at an elevation of 1000 feet, Sir William Hooker unites not only this northern form, but the Red Cedar generally with *Juniperus Sabina* of Europe, which in this case ranges over nearly the whole extent of the northern hemisphere. I am not yet prepared to adopt this view.

If the high northern prostrate Savin is rightly referred to *Juniperus Virginiana*, this species extends from within the Arctic Circle to the Gulf of Mexico. It is the only woody plant which does so, except perhaps *Amelanchier*, which has been traced almost to the Arctic Circle, and possibly *Prunus Virginiana*.

Alnus viridis occurs southward only on the highest Alleghanies.

We naturally enquire whether these fifteen species range widely east and west. Seven of them, those to which an asterisk is annexed, extend from the Atlantic to the Pacific, or very nearly, south of lat. 46°; and of these only two (*Arctostaphylos Uva-Ursi* and *Alnus viridis*) are indigenous to the Old World. *Cornus stolonifera*, *Prunus serotina* and *P. Virginiana*, and probably *Salix discolor*, all peculiarly American, reach or cross the Rocky Mountains. *Cassandra* (of which I have some doubt about its reputed southern range to Georgia) is wholly eastern, and is also European. *Populus tremuloides* and *Abies nigra* are both exclusively Eastern North American in habitation.

The following 68 species of woody plants, range with us through between 20 and 29 degrees of latitude.

— * Tilia Americana.
† Rhus glabra.
— † " aromatica.
— * Vitis cordifolia.
— † Ampelopsis quinquefolia.
— † Acer rubrum.
— † Negundo aceroides.
— * Amorpha fruticosa.
— * Prunus Americana.
— * Spiræa opulifolia.
† " salicifolia.
† Rubus occidentalis.
— † " villosus.
‡ Potentilla fruticosa.
— * Pyrus arbutifolia.
† Ribes Cynosbati.
† " hirtellum.
‡ " lacustre.
‡ " rubrum.
‡ Lonicera cærulea.
† Sambucus pubens.
— † " Canadensis.
‡ Viburnum Opulus.
† Gaylussacia resinosa.
‡ Vaccinium Vitis Idæa.
‡ " Oxycoccus.
‡ Vaccinum uliginosum.
‡ " Canadense.
‡ Arctostaphylos alpina.
— † Epigæa repens.
‡ Cassiope hypnoides.
‡ Andromeda polifolia.
— † " ligustrina.
‡ Phyllodoce taxifolia.
‡ Kalmia glauca.
† Menziesia ferruginea.
‡ Rhododendron Lapponicum.
‡ Loiseleuria procumbens.
— † Fraxinus Americana.
‡ Shepherdia Canadensis.
‡ Empetrum nigrum.
— * Ulmus fulva.
— † " Americana.
— * Quercus obtusiloba.
— † " alba.
— † " rubra.
— * Fagus ferruginea.
— † Corylus Americana.
— † Ostrya Virginica.
‡ Myrica Gale.
† Comptonia asplenifolia.
‡ Betula pumila.

‡ Betula nana.
‡ " papyracea.
‡ Alnus incana.
‡ Salix cordata.
‡ " rostrata.
‡ " phylicifolia.
‡ " pedicillaris.
‡ " Uva-Ursi.
‡ Salix repens.
‡ " herbacea.
‡ Pinus Banksiana.
† Abies balsamea.
‡ " alba.
‡ Larix Americana.
† Cupressus thyoides.
‡ Juniperus communis.

The mark — prefixed to the name indicates that the species extends southward to the borders of the Gulf of Mexico. The asterisk * denotes a range northward to the Great Lakes; †, to the basin of the Saskatchawan; ‡ to the Arctic Circle, or at least to lat. 67°.

It appears then that 34 species, or one half of this list, are of boreal or alpine character, ranging northward to or within the Arctic Circle. Fifteen of these are exclusively alpine or subalpine plants, and occur only on our higher mountains as far south as lat. 44°. Of the rest, those of greatest climatic range are, *Alnus incana*, ranging from about lat. 68° to 39°; *Salix cordata*, with an equally wide range and probably reaching further south; *Larix Americana*, with about the same southern limit, but in an elevated region only; *Juniperus communis*, not found south of lat. 40°; *Myrica Gale*, and *Ribes Cynosbati*, *Potentilla fruticosa*, *Kalmia glauca*, *Betula pumila*, and perhaps *Ribes lacustre*, each have a range of 28 or 29 degrees, but none of them are found south of lat. 40°.

Twenty-two species of the foregoing list extend northward into the Saskatchawan basin, and all but three of them (which cross the 60th parallel and occur in the basin of the Great Slave Lake) find their northern limit there.

On the other hand, 24 species extend southward to the borders of the Gulf of Mexico. Fourteen of these have their boreal limit in the Saskatchawan district, and nine about the Great Lakes.

The following species, 57 in number, range through from 15 to 19 degrees of latitude:

† Hudsonia tomentosa.
* Rhus typhina.
— * " venenata.
— * " Toxicodendron.
— * Ptelea trifoliata.
— * Vitis Labrusca.
† Rhamnus alnifolius.
— * Ceanothus Americanus.
† Acer Pennsylvanicum.
† " spicatum.
* Acer saccharinum.
* " dasycarpum.
* Amorpha canescens.
† Prunus Pennsylvanica.
† Spiræa tomentosa.
† Rubus odoratus.

† " strigosus.
— * Rosa setigera.
— * " lucida.
— * Cratægus coccinea.
— * Cratægus tomentosa.
† Ribes prostratum.
† " floridum.
— * Hamamelis Virginica.
* Cornus sericea.
† Symphoricarpus occidentalis.
† " racemosus.
† Lonicera parviflora.
† " ciliata.
† Diervilla trifida.
— * Viburnum nudum.
† " Lentago.
† " pubescens.
* " lantanoides.
† Vaccinium macrocarpon.
— * " corymbosum.
* Gaultheria procumbens.
— * Kalmia latifolia.
* " angustifolia.
— * Azalea viscosa.
— * " nudiflora.
† Nemopanthes Canadensis.
* Fraxinus pubescens.
— * " viridis.
— * Benzoin odoriferum.
— * Platanus occidentalis.
† Corylus rostrata.
— * Carpinus Americana.
— * Myrica cerifera.
* Salix eriocephala.
† " petiolaris.
— * " angustata.
— * Populus angulata.
† " balsamifera.
† Pinus resinosa.
† Thuja occidentalis.
— * Smilax rotundifolia.

The marks prefixed to the names have the same signification as in the preceding list.

Not one of these species are alpine, or even subalpine, nor found within several degrees of the Arctic Circle. Only two of them (viz., *Symphoricarpus occidentalis* and *S. racemosus*) reach the 60th parallel, or the great northern basin. Twenty-four of them have their boreal limit in the Saskatchawan or Hudson's Bay region; and all of them extend as far north at least as to the Great Lakes, although a few (such as *Ptelea trifoliata* and *Populus angulata*) barely touch their most southern borders, viz., the south shore of lakes Erie and Michigan.

Twenty-three species range southward to the borders of the Gulf of Mexico or very nearly, while their boreal limit is on or near the Great Lakes, between 41° and 49°.

Without carrying this analysis any farther, let us turn to the shrubs and trees of narrowest northern and southern range. Those whose range is not known to exceed six degrees of latitude are 33 in number, viz:

Magnolia macrophylla.
" Umbrella.
Berberis Canadensis.
Hypericum Kalmianum.
Æsculus glabra.
Robinia Pseudacacia.
" viscosa.
Cladrastis tinctoria.
Spiræa corymbosa.
Cratægus cordata.
Calycanthus glaucus.
Fothergilla alnifolia.
Lonicera hirsuta.
" oblongifolia.
Baccharis glomeruliflora.
Gaylussacia brachycera.

Vaccinium erythrocarpon.
Leucothoë Catesbæi.
" recurva.
Andromeda floribunda.
Clethra acuminata.
Azalea arborescens.
Rhododendron Catawbiense.
Styrax Americana.
Ulmus racemosa.
Juglans nigra.
Carya microcarpa.
" sulcata.
Quercus palustris.
Pinus pungens.
Abies Fraseri.
Smilax Walteri.
" hispida.

Fifteen, or 45½ per cent of these are trees; and out of 14 whose range is under four degrees of latitude, six are trees.

On the other hand, out of 140 species of wide or considerably more than average range, enumerated in the preceding lists, 42 (i. e. 30 per cent) may be counted as trees. Now, as almost 60 per cent of our woody plants attain under favoring circumstances the stature of trees, the general impression, that trees are more limited in range than shrubs, is not confirmed by the list last given, in which the percentage of trees is diminished instead of enlarged; but seems decidedly to be so by the list of wide-ranging species, even after the exclusion of the alpine plants, which of necessity are not trees. That is, local species are about as likely to be shrubs as trees, but shrubs are in general more widely distributed than trees.

A very few of our shrubs and trees, if rightly determined, extend southward much beyond the southern boundaries of the United States. Those which do so, principally, *Ascyrum stans* and perhaps *Zanthoxylum Carolinianum*, in the West Indies; and *Negundo aceroides*, *Sambucus Canadensis*, *Cephalanthus occidentalis*, *Vaccinium stamineum*, *Salix angustata*, and *Taxodium distichum*, in Mexico.

Northward and Southward range in this country of Herbaceous Plants.

Upon this subject my statements must be brief and general. Of the 1745 phænogamous herbaceous plants of the Flora of the Northern United States, diminished to about 1690 by the exclusion of the alpine and subalpine species, here left out of view—

843 species, or 50 per cent, range southward to the borders of the Gulf of Mexico.

538, or not quite 32 per cent, extend northward into the Saskatchawan basin or to Labrador.

107 of these reach or cross the Arctic circle.

24 species, or less than 1½ per cent, range from the Gulf of Mexico to the Arctic circle.

180, or 10½ per cent, range from the Gulf of Mexico to the Saskatchawan or Labrador.

248 species, or over 14½ per cent, range from the Gulf of Mexico to the Great Lakes or the St. Lawrence.

The twenty-four herbaceous plants of widest climatic range are

Ranunculus aquatilis.
" Cymbalaria.
" Purshii.
" sceleratus (a doubtful native southward).
Sarracenia purpurea.
Nasturtium palustre.
Cardamine hirsuta.
Barbarea vulgaris (not indigenous at the south?).
Sisymbrium canescens.
Viola cucullata.
Drosera rotundifolia.
Spergularia rubra.
Lupinus perennis (if the plant growing on the Arctic sea-coast is correctly referred to this species).
Galium trifidum.
" triflorum.
Erigeron Philadelphicum.
Achillea Millefolium (probably introduced southward).
Senecio aureus.
Taraxacum Dens-leonis.
Dodecatheon Meadia.
Chenopodina maritima?
Potamogeton pectinatus.
Luzula campestris.
Carex Novæ-Angliæ.

All except three or four of these species range westward to the Pacific; but one, *Sarracenia purpurea*, is remarkably restricted to the vicinity of the Atlantic. Only the seven printed in italics are indigenous to North America exclusively.

The Range of our Species compared with the size of the Genera they belong to.

The data before us may be used to test Mr. Darwin's surmise, that the species of large genera on the whole occupy a greater geographical area than those of small genera. Certainly almost half of the herbs of the last preceding list belong to very large genera; and all but four of them to genera of more than average size, that is, of more than ten or twelve species. I find, also, that 126 out of the 180 herbaceous species which range from the Gulf of Mexico to the Saskatchawan or Labrador, viz. 70 per cent, belong to genera containing above the average amount of species each, and about 112 of them belong to genera which are represented in the Flora of the Northern United States by above the average of indigenous species to genus.

And our woody plants of wide range tend more strongly to confirm this view, as the following table shows.

Woody plants ranging through	Whole No. of species.	Belonging to Genera,		
		Of great size.	Of more than average size, i. e. of over 10 species.	Of a single species or nearly so.
30°–40° of latitude.	15	3	13	1
20° " "	68	20	48	6
15° " "	57	7	44	1
	140	30	105	8

That is, in the first list, or in the species of widest range, 86½ per cent; in the second, 70½ per cent; in the third, 76 per cent, or in all three together 75 per cent of the species belong to genera of above the average size.

The converse does not tell in the same way, so far as our list of 33 species of narrowest range shows; for at least 21 of them belong to genera of above the average size, and only two are monotypic. But here the particulars are too few to draw any useful induction from.

Species of the Northern United States which have some other and widely sundered habitation.

The plants which I here have in view belong to DeCandolle's category of *Disjoined Species* (Espèces Disjointes),* or those of which the individuals exist in two or more separated countries, and which cannot reasonably be regarded as having been conveyed from one to the other by any existing means of transport, whether on account of their mode of life, the character of their seeds, the extreme distance of their habitations, or any other reason. I restrict myself, however, to only one, and that a small, portion of the numerous species which DeCandolle treats of under this head. For in this view almost all the undoubtedly indigenous phænoganous plants common to this country and to the Old World are disjoined species. I exclude both those species which are rather widely distributed in Northern Europe or Asia as well as in this country, and those which are dispersed over a very considerable portion of the terrestrial surface of the globe,† and consider only those of remarkably isolated as well as distant habitats.

The following are the principal cases of the kind with which we have to do.

Anemone multifida. North America, from lat. 42° northward. — South America from Chili, and perhaps Peru, southward.

Trautvetteria palmata. Illinois to Tennessee. Oregon on the Pacific: no intermediate station known.

Myosurus minimus. Florida and Georgia to Illinois, and west to Oregon and California. Europe, north to Finland.—It is remarkable that along with the common Mousetail in Oregon grows the only other species of the genus, *M. aristatus, Benth.;*

* *Géographie Botanique*, 2, p. 993.

† DeCandolle (*Géogr. Bot.*, 1, p. 564) gives a catalogue of 117 Phænogamous species which are now dispersed (whether by naturalization or otherwise) over at least one-third of the terrestrial surface of the globe,—a number which he supposes might be raised to 200. Some botanists, uniting nominal species, would add considerably to the number. Our *Flora of the Northern United States* comprises 103 of these, and perhaps should have comprised two or three more. Of this number 58 are reckoned as indigenous plants, and 45 as introduced species. A few species are probably to be transferred from the indigenous to the naturalized list, viz., *Galium Aparine, Gnaphalium uliginosum, Juncus bufonius*, and perhaps *Poa annua*.

which elsewhere occurs only in Chili, where it is the *M. apetalus* of Gay.

Brasenia peltata. Canada to Florida and Eastern Texas. Eastern Himalayas, Japan (*fide* Planchon), Eastern Australia. The only known species of the genus. The other genus of this group, *Cabomba*, was once thought to furnish another case of great disjunction; the original species inhabiting Cayenne and Brazil being long supposed to be identical with the species of the Southern United States. The latter I distinguished twenty years ago, chiefly by the form of the floating leaves, under the name of *C. Caroliniana;* but I should not be surprised if it were eventually reunited to *C. aquatica.*

Subularia aquatica. As already stated in a former article (vol. 23, p. 65), the only known stations of this plant in the New World are at most two, one in Maine, the other in New Hampshire. But it is a plant very likely to be overlooked. Northern Europe to lat. 70°, and Siberia.

Silene Antirrhina. United States, south to the borders of Mexico, and perhaps farther. South Brazil and Northern Patagonia.

Cerastium arvense. Northern parts of N. America and in the Old World. South Brazil and Chili to the Falkland Islands, according to Dr. Hooker.

Sagina procumbens. Northeastern States, rare. Falkland Islands. Perhaps not indigenous in the New World. Europe.

? *Elatine Americana.* New Hampshire to Kentucky. New Zealand! according to Dr. Hooker. But a further comparison is desirable.

? *Lathyrus maritimus.* Coasts of N. America north of lat. 40°, and in corresponding parts of the Old World. Southern border of Chili, lat. 47° S. Needs fuller confirmation.

Potentilla anserina. Pennsylvania to California and northward, and northern part of the Old World. Chili. New Zealand.

Potentilla frigida. Alpine region of the White Mountains of New Hampshire. Greenland. Swiss Alps.

? *Potentilla tridentata.* Alleghany Mountains to Arctic America, lat. 64°; generally subalpine, but found on the Coast of Massachusetts (Cape Cod, H. J. Clark,) and Maine; Labrador and Greenland. Clova Mountains, Scotland; found many years since by G. Don but by no one else. I had omitted to mention this as a European species, having the impression that it was supposed to have been wrongly introduced into the Flora of Great Britain. Hooker and Arnott, however, still retain it, although marking it as extinct. If it was really found indigenous in Scotland, then it is (as Prof. Tuckerman has aptly remarked to me) an exact counterpart to *Carex fulva*, which was first detected in this country, and once gathered in Massachusetts, but never found again in America, although it has proved to be not uncommon in

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Western Europe. These indications of the extinction of a species on one side of the Atlantic, while it flourishes on the other, are very significant.

Circæa Lutetiana. This is not recorded from any station north of lat. 46°, nor west of the Mississippi. In Europe it ranges north to Scotland and Finland and east to Altai. Hence De Candolle includes it in his list of remarkably disjoined species.

Hippuris vulgaris. Rare in this country, but extending from far north to lat. 36° along the Rocky Mountains, and reappearing in Patagonia. —

Sium lineare. Florida to the Saskatchawan and northern Oregon. Siberia. —

Cryptotænia Canadensis. Eastern United States and Canada. Japan, *fide* Zuccarini. — 1

Heracleum lanatum. Northern United States to Newfoundland; Oregon and Sitcha. Japan. —

Hydrocotyle Americana. Eastern United States. Brazil. New Zealand, (*fide* Dr. Hooker.) —

Crantzia lineata. Massachusetts to Texas. Buenos Ayres to the Falkland Islands. New Zealand. — 1

Osmorrhiza longistylis. Northern United States and Canada to Oregon. Japan! (*O. Japonica*, Zucc.) — 4

Aralia quinquefolia (*Panax quinquefolium*, Linn.). Canada to Georgia along the mountains. China? and Himalayas, (*P. Pseudo-Ginseng*, Wall.) — 25

Viburnum lantanoides. Northern States, not crossing the Alleghanies, and Canada. Japan! (*V. plicatum*, Thunberg.) — 12

Matricaria discoidea. St. Louis, Missouri. Probably a recent immigrant from Oregon, although thoroughly established. California to Unalaschka and adjacent parts of Asia. Sweden! Doubtless of recent introduction, but how introduced is unknown. — 13

Monotropa uniflora. Canada to Louisiana; Oregon. Falls of Tequendama, New Granada, *Prof. Holton!* Sikkim and Khasian Himmalayas, *Dr. Hooker!* This isolated occurrence of a plant so peculiar in appearance and mode of life, in these districts so widely separated from each other, furnishes far the most remarkable case of anomalous distribution I know. The species is unknown north of Canada, and must be rare west of the Mississippi, as Nuttall alone mentions it from Oregon. But I should not be surprised to hear of it from Japan on the one hand, and the Mexican Andes on the other. — 1

Plantago maritima, var., *juncoides*, &c. Northern hemisphere; on the Atlantic coast of North America south to lat. 40°; on the Pacific coast to lat. 36°. Straits of Magellan. — 158

Primula farinosa. Northern hemisphere; in the United States south to lat. 42°, and in the Rocky Mountains to lat. 39°. Straits of Magellan and Falkland Islands! — 86

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— *Centunculus minimus.* Florida to Illinois and Oregon, Southern Brazil! Europe, north to Norway. Perhaps introduced into Brazil?

— *Phryma Leptostachya.* Canada to Florida; not found west of the Rocky Mountains. Nepal!

— *Veronica Anagallis.* Around the northern hemisphere, in the temperate zone. New Zealand, *fide Dr. Hooker.*

— *Veronica serpyllifolia.* Around the northern hemisphere. Quito and Falkland Islands, &c. Cape of Good Hope. Perhaps introduced in the southern hemisphere.

— *Dichondra repens.* Virginia to Chili. New Zealand. Tasmania to Eastern Africa. Cape of Good Hope.

? *Salicornia mucronata.* Coast of New England; also on the coast of Spain, if the plant of Lagasca under this name is the same as ours. The two have never been compared; and the main object in the present mention of them is to ask that this may be done.

? *Castanea vesca.* Eastern United States, north to lat. 44°. Southern and Eastern Europe. (Vide vol. 23, p. 65.)

Betula alba. Northeastern United States, from lat. 40° to 46°. Northern Europe to the Arctic regions, and Siberia.

Convallaria majalis. Mountains of Virginia and Carolina. Europe and Northern and Eastern Asia. Japan.

? *Polygonatum latifolium.* Pennsylvania. Central and Southern Europe.

Smilacina stellata. Northern States to California, Oregon and Labrador. Norway.

— *Smilacina trifolia.* Northern States, and from Labrador to Bear Lake, and the Rocky Mountains. Siberia.

— *Trillium erectum* var. *album.* Northern States and Canada. Japan!

Vallisneria spiralis. United States east of the Mississippi, and Canada to lat. 46°. France to Italy; near St. Petersburgh? also on the Wolga. India?

— *Anacharis Canadensis.* Eastern part of Canada and the United States. New Granada to Chili. Probably in intermediate stations.

— *Zannichellia palustris.* Northern hemisphere, only in temperate regions; neither arctic nor tropical. New Zealand.

? *Spiranthes cernua.* United States, Canada, and Oregon. Western coast of Ireland.

Xerophyllum asphodelioides. New Jersey to Carolina; but nowhere west of the Alleghanies, except in Oregon and California.

Juncus stygius. Northern New York at one station. Newfoundland. Scandinavia; Bavaria and Switzerland.

? *Juncus maritimus.* Coast of the Atlantic United States south of lat. 40°. Europe, &c.

Eriocaulon septangulare. Eastern United States, north of lat. 40°, to the Saskatchawan and Newfoundland. Western Coast of Ireland, Isle of Skye, and the Hebrides.

Hemicarpha subsquarrosa. United States from Maine? to Texas. — Brazil.

Rhynchospora fusca. Northeastern United States, lat. from 40° to 44½°. Europe south of Sweden.

Carex flacca. New Jersey, lat. 40°. Europe from Finland southward.

Carex lævigata. Massachusetts? England to Portugal.

Carex fulva. Massachusetts; found only once. Newfoundland; where it was first detected, but has not been found again. W. Europe from Finland southward.

Carex canescens, Linn., (*C. curta*, Good.) Colder parts of the Northern hemisphere, south to lat. 40° in this country. Antarctic America. —

Carex stellulata. Same general northern range as the last. New Zealand, *fide* Dr. Boott. —

Carex teretiuscula. Same general range as the last. New Zealand, *fide* Dr. Boott. —

Phleum alpinum. Alpine and Arctic regions in the northern hemisphere. Antarctic America, *fide* Hooker. —

Agrostis canina. Only subalpine in the United States. Falkland Islands, *fide* Hooker. —

? *Spartina juncea.* Atlantic coast of the United States. French coast of the Mediterranean, at one station only, near Fréjus. A chance introduction?

Spartina stricta (*S. glabra* and *S. alterniflora*). Atlantic coast of the United States to Guadeloupe and Cayenne. Coast of England to the Adriatic; at few stations. A case of accidental or oceanic transport?

Kœleria cristata. Temperate and colder regions of the northern hemisphere. New Zealand and Tasmania, *fide* Hooker. —

Glyceria fluitans. Same general range as the last. Australia. —

Poa nemoralis. Northern and colder parts of North America; more common in Europe. Antarctic America, *fide* Hooker. —

Poa pratensis. Same general distribution as the last. Antarctic America, *fide* Hooker. —

Festuca ovina. Same distribution as the preceding. New Zealand, *fide* Hooker. —

Triticum repens. Same distribution generally as the preceding. Antarctic America, *fide* Hooker. —

Hordeum jubatum. Atlantic and Pacific coasts of North America, chiefly northward on this side, and south to California on the other; also along the Great Lakes. Chili? Straits of Magellan, *fide* Hooker. —

Aira flexuosa. Northern hemisphere, throughout the cooler parts. Patagonia and Falkland Islands.

Aira cæspitosa. Colder parts of the northern hemisphere. Antarctic America and New Zealand, *fide* Hooker.

Trisetum subspicatum. Alpine and arctic exclusively in Europe, Asia and N. America (except the var. *molle*, which is rarely ever subalpine in the Northern States); advancing south along the Rocky Mountains to about lat. 40°. Andes of Mexico, Colombia, and Peru, *fide* Hooker. Antarctic America and Campbell Islands: also Tasmania, *fide* Hooker.

Hierochloa borealis. Around the colder parts of the northern hemisphere. New Zealand, and Tasmania, *fide* Hooker.

To this list of 69 phænogamous species of our flora inhabiting very widely sundered stations, the following Ferns should be appended, namely:

Scolopendrium officinarum. Banks of a deep ravine in Madison County, New York, where it abounds; the only American habitat known. Europe and Northern Asia.

? *Camptosorus rhizophyllus.* Atlantic United States, chiefly along the Alleghanies, and north to the Saskatchawan. Siberia and Kamtschatka?

Adiantum pedatum. Eastern United States and Canada to Oregon and Unalaschka. Kamtschatka, Japan, Nepal.

Aspidium Lonchitis. Lake Superior, Rocky Mountains. Unalaschka, Northern Europe and Asia from Lapland to Altai.

Schizæa pusilla. Pine barrens of New Jersey, lat. 39½°–40°; very local, but abundant. Newfoundland; lat. 49°; and not elsewhere.

I do not include in this enumeration *Saururus cernuus* and *Stachys aspera*, adduced by DeCandolle as species extraordinarily disjoined and isolated. The latter I have considered as merely a variety of the polymorphous and widely diffused *S. palustris.* The second DeCandolle mentions on the authority of Hooker and Arnott, who were unable to distinguish Chinese specimens from our *Saururus cernuus.* But Japanese specimens of what I take to be *S. Loureiri*, Decaisne, seem to be marked by good specific characters. An analogous case, still needing examination is that of *Penthorum Chinense*, which the elder DeCandolle, however, distinguishes from our *P. sedoides* by its seeds.

These species of widely sundered habitation arrange themselves, for the most part, under three heads, viz:

1. Those which re-appear in high southern or antarctic latitudes. These, the most remarkable of all, are about 34 in number, or nearly half of our list. And to this number might be added several other species, common to our northern and to high southern regions, but not occurring in our Flora; such as *Draba*

incana, *Montia fontana*, *Saxifraga exarata*, *Erigeron alpinum*, *Statice Armeria*, *Carex festiva*, and *Alopecurus alpinus*, enumerated in Hooker's Flora Antarctica, as both Arctic and Antarctic American as well as European species.

2. Those which re-appear in Japan, the Himalaya, or some part of Northern Asia, but are not European; of which the following are the principal: viz, *Brasenia peltata*, *Sium lineare*, *Cryptotænia Canadensis*, *Heracleum lanatum*, *Osmorhiza longistylis*, *Aralia quinquefolia*, *Viburnum lantanoides*, *Monotropa uniflora*, *Phryma leptostachya*, *Smilacina trifolia*, *Trillium erectum*, var., *Camptosorus rhizophyllus*, and *Adiantum pedatum*. A goodly number of species common to Northwestern America and Japan, and of others common to the Himalayas, Europe, and North America, although as yet known from but few stations throughout large parts of this belt (such as *Spiræa Aruncus*, *Pyrola rotundifolia*, &c.,) and whose dispersion is scarcely more explicable than that of the foregoing by any existing agencies, serve nearly to bridge over the wide gap which, at first view, appears so markedly to separate these extraordinarily sundered plants from the generality of species.*

3. Species of Western Europe and (chiefly) Eastern North America, not reaching here to high latitudes, and mostly of limited range on one or the other side of the Atlantic. Of this sort are *Myosurus minimus* (in this country remarkably southern, but also far western in range), *Subularia aquatica*, *Circæa Lutetiana*, *Betula alba*, var., *Convallaria majalis*, *Juncus Stygius*, *Carex flacca*, *lævigata*, and *fulva*, *Scolopendrium officinarum*, and *Aspidium Lonchitis*, all much more local in this country than in Europe; and on the other hand, *Potentilla tridentata*, *Smilacina stellata*, *Vallisneria spiralis*, *Spiranthes cernua*, *Spartina stricta*, and *Eriocaulon septangulare*, all common and for the most part rather widely distributed plants in this country, but very local in Europe. All but four species on this list belong exclusively to the Atlantic border of North America. Cases of this kind are naturally regarded by some as indications of a former terrestrial connection between North America and Europe.

Only three or four of these species of widely sundered stations are maritime, and of these only *Spartina* and the *Salicornia* (if the latter be the same on both sides of the Atlantic, which there is no evidence of) could owe their present dispersion to oceanic currents. The light fruits of *Circæa* are provided with minute hooks; those of *Heracleum* and *Betula* are winged; the spike of

* Out of 49 species belonging to these first and second heads, as many as 10 belong to monotypic genera, and 21 to genera of less than ten good species;—6 of the species belong to the vast genus Carex;—on the whole rather militating against the idea that the geographical extension of species bears some proportion to the size of the genus they belong to.

Hordeum jubatum breaks up into short joints, and the persistent glumes and the palcæ enclosing the seed are long-awned. But no others of the 69 phænogamous species above enumerated enjoy peculiar facilities for, or are endowed with any appliances favorable to adventitious transport.

Such cases, accordingly are much relied upon by its advocates in proof of the doctrine of the double or multiple origin of species. Even DeCandolle, who formerly maintained that doctrine, but whose matured opinion favors the idea that species of plants generally originated each in a single birth-place, is still inclined to view such cases as exceptions to the general rule. A fuller investigation will probably do away with this intermediate hypothesis. If the dispersion of other plants generally could be accounted for by existing agencies acting under the present state of things, and if there were really any marked line of difference to be drawn between these and other widely dispersed but less isolated species, the supposition of a double birth-place for the exceptional species would be the most natural; although one would then be inclined to regard them as mostly cases of closely related species whose points of difference are still unascertained or undervalued. For we no more know how nearly alike two species may appear and yet be specifically distinct, than we know how widely they may differ and yet own a common origin. The botanist's best conclusions regarding the limitation of species are seldom more than judgments on imperfect data, constantly liable to be questioned and revised.

But both these most striking cases, and the transitional ones between them and those of ordinary distribution, are becoming too numerous to bear this exceptional mode of explanation. DeCandolle lays much stress upon the isolated occurrence of a single peculiarly United States species, *Phryma leptostachya*, in Nepal. Now the foregoing catalogue includes three or four additional cases of the same kind, which Drs. Hooker and Thomson's Himalayan collections may probably double; and the considerable number of North American species which meet Himalayan ones in Japan already indicates the line of connection between these two distant floras. We should therefore look in one and the same direction for the explanation of these extraordinary no less than of the more ordinary cases of distribution, and, adopting the conclusion to which DeCandolle himself arrives, and maintains on various and convincing grounds,—viz., that plants must have been created at different epochs, and that the greater part of the existing species are older than the present configuration of our continents,—should refer such anomalous distribution to very ancient dispersion; and all the more confidently as the known examples of the kind increase in number.

As the discussion of this most difficult problem proceeds, the two antagonistic positions only seem likely to be tenable;—the one attributing much to changes of station, etc., occurring during a long lapse of time, and the other looking upon the whole actual area of each species as its original home. The supporters of the first view regard each species as having spread from a single and local birth-place, or even, as the more thorough-going (like Dr. Hooker) maintain, from a single individual or pair. The opposing view finds its hardiest and most consistent advocate in Agassiz, who contends, if I rightly apprehend him, that each species probably originated in as many individuals, and covering from the first as large an area as it subsequently possessed.

Of the first-named theory, the only question is whether it will sufficiently explain all the facts of distribution; the second supersedes the necessity of such explanation, by assuming the actual distribution to be essentially the original state. The first theory is based upon the natural idea of species as consisting of kindred individuals descended from a common stock, which, whether demonstrable or not as a fact, gives us a clear and distinct conception of *species*, and the only one we possess. The second theory, being incompatible with this conception, leaves species no objective basis in nature, and seems to make even the ground of their limitation a matter of individual opinion.

The Distribution of our Phænogamous Species, and of the Individuals which represent them, within the limits of our Flora.

The distribution of the materials of our flora over the surface included within its limits, is a subject which I have not room nor time left for discussing with anything of the fullness it deserves. Properly to discuss this and kindred topics would require a great amount of detailed investigation, and would expand these articles into a treatise.

Viewed as to its amount or prominence, the importance of each species as a constituent of our flora depends upon the extent of country it ranges over, and the relative abundance of its individuals. To get some general idea of both points, I have gone over the pages of the *Flora of the Northern United States,* and indicated by peculiar marks, 1, those species which are very local, either absolutely so, or because they barely enter within our borders, however widely they may range beyond them on any side; 2, those of narrow or restricted range within our limits, not extending over more than a tenth or an eighth part of our territory; and 3, wide-spread species, which have been found over nearly the whole length and breadth of our territory. Then, by a different set of marks I have indicated, 1, those species which are very scarce in individuals in their proper habitat; 2, those which are not abundant in individuals; and 3,

those which ordinarily are very abundant in individuals wherever they occur. The latter includes our *social plants*, as well as a larger number which could not properly be so called. I should have distinguished the really social plants from the others if I knew how to draw any line between the two. It would be very difficult to fix upon any precise standard of scarcity or abundance: another botanist might give a considerably different estimate; and the same species must vary in abundance in different parts of so large an area. No great accuracy is therefore to be expected in the numbers. The introduced plants are of course left out of view: and the whole following statement may be taken to refer rather to the country in its wild state, than as now gravely modified in its botanical features by the agency of civilized man.

1. *As to the area occupied*, I compute that there are of

	Exogenæ	Endogenæ excl. Glumaceæ.	Cyperaceæ and Gramineæ.	Total.
1. Very local species, - -	228	26	44	298
2. Species of small or narrow range, compared with the extent of country embraced in the Flora, - - - - -	542	92	144	778
3. Species ranging over an area equal to between $\frac{1}{8}$th and $\frac{3}{4}$ths of our territory, i. e. all not included in No. 1, 2 and 4. - -	397	49	92	538
4. Species of widest range over our territory. - -	323	59	95	477

2. *As to the abundance of individuals* where the species occurs:

	Exogenæ.	Endogenæ.	Total.
1. Very scarce, - - - - - -	11	10	21
2. Not abundant, - - - - -	66	20	86
3. Moderately abundant (as far as known), - - - - -	493	47	540
4. Very abundant, - - - -	920	524	1444

To exhibit the distribution according to the genera, or even the natural orders, would require too much room.

In the last table I have not distinguished the Glumaceous from the Non-Glumaceous *Endogenæ*, because, in fact, all our *Gramineæ* and *Cyperaceæ* are abundant in individuals wherever they occur, so that I have thrown in the whole 375 under the fourth head; although probably one quarter of them might be better placed under the third. Of the 20 *Endogenæ* which are not abundant in their habitats, but yet not very scarce, all but four are *Orchidaceæ*. The 21 scarcest species are

Exogenæ.	*Endogenæ.*
Sibbaldia procumbens.	Limnobium Spongia.
Saxifraga rivularis.	Platanthera rotundifolia.
Nardosmia palmata.	Listera cordata.*
Coreopsis bidentoides (a very obscure plant).	" australis.
Gnaphalium supinum.	" convallarioides.
Nabalus Bootii.	Calypso borealis.
Arctostaphylos alpina.	Tipularia discolor.
Pterospora Andromedea.	Liparis liliifolia.*
Schweinitzia odorata.	" Lœselii.*
Hemianthus micranthemoides (?)	Aplectrum hyemale.*
Obolaria Virginica.*	

Five of the plants in the first column (printed in *italics*) are alpine, and with us peculiarly local, species; and four of the remainder are very local, the two of considerable range being *Pterospora Andromedea* and *Obolaria Virginica*. Of the ten species in the second column all but one are *Orchidaceæ*, and all but one (*Aplectrum*) either very local species or of narrow range. None of the 21 species are known at many stations within our limits; only five of them (marked with an asterisk) have probably been collected at more than half a dozen places; and most of the rest are known at only two or three stations.

And generally, that our species of widest range are most abundant in individuals is shown by the fact, that, of our 477 most widely spread species, 420 (or 96 per cent) are marked as belonging to this category. These are distributed among the natural orders as follows.

Number of Species of each Natural Order which are both of widest Geographical Range in the Northern United States, and most abundant in Individuals where they occur.

Ranunculaceæ,	12	Anacardiaceæ,	5
Berberidaceæ,	1	Vitaceæ,	4
Cabombaceæ,	1	Rhamnaceæ,	1
Nymphæaceæ,	2	Celastraceæ,	1
Papaveraceæ,	1	Aceraceæ,	2
Fumariaceæ,	1	Polygalaceæ,	2
Cruciferæ,	5	Leguminosæ,	14
Violaceæ,	6	Rosaceæ,	20
Cistaceæ,	2	Lythraceæ,	1
Droseraceæ,	1	Onagraceæ,	5
Hypericaceæ,	5	Cucurbitaceæ,	1
Caryophyllaceæ,	4	Crassulaceæ,	1
Tiliaceæ,	1	Saxifragaceæ,	1
Oxalidaceæ,	1	Umbelliferæ,	6
Geraniaceæ,	2	Cornaceæ,	2
Balsaminaceæ,	2	Caprifoliaceæ,	4

Rubiaceæ,	7	Urticaceæ,	6
Compositæ,	57	Plantanaceæ,	1
Lobeliaceæ,	3	Juglandaceæ,	3
Ericaceæ,	6	Cupuliferæ,	7
Aquifoliaceæ,	1	Betulaceæ,	2
Primulaceæ,	2	Salicaceæ,	11
Lentibulaceæ,	1	Coniferæ,	2
Orobanchaceæ,	1		
Scrophulariaceæ,	15	Araceæ,	2
Verbenaceæ,	1	Typhaceæ,	3
Labiatæ,	11	Lemnaceæ,	3
Borraginaceæ,	2	Naiadaceæ,	6
Hydrophyllaceæ,	1	Alismaceæ,	3
Convolvulaceæ,	2	Hydrocharidaceæ,	2
Solanaceæ,	1	Orchidaceæ,	7
Gentianaceæ,	1	Amaryllidaceæ,	1
Apocynaceæ,	2	Iridaceæ,	2
Asclepiadaceæ,	6	Dioscoreaceæ,	1
Oleaceæ,	2	Smilaceæ,	3
Phytolaccaceæ,	1	Liliacæ,	4
Polygonaceæ,	10	Melanthaceæ,	2
Lauraceæ,	1	Juncaceæ,	8
Saururaceæ,	1	Pontederiaceæ,	2
Ceratophyllaceæ,	1	Cyperaceæ,	53
Callitrichaceæ,	1	Gramineæ,	39
Euphorbiaceæ,	3		
Exogenæ,	279,	Endogenæ,	141 = 420

These 420 species must form the most conspicuous elements of our flora taken as a whole; and if there were room to spare, it would be worth while to enumerate them. If we arrange the families they belong to in the order of the number of these common species they respectively contain, the largest ten will stand as follows:—

Compositæ,	57	Leguminosæ,	14
Cyperaceæ,	53	Ranunculaceæ,	12
Gramineæ,	39	Labiatæ,	11
Rosaceæ,	20	Salicaceæ,	11
Scrophulariaceæ,	15	Polygonaceæ,	10

On comparing this with the table on p. 213 of vol. 22, we perceive that the orders hold nearly the same relative rank, except that the *Rosaceæ* and *Leguminosæ* have interchanged places (the former having a much larger number both of wide-spread and of social plants than the latter); that the *Ericaceæ* and *Orchidaceæ* fall to a low position, and that in their stead the *Salicaceæ* and the *Polygonaceæ* are among the largest orders. This is owing to the general absence of *Ericaceæ* in our open or prairie country west of the Alleghanies, and to the small number of *Orchidaceæ* which endure much diversity of climate.

Moreover, seven orders comprise half of these plants; whereas it takes between nine and ten orders to embrace a moiety of all our indigenous species.

The species which I have counted as those of widest range are simply those which are known to occur along or not far distant from our frontiers on the four sides, without reference to the frequency of their occurrence within the area. And the species designated as very abundant in individuals are merely those which occur copiously wherever the species occurs at all, in a congenial station, even if only a single station be known, as is the case with *Sullivantia Ohioensis*, *Calamagrostis Pickeringii*, &c. It might well happen, therefore, that some of the foregoing 420 species of widest range within our territory, and of greatest abundance in their localities, should after all be uncommon plants, on account of the sparseness of the habitats. And on turning over the lists, indeed, I find that they contain species of very various degrees of abundance, above a certain point (which I am unable to express numerically), and of quite various degrees of frequency of occurrence, i. e. of the number and extent of the stations, throughout the country. But so true is it as a general rule, that species of wide range in our country are species of frequent occurrence, that I have not noticed any strongly marked exceptions to it in the lists from which the foregoing statements were deduced, viz., those which are also abundant in individuals,—meaning, of course, of frequent occurrence at the proper stations for each species; for very few plants are sown broad-cast over the land, and few occur under any wide diversity of physical circumstances. I was inclined to draw up a catalogue of those widely-ranging species which are most abundant generally throughout our district, and another of the least abundant. But I find, on trial, that this demands a critical consideration which I have not time to give, as well as a particular knowledge of the details of the vegetation of the different parts of so wide a country, which I am far from possessing. The area is much too large, and the climate, soil, &c., too diversified for the proper elaboration of such a mass of details. I conjecture that about two-thirds of the foregoing 420 species would find a place in a list of the 500 commonest plants of each of the eighteen States within our limits.

It may be mentioned that about 350 of these both widespread and abundant species are herbs, 42 are shrubs or woody vines, and 28 may be reckoned as trees. The latter, forming as they do an important feature in the vegetation of a country which was naturally for the most part forest-clad, are here enumerated:—

Tilia Americana.
Acer rubrum.
" dasycarpum.
Prunus Americana.
" Virginiana.
" serotina.
Cratægus coccinea.
" tomentosa.
Amelanchier Canadensis.
Fraxinus Americana.
" viridis.
Sassafras officinale.
Ulmus Americana.
Celtis occidentalis.
Platanus occidentalis.
Carya alba.
" glabra.
" amara.
Quercus obtusiloba.
" alba.
" coccinea.
" rubra.
Carpinus Americana.
Ostrya Virginica.
Salix nigra.
Populus tremuloides.
Pinus mitis.
Juniperus Virginiana.

The foregoing list, after all, includes none of our *most social* forest trees. The latter I should rank in the following order as to sociability:—

Abies nigra and alba.
Abies balsamea and Fraseri.
Thuja occidentalis.
Larix Americana.
Abies Canadensis.
Pinus Strobus.
Pinus Tæda, rigida, and the rest.
Taxodium distichum.
Cupressus thyoides.
Salix nigra.
Populus monilifera and angulata.
Fagus ferruginea.
Fraxinus sambucifolia.
Betula alba.
" papyracea.
Acer saccharinum.
Quercus nigra, obtusiloba, aquatica, &c.

The most social of the larger shrubs, rising occasionally to small trees, are:

Rhododendron maximum.
Kalmia latifolia.
Salix, various species.
Alnus incana and serrulata.
Myrica cerifera.
Quercus ilicifolia.
Rhus typhina, glabra, and venenata.
Amorpha fruticosa.
Zanthoxylum Americanum.
Pyrus Americana.
Cephalanthus occidentalis.
Vaccinium corymbosum.
Clethra alnifolia.
Azalea viscosa, &c.

Characteristics of the Vegetation of the principal Districts comprised in our Flora.

The main botanical districts, into which the territory embraced in our Flora is naturally divided, are three, with two subordinate ones. These are unmistakably defined by the general features of the country, and pretty strongly marked by their vegetation. They are,

1. The Southeastern low border (naturally wooded).
2. The great Middle and Northern Wooded Region.

3. The Western Unwooded or Sparsely wooded Region, characterized by prairies, oak-openings, &c. To which are appended,
4. The Alpine and Subalpine Region, forming a few isolated patches in the second district.
5. The line of Sea-coast, or Maritime District.

I. *The Southeastern District.*—If, from the intersection of the 80th parallel of longitude with the southern boundary of Virginia a line be drawn northeast to Washington and the city of New York, it will very nearly mark the inland limits of this district, except that a narrow prolongation of it, somewhat modified in character, skirts the coast as far as to Cape Ann, and vanishes at the southern point of Maine. The Pine-Barrens of New Jersey represent this district fully. Its prevalent forest-growth consists of Pitch Pines and Oaks, especially of the Spanish Oak, Post Oak, and Black Jack, and in low grounds of Red and White Maples and Birch. Few of the forest trees probably were ever large and stately, at least at the north. The characteristic trees and largest shrubs are *Pinus rigida* and *P. inops*, and at the south *P. Tæda* and *Taxodium distichum*, *Cupressus thuyoides*, *Betula alba* and *nigra*, *Castanea pumila*, *Quercus falcata*, *Phellos*, and *aquatica*, *Ilex opaca* (which at the south passes inland to the flanks of the mountains), *Liquidambar styraciflua*, *Chionanthus Virginica*, *Itea Virginica*, *Clethra alnifolia*, *Azalea viscosa*, *Cratægus parvifolia*, *Acer dasycarpum*, *Magnolia glauca*, and at the south *Persea Carolinensis*, with several southern trees (such as *Quercus virens*, *Olea Americana*, &c.) which however occur only on the coast of Virginia. Other most characteristic shrubs are *Gaylussacia dumosa* and *frondosa*, *Leucothoë racemosa*, and at the south *L. axillaris*, *Andromeda Mariana*, *Ilex* (*Prinos*) *glabra*, *Corema Conradi* and *Comptonia asplenifolia* at the north, and *Myrica cerifera* along the whole line of coast. The two species of *Ascyrum* and *Smilax laurifolia* may also be mentioned.

As to herbs, out of about 120 either wholly peculiar or otherwise characteristic species, I must barely mention *Drosera filiformis*, *Polygala lutea* and *ramosa*, *Clitoria Mariana*, three species of *Rhexia*, *Opuntia vulgaris*, *Eryngium Virginianum*, *Eupatorium leucolepis*, *resinosum*, *album* and *aromaticum*, *Aster Radula*, *surculosus*, *spectabilis*, and especially *A. concolor*, with *Solidago virgata*, *puberula*, and *pilosa*, four species of *Chrysopsis*, *Coreopsis trichosperma*, *Nabalus virgatus*, *Utricularia inflata*, *clandestina*, *striata*, *purpurea* and *resupinata*, *Schwalbea Americana*, *Pyxidanthera barbulata*, *Stylisma Pickeringii*, four species of *Sabbatia*, *Euphorbia Ipecacuanha*, *Gymnadenia flava* and *Platanthera cristata*, *Lachnanthes*, *Lophiola*, *Yucca filamentosa*, *Xerophyllum* and *Helonias bullata*, *Tofieldia pubens*, *Narthecium Americanum*, and *Amphicarpum*, the last two peculiar to the Pine-barrens of New Jersey.

II. *The Middle and Northern Wooded District* takes in the whole breadth of our territory along its northern boundary, but narrows rapidly towards the south into a wedge-like shape. A line drawn from Fond du Lac to the western end of Lake Erie, and thence south to the Tennessee line, would serve tolerably well for its western boundary. This vast tract naturally divides into three provinces, viz: the *Southern*, comprising all south of Pennsylvania and the Ohio River; the *Northeastern*, comprising all north and east of Pennsylvania, and all except the southwestern corner of that state; and the *Northwestern*, including all west of Pennsylvania. With some local and inconsiderable exceptions, this tract was originally covered with dense forest, composed in the higher and cooler or moister portions partly of Spruces, and in the valleys of White Pines, and partly of Beech, Maples and other deciduous trees, or in sandy tracts of Pitch Pines, Post Oaks, &c., and in the lower portions with stronger and deeper soil, of several kinds of Oak, of Hickories, Chestnut, &c.

The most characteristic and important tree of the whole region doubtless is, or rather was, *Pinus Strobus*, the White Pine, which everywhere at the north once filled the principal intervales with a most stately growth. Other prominent forest-trees of the whole district are the White, Red, Scarlet and Chestnut Oaks, the Chestnut, the Beech, three Hickories (*Carya alba*, *glabra* and *amara*), the Butternut, the White and Slippery Elm, the White, Red and Green Ash, the Sugar Maple, and of course the widespread Red Maple, as well as the common Lime-tree or Basswood; also, as we verge southward or westward, the Tulip-tree and the Cucumber-tree. Trees which belong wholly or characteristically to the southern province are *Abies Fraseri*, *Magnolia Umbrella* and *Fraseri*, *Asimina triloba*, *Tilia heterophylla*, *Negundo*, the Sweet Buckeye, the Common and the Clammy Locust-trees, the Red-bud, the Sorrel-tree, and *Rhododendron maximum;* which last, with *Kalmia latifolia*, rising into small trees in many places, form almost impassable thickets along the steep sides of the Alleghany Mountains. The Ohio Buckeye (*Æsculus glabra*), the Kentucky Coffee-tree, the Honey Locust, the American Crab-apple, the Black Walnut and *Carya sulcata* are characteristic of the western province. *Pinus resinosa*, *Abies balsamea*, *Canadensis*, *nigra* and *alba*, *Larix Americana*, *Thuja occidentalis*, with *Betula papyracea*, *excelsa* and *lenta*, *Quercus palustris*, the Black Ash, and among small trees, *Pyrus Americana*, *Prunus Pennsylvanica*, *Acer Pennsylvanicum*, and *Rhus typhina*, are characteristic northern species. I must not stop to enumerate the characteristic shrubby and herbaceous plants.

III. *The Western District*, comprised between the boundary last mentioned and the Mississippi River, consists of glades, 'Oak-openings,' 'barrens,' and at length of prairies or open

plains. Its trees, where these occur, are principally some of those of the foregoing districts. especially *Quercus nigra, imbricaria, rubra* and *obtusiloba* with *Q. macrocarpa, Carya olivæformis,* and along rivers the Cotton-wood, Blue Ash, &c. I can hardly enumerate any peculiar shrubs of the district, excepting *Amorpha canescens*, which is local this side of the Mississippi. The characteristic herbs of the prairies, &c., would seem to be *Compositæ*, especially Helianthoid Compositæ, such as *Helianthus rigidus, lætiflorus, occidentalis, mollis, hirsutus*, and in the river bottoms *H. doronicoides, Actinomeris helianthoides, Coreopsis aristosa* and *palmata, Echinacea purpurea* and *angustifolia*, and especially *Silphium laciniatum* (the Compass plant), *terebinthinaceum, integrifolium*, &c.; to which may be added *Cacalia tuberosa, Nabalus racemosa, asper* and *crepidineus, Ambrosia bidentata* and *psilostachya, Veronica fasciculata, Liatris pycnostachya, Eupatorium serotinum, Solidago Ohioensis, Riddellii*, and *Missouriensis, Aster oblongifolius, azureus, turbinellus*, and *sericeus*. As herbs peculiar to this district and its immediate borders, I may mention *Isopyrum biternatum, Delphinium tricorne, Stylophorum diphyllum, Hypericum sphærocarpum* and *dolabriforme, Psoralea Onobrychis* and *stipulata, Gillenia stipulacea, Geum vernum, Gaura filipes, Ludwigia polycarpa, Erigenia bulbosa, Solidago Shortii* and *rupestris, Monarda Bradburiana, Seymeria macrophylla, Lithospermum latifolium, Phlox bifida, Gentiana puberula, Platanthera leucophæa, Cypripedium candidum, Trillium recurvatum* and *nivale*. The only Grasses I know which are peculiar to the district, and not found east of the Alleghanies, are *Poa sylvestris, Diarrhena Americana*,—neither of them prairie-grasses,—and *Lepturus paniculatus*, which mainly belongs to salt-licks and to the dry plains farther west.

In fact,—looking at North American botany comprehensively,—this district cannot claim to be distinguished as a separate one. It is only a broad border along which the great naked plains of the west and the eastern forest region meet and blend through the most diversified gradations. And so, likewise our south-eastern district is only a narrow extension of the botany of the warm-temperate region of the Southern United States, prolonged northward upon the low coast, just as the botany of our cool-temperate region is prolonged southward along the Alleghanies.

IV. *The Alpine and Subalpine District* has been sufficiently illustrated already (vol. 22, pp. 207, 230, vol. 23, p. 62).

V. *The Maritime District* is inhabited by the following 60 species.

Ranunculus Cymbalaria.
Cakile Americana.
Hudsonia tomentosa.
Lechea thymifolia.
Honkenya peploides.
*Spergularia rubra.
Sesuvium Portulacastrum.
*Hibiscus Moscheutos.

Lathyrus maritimus.
*Prunus maritima.
Crantzia lineata.
Ligusticum Scoticum.
Archangelica peregrina.
*Aster flexuosus.
* " linifolius.
*Solidago sempervirens.
Pluchea camphorata.
Baccharis halimifolia.
*Iva frutescens.
Borrichia frutescens.
Plantago maritima.
*Statice Limonium.
Glaux maritima.
Limosella aquatica.
Gerardia maritima.
Mertensia maritima.
Sabbatia calycosa.
" stellaris.
" gracilis.
" chloroides.
Blitum maritimum.
*Atriplex hastata.
*Obione arenaria.
*Salicornia herbacea.
Salicornia mucronata.
" ambigua.
*Chenopodina maritima.
*Salsola Kali.
Euxolus pumilus.
*Acnida cannabina.
*Rumex maritimus.
*Euphorbia polygonifolia.
*Zostera marina.
*Ruppia maritima.
Triglochin palustre.
" maritimum.
Juncus maritimus.
" bulbosus.
Scirpus Olneyi.
* " maritimus.
Vilfa Virginica.
Calamagrostis arenaria.
Spartina polystachya.
* " juncea.
* " stricta.
Glyceria maritima.
" distans.
*Brizopyrum spicatum.
Uniola paniculata.
*Hordeum jubatum.

A little less than half of these maritime species occur also in Europe; and one not found in Europe (*Ranunculus Cymbalaria*) occurs in Northern Asia. Four of them are exclusively southern, not extending northward to the Delaware Bay; viz. *Borrichia frutescens*, *Sabbatia calycosa*, *Vilfa Virginica*, and *Uniola paniculata*, and nine others (including *Juncus maritimus*) are prevailingly southern, and find their boreal limit south of Massachusetts Bay. Four species (*Ligusticum Scoticum*, *Archangelica peregrina*, *Glaux maritima*, and *Mertensia maritima*) are exclusively northern, not occurring south of New England; and 23 species (those with an asterisk prefixed) range along the coast from Maine to Virginia, or nearly so. Several maritime species still linger on the shores of our Great Lakes, mementoes of their former saltness, viz. *Hudsonia tomentosa*, *Cakile Americana*, *Lathyrus maritimus*, *Calamagrostis arenaria*, and *Hordeum jubatum*; while *Ranunculus Cymbalaria*, *Glaux maritima*, &c. occur in saline soil far beyond the Mississippi, and the former, with *Hibiscus Moscheutos*, *Salicornia herbacea*, *Scirpus maritimus*, and the two species of *Triglochin*, spring up at most of our salt springs in the interior of the country, as at Salina, New York. Singularly enough, what seems to be truly *Triglochin maritimum* (the *T. elatum* of Nuttall) is of no uncommon occurrence throughout Western New

York, Ohio, Wisconsin, &c., in high sphagnous bogs which have not the least trace of saltness.

Only one of our maritime plants is a true shrub, viz. *Baccharis halimifolia*. *Iva frutescens* is more or less woody; and *Hudsonia tomentosa* is a heath-like under-shrub: the rest are herbs.

On the whole, I should say that the range of our maritime plants through degrees of latitude is not sensibly greater than that of our herbaceous species generally.

The Prominent Characteristics of the Flora of the Northern United States.

To answer the question as to what are the leading characteristics of the vegetation of the Northern United States, taken as a whole, we should have to consider, first: What are the more remarkable peculiarities of our flora, as discovered by the instructed botanist with the whole field systematically displayed to his mental view; and secondly, what are the plants or the forms of vegetation which, by their abundance or their prominence, impart to our flora its dominant features. The first is a matter of deduction from a variety of facts, many of which would never arrest the attention of the casual observer: the second relates to points which would most attract the notice of the passing botanical traveller or the ordinary observer. The answer to the former no less than to the latter enquiry, would depend upon the point of view. To the traveller from our Southern States, or from the great plains of the West, the novel features of our vegetation are those which it has in common with Europe. To the European visitor the striking peculiarities are those which we share with the southern part of the country, and these would increase in prominence as he proceeded southward and westward. And, in forming his idea of a flora, the botanist naturally, if not inevitably, takes that of Europe as his standard of comparison.

In comparing, as the botanist naturally would, our flora with that of Northern and Western Europe, the following would appear to be leading characteristices.

1. Our comparative richness in ordinal types;—our flora having, as already remarked (vol. xxii, p. 216), 26 orders which are absent from that of Europe, while the latter (exclusive of the Mediterranean basin) has only seven orders which are wanting here.

2. The prevalent subtropical character of our extra-European orders;—which has been already referred to, and which will be manifest to the botanist inspecting the list of such orders given in a former article (vol. xxii, p. 215).

3. Our richness in species of woody plants, and especially of trees; as already alluded to (p. 84). This will strikingly appear

from a comparison of our flora with an equivalent European one,—with the German flora, for example. In Koch's *Flora Germanica* (excluding the Adriatic region), I count 60 indigenous species of trees, belonging to 27 genera, and comprised in 14 orders. In our own *Flora of the Northern United States*, adopting the same estimate as to what constitutes a tree, I count 132 trees, in 56 genera, and belonging to 25 orders; as follows:—

Magnoliaceæ,	2	genera,	and	6	species	of	trees.
Anonaceæ,	1	"	"	1	"	"	
Tiliaceæ,	1	"	"	2	"	"	
Camelliaceæ,	1	"	"	1	"	"	
Anacardiaceæ,	1	"	"	1	"	"	
Sapindaceæ,	3	"	"	8	"	"	
Leguminosæ,	6	"	"	7	"	"	
Rosaceæ,	4	"	"	15	"	"	
Hamamelaceæ,	1	"	"	1	"	"	
Araliaceæ,	1	"	"	1	"	"	
Cornaceæ,	2	"	"	4	"	"	
Caprifoliaceæ,	1	"	"	1	"	"	
Ericaceæ,	2	"	"	2	"	"	
Aquifoliaceæ,	1	"	"	1	"	"	
Ebenaceæ,	1	"	"	1	"	"	
Sapotaceæ,	1	"	"	2	"	"	
Oleaceæ,	3	"	"	8	"	"	
Lauraceæ,	2	"	"	2	"	"	
Urticaceæ,	4	"	"	8	"	"	
Platanaceæ,	1	"	"	1	"	"	
Juglandaceæ,	2	"	"	9	"	"	
Cupuliferæ,	5	"	"	21	"	"	
Betulaceæ,	1	"	"	5	"	"	
Salicaceæ,	2	"	"	7	"	"	
Coniferæ,	7	"	"	18	"	"	

The only natural order containing trees in the German flora and not in ours is the *Rhamnaceæ;* the only order in which the German flora exceeds ours in arboreous genera is that of *Betulaceæ* (which comes from our not counting any of our Alders as trees); the only order in which the German flora has more species of trees than ours is that of the *Salicaceæ* (10 to 7), we counting but one truly arboreous indigenous Willow. On the other hand, our flora surpasses the German not only in the twelve additional orders (one of which is represented by nine species and another by six), but also having a greater number of species in ten out of the thirteen orders common to the two countries, and of genera likewise in all but three of them. That is, we possess of

Sapindaceæ (including Hippocastanaceæ and Aceraceæ),	2	more	genera	and	3	more	species	of trees.
Leguminosæ,	5	"	"	"	6	"	"	"
Rosaceæ,	0	"	"	"	2	"	"	"

Cornaceæ,	1	more	genus	and	3	more	species of trees.
Ericaceæ,	1	"	"	"	1	"	" "
Oleaceæ,	2	"	"	"	6	"	" "
Urticaceæ,	2	"	"	"	5	"	" "
Cupuliferæ,	0	"	"	"	11	"	" "
Betulaceæ,	0	(—1)	"	"	3	"	" "
Coniferæ,	3		"	"	10	"	" "

4. Our flora, it may be seen, accordingly predominates in its species of Pine, Fir, Oak, Birch, Elm, Ash, arboreous as well as shrubby *Cornaceæ, Cratægi*, and of arboreous *Leguminosæ;* and its characteristic trees are the *Taxodium*, the Overcup, Willow and Chestnut-Oaks, the Hickories and Walnuts, the Planer-tree and two *Sapotaceæ*, which barely reach us from the South; the Persimmon, the Gum-trees (both *Nyssa* and *Liquidambar*), the Common and Honey Locusts, *Cladrastis*, and the Kentucky Coffee-tree, the Negundo and three species of Buckeye, the Sumac, the Loblolly Bay of our southeastern border, the Papaw-tree, the Tulip-tree, and our five species of Magnolia. We might have added *Zanthoxylum*, but no Prickly Ash fairly forms a tree within our geographical limits.

5. Our flora is equally rich in shrubs, of a great variety of families, especially in those which make an undergrowth in forests; and, among them, in *Vaccineæ*, *Andromedeæ* and *Rhodoreæ*, while it has no *Arbuteæ* rising above the surface of the ground, and no *Ericeæ* or Heaths at all.

6. It is also rich in *Compositæ*, especially Helianthoid *Compositæ*, *Eupatorinæ*, Asters, and Solidagoes, in the latter genera outnumbering any other region; but is poor in *Anthemideæ*, true *Senecioneæ*, and in *Cynareæ*, and especially so in *Cichoraceæ*.

7. It has an unusual number of *Cyperaceæ*, which is owing partly to the remarkable number of extra-European genera, and partly to the number of species of *Cyperus*, *Rhynchospora*, and *Carex*.

8. From the position of *Rosaceæ* on the list of the larger orders, our flora would be supposed to be unusually rich in that order also; but this result happens in consequence of our remarkable comparative poverty in *Cruciferæ*, *Umbelliferæ*, *Labiatæ*, and *Caryophylleæ*. Other orders in which our flora is much deficient, as compared with Europe, are *Borraginaceæ*, *Campanulaceæ*, *Liliceæ* in the larger sense, and *Iridaceæ*, *Crassulaceæ*, *Chenopodiaceæ*, *Primulaceæ*, and *Geraniaceæ*. Those in which we are correspondingly rich are *Asclepiadaceæ*, *Polemoniaceæ*, *Smilaceæ*, *Melanthaceæ*, *Araliaceæ*, and *Onagraceæ*.

9. To present the elements of the 26 orders represented in our flora but wanting in that of Europe, and in which characteristic features are necessarily comprised, would still further extend

an article already inconveniently protracted. The botanist can readily gather the needful details respecting them, and respecting our extra-European genera generally, from the data given in a former article.

As regards the plants most striking and important in the physiognomy of our vegetation, the first rank is undoubtedly held by the trees of social growth; and of these the principal are *Coniferæ*. The characteristic tree of the proper Northern States is, therefore, *Pinus Strobus*. This, the tallest and once the most plentiful of our trees, when the country lay in all the wildness of nature, must have given the dominant feature to a great part of the landscape. White Pines may probably be distinguished by their port and aspect from a greater distance than any other of our forest-trees, except perhaps the *Taxodium* of our Southern "Cypress" swamps, and the long-leaved Pine which so strikingly marks a belt of low and barren country stretching from the southeastern borders of Virginia to the Gulf of Mexico and the Mississippi.

Pinus Tæda near our southern limits, and, more northward, *P. rigida* and the other Pitch Pines, give a predominant feature to the "pine-barrens" of the Northern States.

Our Arbor Vitæ (*Thuja occidentalis*) of intensely social growth, is the physiognomic tree of our cold swamps at the North, and of Canada. Large tracts of cold and poor marshy land at the north, and on the mountains, are occupied with the well-marked Balsam Fir, or, where less damp, with the more sombre and stiff Black Spruce, or, with the closely related White Spruce; the latter, however, only along our northern frontier. *Abies Fraseri* replaces the common Balsam Fir in the Alleghanies south of Pennsylvania, and has just the same aspect. Hemlock Spruce woods (*Abies Canadensis*) cover hill-sides and sharp ridges of a light and thin soil, where water never stands, throughout the northern part of the country, with a truly characteristic forest-growth. Larch or "Tamarack" swamps are strongly marked in aspect, but are never large.

No other species of forest trees that I know monopolize the ground in so marked a manner, and impress their single features upon a tract of country. The Beech woods of elevated tracts, and the Sugar Maple in richer and lower ground, make the nearest approach to it: but ordinarily our woods of deciduous trees consist of a mixture of several species, in which different kinds predominate according to the situation. In enumerating, as I have done farther back, the trees most characteristic of our three principal districts, I have mentioned those which more than any other give character to our arborcous vegetation. As trees which possess marked individuality, and which may be known from far, I barely mention the common American Elm of our

intervales, the Button-wood or *Platanus* on the banks of rivers and streams, the Sugar Maple, the various Hickories, the Black Walnut, and several Oaks, the White and the Paper Birch, conspicuous from the ghastly white bark of their trunks, as well as by their light and handsome foliage, the Sassafras, the Cucumber-tree, the Tulip-tree, the Honey Locust with its remarkably light and feathery foliage, and the *Gymnocladus* or Kentucky Coffee-tree, with its thick and stout branchlets, and its remarkably decompound foliage, rendered the more striking in aspect by the oblique or almost vertical position which the leaflets generally assume.

Of trees conspicuous in blossom, *Cornus Florida*, the two Umbrella-leaved Magnolias, the Locust, the *Cladrastis*, the Red-Bud, and the Crab-Apple hold the first place, and the Umbrella-trees with their rose-colored cones are equally conspicuous in fruit. The Loblolly-Bay, *Rhododendron maximum*, and the *Chionanthus* or Fringe-tree are equally showy, but they are generally shrubs rather than trees.

Considering our great variety of trees and shrubs, there is a remarkable absence of broad-leaved evergreens. The American Holly is our only tree of the sort of considerable size, and that is not a common one. Of large shrubs or small trees, *Rhododendron maximum* and *Kalmia latifolia*—our "Laurels,"—are our principal and truly characteristic evergreens, as they are among the most social of our woody plants.

The herbaceous plants which most strike the eye are of course the *Compositæ*, especially toward the close of summer, when golden Solidagoes and purple, blue, and white Asters are everywhere conspicuous. Of vernal flowers,—peculiarly delightful to us after a winter which destroys all herbaceous vegetation,—the most common species which strike the eye over the whole country (in their appropriate stations) are *Caltha palustris, Aquilegia Canadensis, Anemone nemorosa*, with *Thalictrum anemonoides, Sanguinaria Canadensis, Saxifraga Virginiensis, Viola cucullata, sagittata* or one or two other stemless Violets, *Claytonia*, one or the other species, *Oldenlandia* (*Houstonia*) *cærulea, Senecio aureus, Smilacina bifolia, Erythronium Americanum, Uvularia sessilifolia*, and, a little later, *Geranium maculatum*.

The part which introduced plants take in our flora, with some kindred topics, must be considered in a future article.

(Vide p 381.
(mention)

In most cases the machinery of a steamship is placed in the centre of the vessel, and thence motion is carried to the propellor blades by a long shaft rigidly connected. If the frame of the vessel springs at all by the motion of the sea, the shaft is thrown out of line and must consequently heat. To remedy this the shaft should be allowed some *play* in the couplings where the *lengths* of the shaft are joined together.

But it is the wearing of the journals and bearings outside the vessel that is most prejudicial, most frequent, and most difficult of repair. One cause of this wear is that the blades are not made smooth and not balanced, so that the centre of rotation and the centre of gravity do not coincide. No machinery in revolving works well under these circumstances.

But the most important disturbing cause is the following. The propellor blades of a vessel on leaving port are set in motion in a plane at right angles to the vessel's keel. The propellor blades tend to "persist" in this plane, and the greater their momentum the greater their resistance to any cause tending to draw them from this plane. But the motion of the vessel is a constant disturbing cause, and in resisting the motion of the vessel the revolving propellor presses with great force on the bearings.

Suppose, as in some vessels, the propellor (blades and hub) to weigh fifteen tons. Propellors of this size have their centres of oscillation moved at the rate of thirty-six feet per second when in full action. We have then a weight of fifteen tons moving at thirty-six feet per second, to be deflected from its line of action whenever the vessel rises or falls. The wear caused by this action has been attempted to be overcome by putting wooden linings in bearings; how far successfully has yet to be shewn.

It would undoubtedly be better to remove the cause than to remedy the effects. It seems to the writer that the cause may be easily removed by simply so arranging the propellor blades (or the frame in which they are mounted), that the propellor blades can keep in the original plane of rotation however the vessel may move in a sea way. The plans for effecting this are not easily explained without drawings. But means of so arranging the propellor blades that they will keep vertical however the vessel may move will occur to most persons acquainted with machinery.

Art. X.—*Statistics of the Flora of the Northern United States;* by Asa Gray.

[Continued from vol. xxii, p. 232.]

The Catalogues of the alpine and subalpine species of our Flora of the Northern States, given on pp. 230 and 231, in the former part of this communication, are found to be very imperfect, through some unaccountable omissions. They are here reproduced in a corrected form.

1. *List of Phænogamous Species found only in our small Alpine Region.*

Cardamine bellidifolia.
Viola palustris.
Silene acaulis.
Sibbaldia procumbens.
Potentilla frigida.
Epilobium alpinum, var. majus.
Saxifraga rivularis.
Saxifraga stellaris, var. comosa.*
Gnaphalium supinum.
Nabalus Boottii.
Nabalus nanus.
Vaccinium cæspitosum.
Arctostaphylos alpina.
Cassiope hypnoides.
Phyllodoce taxifolia.
Loiseleuria procumbens.
Rhododendron Lapponicum.
Veronica alpina.
Castilleia septentrionalis.
Diapensia Lapponica.
Oxyria reniformis.
Betula nana.
Salix phylicifolia.
Salix Uva-Ursi.

* This is a recent discovery, on Mount Katahdin, Maine, by Joseph Blake, Esq. Pursh had given *Saxifraga stellaris* as a native of Canada, but this was hardly credited: it has long been known from Labrador. But the *S. foliolosa*, which is plainly a state of *S. stellaris*, was known in this country only from the Arctic Islands, and from Sitcha on the northwest coast. With this species I replace *Dryas integrifolia* of the former list, which I think cannot have been really found on the White Mountains or elsewhere within our limits: Pursh must have mistaken something else for it in Prof. Peck's herbarium, as well as for *Alchemilla alpina*. Moreover, it is wrongly marked in the Manual of Bot. N. States, as also European.

The following points likewise need correction:

On p. 207, line 24, the Alleghany Mountains are said, in round numbers, to rise to an elevation of about 6300 feet. My excellent and accurate friend, Professor Guyot, informs me that the results of his barometrical measurements made during the past summer assign to the Black Mountain an elevation of fully 6710 feet above the level of the sea. Yet the summit was covered with trees (mostly *Abies Fraseri*), which, however, are now being cut away.

Page 217, et seq. The following additions may be made to the table, in their proper places. To the second column, i. e. Extra-European genera of E. North America, *Phaseolus* and *Aralia*. To the fourth column, of temperate E. Asia, including the Himalayas, *Elodea*, *Stylosanthes*, *Phaseolus*, *Galactia*, *Amphicarpæa*, *Centrosema*, *Itea*, *Fothergilla*, *Aralia*, *Triosteum?* *Spermacoce*, *Nabalus*, *Gaultheria*, *Mimulus*, *Phytolacca*, *Sassafras?* *Podostemon* (and others remain to be added),—essentially increasing the remarkable number of Eastern Northern American genera which are represented in an antipodal region, of analogous extreme climate, but not in the less distant regions of Western Europe and Western North America, the greater parts of which are endowed with a more equable climate.

Page 239. In the heading of the third column, second line, occurs a misprint of "and" for "not."

Page 232, line 4, "*Cirsium pumilum*" is to be erased, as it occurs in Missouri, according to Dr. Engelmann.

Salix repens.
Salix herbacea.
Luzula arcuta.
Luzula spicata.
Juncus trifidus.
Carex capitata.
Carex atrata.
Carex rigida.
Phleum alpinum.
Calamagrostis Pickeringii.
Poa laxa.
Aira atropurpurea.
Hierochloa alpina.

They are 37 species in number. Of these all but the five printed in *italic* are natives likewise of Europe.

2. *List of Subalpine Phænogamous Species, which occur mainly in our Alpine Region, but are also found decidedly out of it.*

Alsine Grœnlandica.
Geum radiatum.
Rubus Chamæmorus.
Solidago thyrsoidea.
Solidago Virga-aurea.
Arnica mollis.
Vaccinium uliginosum.
Vaccinium Vitis-Idæa.
Euphrasia officinalis.
Polygonum viviparum.
Empetrum nigrum.
Platanthera obtusata.
Scirpus cæspitosus.
Carex scirpoidea.
Carex capillaris.
Trisetum subspicatum.

Making 16 species; of which all but the five printed in italic are likewise European; and two of these occur in Greenland.

3. *List of Species not found in our Alpine Region, and half of them not even in Subalpine Stations, although they are all Subalpine or Arctic in Europe.*

Saxifraga tricuspidata.
Saxifraga oppositifolia.
Saxifraga aizoides.
Saxifraga Aizoon.
Artemisia borealis.
Juncus Stygius.
Carex gynocrates.

The last two of these seven species are likewise remarkable for not having been found in continental British or Arctic America nor in Labrador; but one of them occurs in Newfoundland, and the other in Greenland.

It would be in order now to consider the range of our species generally north and south. But I will for the present restrict the inquiry to a special and small part of them, namely, to the species which we possess in common with Europe.

The Northward Range in this country of the Phænogamous Species which are common to us and to Europe.

This is an interesting point of inquiry, from its bearings upon the mooted question of the single or multiple origin of the species:—upon whether they may have been diffused each from a common centre, or were originally given to two or more widely separated parts of the world. The arctic regions form one botanical province. The greater part of their plants are com-

mon to the Old and the New Worlds; and the same species is as likely to occur at any two stations within the arctic circle as at any other two stations equally distant. We naturally look northward for the connection of our flora with that of the Old World; and as we meet with United States plants identical with those of Europe, we are interested to know whether they range northward into or near to the area of common northern vegetation. The *data* now in our possession furnish the following results.

Of our species common to Europe, we know only five which do not occur north of the 40th parallel of latitude, or which barely cross this line. These are

Callitriche pedunculata.
Juncus maritimus.
Convallaria majalis.
Cyperus rotundus.
Carex flacca.

The first of these has doubtless been overlooked. The second is a little-known plant with us, and the identification is not perfect. The fourth is a tropical species, and evidently an immigrant into the southern United States as well as into southern Europe, nor is it impossible that our Nut-Grass may again be specifically distinguished from *Cyperus rotundus*. The fifth is here found only in New Jersey, between lat. 40° and 41°. Unless it has been overlooked in the Northern States (which seems unlikely), or unless our plant has been wrongly referred to the variable *Carex flacca*, it affords a remarkable instance of the local occurrence here of a species which is widely diffused in the Old World. It seems not likely to have been introduced from Europe. The third is the most remarkable case; that of the Lily of the Valley (*Convallaria majalis*). This species—or one which I could not in any respect distinguish from it on a comparison of living specimens—abounds in the higher Alleghanies of North Carolina, I believe also in those of Georgia, and it extends north to the Peaks of Otter in Virginia, lat. 37½°, at an altitude of 4000 feet; but it is not known to occur anywhere beyond this; while in Western Europe it extends nearly to lat. 70°. It is not a plant which could well have escaped observation in the Northern States.

The following 15 species are not known to occur north of lat. 45°:

Myosurus minimus.
Subularia aqnatica.
Centunculus minimus.
Veronica officinalis.
Myosotis arvensis.
Salicornia mucronata?
Polygonum dumetorum.
Castanea vesca, var.
Polygonatum latifolium.
Rhynchospora fusca.
Carex vulpina.
" muricata.
" lævigata.
Spartina juncea.
" stricta.

Myosurus minimus occurs with us only in the valley of the Mississippi,—thence south to Texas and west to the Pacific, but not extending northward beyond lat. 45°. It has all the appearance of being indigenous; and in Oregon it is accompanied by a second species which is also a native of Chili. In Europe it occurs as far north as Finland.

Subularia aquatica seems to be a very rare plant in North America, found only in the northeastern corner of the United States.* From its size, aspect, and place of growth it is exceedingly liable to be overlooked. It is to be sought in Nova Scotia, Newfoundland and Canada East. It reaches lat. 70° in Europe.

Centunculus minimus, which extends northward to lat. 60 in Europe here scarcely passes the 41st parallel in the valley of the Mississippi, where alone it occurs in the Northern States.

Veronica officinalis is certainly indigenous in the Alleghany Mountains south of Pennsylvania, and apparently so in the western part of New York. It is not known north of lat. 44°, and in Europe it does not reach the Arctic circle.

Myosotis arvensis is not common here, and has probably been introduced.

Salicornia mucronata, Bigel., is most probably not identical with its homonym on the coast of Spain.

Polygonum dumetorum (if our P. scandens really belongs to it,) does not pass the 45th parallel with us, while in northern Europe it crosses the Arctic circle.

Our Chestnut is one of the few American trees which can anyhow be identified or confounded with European species. It nowhere occurs north of lat. 44° or 45° in this country; and as the European Chestnut is perhaps not really indigenous in any higher latitude in the Old World, we have here either a very anomalous case in geographical distribution, or else must regard our chestnut as specifically distinct. Analogy would favor the latter view, and (which is more directly to the purpose) so also would some little differences in the fruit, such, however, as would be of small account in case the trees were natives of the same district.

Polygonatum latifolium. This is a case of imperfect identification; the American plant so called being known to us only by specimens sent from Pennsylvania by Muhlenberg to Willdenow.

* In the *Genera of N. American Plants Illustrated*, i, p. 164, no less than in the *Manual*, I have made a mistake in respect to the habitat of this plant, which has kindly been pointed out by Prof. Tuckerman. Nuttall long ago gathered it in the ponds of Paris, Maine. I had supposed that Nuttall's station was rediscovered by Messrs. Tuckerman and Oakes; but I am informed that the locality and the only one now known in this country, is Echo Lake, in the Franconia Notch, New Hampshire, where it was detected in 1844 by Prof. Tuckerman, as is recorded by that accurate botanist, indeed, in the pages of this Journal, for September, 1848.

Rhynchospora fusca, and the three species of *Carex* would certainly be expected to have a more northern range. *C. lævigata* has been found but once. What is called *C. vulpina* is probably not distinct enough from *C. alopecoidea;* and *C. muricata*, if rightly identified, may have been introduced, at least into New England, where it occurs only in suspicious situations, and rarely.

The two species of *Spartina* belong properly to America, being found only in a few places on the coast of Europe, where they seem to have effected a chance lodgment.

The following species, 36 in number, are not known to reach in this country, or at least sensible to pass, the 50th parallel of latitude.

Ranunculus repens.
Nuphar Kalmiana.
Draba verna.
Drosera longifolia.
Sagina procumbens.
Oxalis acetosella.
" stricta.
Geranium Robertianum.
Vicia Cracca.
Geum strictum.
" rivale.
Potentilla argentea.
Lythrum Salicaria.
Circæa Lutetiana.
Myriophyllum verticillatum.
Xanthium strumarium.
Samolus Valerandi.
Scrophularia nodosa.
Atriplex hastata.
Salsola Kali.
Humulus Lupulus.
Betula alba, var.
Taxus baccata, var.
Typha angustifolia.
Vallisneria spiralis.
Spiranthes cernua.
Microstylis monophyllos.
Juncus Stygius.
" effusus.
Lemna gibba.
Najas flexilis.
Zannichellia palustris.
Ruppia maritima.
Cyperus flavescens.
Carex fulva.
Milium effusum.

Upon this list I remark, first, that two of the species, although admitted as indigenous in the *Manual of the Botany of the Northern United States*, were probably introduced from Europe since the settlement of the country; namely *Draba verna* and *Potentilla argentea*. At least the expression of doubt which in the work just mentioned is thrown upon the former, I now think equally applies to the latter. I never saw either of them growing in other than suspicious situations. They are found only in the Eastern United States and in the long-settled parts of Canada; while in Europe the first falls short of, and the second barely enters Lapland.

Lythrum Salicaria has better claims to citizenship, at least in Eastern New England, but it is not clear from suspicion. Douglas gathered it in wet meadows of Upper Canada; but if really indigenous to this country it is surprising that it does not extend farther north.

Some of the forms which I have felt obliged to join with *Xanthium strumarium* seem to be indigenous in the northwestern por-

tion of our district; and so, along the coasts and great rivers, does the variety *echinatum* (which most botanists will still fancy to be very distinct); but the latter, more widely dispersed over the world, is probably an immigrant from farther south. The real home of the species is uncertain: it could not be expected to occur much north of lat. 46°.

Betula alba and *Taxus baccata*, var. *Canadensis* are the only woody plants upon the list. As to the first, I have followed Spach in considering our White Birch identical with the European. It occurs only from the eastern part of Pennsylvania and New Jersey to Maine, and not far from the coast, reaching barely to about the 46th parallel, one or two degrees beyond the Chestnut. In Western Europe *B. alba* extends into the arctic regions. The American tree should be critically compared anew with the European. At present the White Birch and the Chestnut are our only trees here considered as specifically identical with European ones; unless we add our low and procumbent representative of the Yew (*Taxus baccata*, var. *Canadensis*). If a striking difference in habit or mode of growth alone may be relied upon for characters, then our Yew must be specifically distinct from that of Europe. Other differences, however, have not been detected. Our Yew, according to Richardson, merely reaches the southern borders of the Saskatchawan basin, say about lat. 50°. In Oregon there are Yew trees with the port of the ordinary *T. baccata*, which appears not to occur in Northern Asia, although Dr. Hooker recognizes it in the Himalayas.

Drosera longifolia (*intermedia*), *Circœa Lutetiana*, and *Myriophyllum verticillatum* might be expected to extend farther north than lat. 47°, but they do not occur in Lapland.

Juncus Stygius is the most remarkable member of this list. Its only known habitat on the North American *continent* is a bog adjoining a small lake in Jefferson county, New York, lat. 44°, where I found it in great abundance twenty-four years ago. But it has been collected in Newfoundland, probably south of lat. 49°. This is a mainly Scandinavian species, of high northern range, not found in Denmark, according to Fries, but extending to Bavaria and the Alps. It has been said to occur in Northeastern Siberia, but Trautvetter corrects this in his *Florula Ochotensis:* what he had taken for it, he finds on reëxamination, to be *J. castaneus*. In all probability it grows in Lower Canada: but if in Northern British America it could hardly have been overlooked by Richardson and Drummond.

Carex fulva is another species unknown in Northern British America, found at only one station in the United States, and elsewhere only in Newfoundland, whence Goodenough received the specimens on which he founded the species. In Europe, it is scarcely found north of lat. 60.

Spiranthes cernua, if really European, is found only on the west coast of Ireland, and belongs to the same remarkable category as *Eriocaulon septangulare*, of the next list.

For the rest of the list, no particular remarks are needed. Their northern range in this country corresponds generally with that in Europe, making allowance for the difference in climate; that is, they range ten or fifteen degrees farther north in Western Europe than in North America. This is true even of *Vallisneria spiralis*, a plant of temperate climates, with a wide southern range, and neither Scandinavian nor North German. In North America it extends to about lat. 46° : in Russia it is recorded as occurring near St. Petersburg, lat. 60°.

The following species, 56 in number, range north of lat. 50, and many of them have been traced up to lat. 55°, but not much if any beyond the latter parallel.

Anemone nemorosa.
Cerastium arvense.
Trifolium repens.
Ludwigia palustris.
Sium angustifolium.
Bidens cernua.
Gnaphalium uliginosum.
Chimaphila umbellata.
Monotropa Hypopitys.
Statice Limonium.
Utricularia vulgaris.
" minor.
Lycopus Europæus.
Myosotis palustris.
Calysegia sepium.
Salicornia herbacea.
Rumex maritimus.
Ceratophyllum demersum.
Acorus Calamus.
Sparganium ramosum ?
" angustifolium.
Lemna trisulca.
" polyrhiza.
Potamogeton pectinatus.
" prælongus.
" lucens.
" heterophyllus.
Scheuchzeria palustris.
Alisma Plantago.
Anacharis Canadensis.
Liparis Lœselii.
Platanthera bracteata.
Eriocaulon septangulare.
Eleocharis acicularis.
Scirpus maritimus.
Eriophorum alpinum.
Carex teretiuscula.
" tenella.
" tenuiflora.
" maritima.
" irrigua.
" pallescens.
" flava.
" filiformis.
" Pseudo-Cyperus.
" ampullacea.
Leersia oryzoides.
Calamagrostis arenaria.
Kœleria cristata.
Glyceria aquatica.
" fluitans.
Poa serotina.
" compressa.
Phragmites communis.
Triticum caninum.
Aira flexuosa.

Concerning two plants on this list, doubts may fairly be raised whether they are indigenous to this continent, viz. *Gnaphalium uliginosum* and *Poa compressa*. The former is one of our commonest plants, but is only found along damp road-sides and in ground which is or has been tilled. It is found on the Saskatchawan ;

but if there restricted to similar situations, I should consider it one of the species unwittingly introduced by man from Europe. *Poa compressa* here has wholly the appearance of a naturalized plant. Richardson and Drummond gathered it also on the Saskatchawan, I know not in what stations. E. Meyer records it as in Labrador.

Triticum caninum, like the common Couch-Grass (*T. repens*), as it generally occurs with us, is evidently of European derivation; but both species are indigenous from our northern borders northward and westward.

The White Clover (*Trifolium repens*) which springs up so copiously and promptly wherever forests are destroyed and the land turned into pasture, is in the same category, being wild at the north and the far West, and undoubtedly imported likewise at the settlement of the country.

Of *Cerastium arvense*, and probably of *Acorus Calamus* also, we have within our limits both an indigenous and an introduced stock.

With *Anacharis Canadensis* it is not certain that the German and Russian plant is identical, the flowers being unknown there: nor, if so, are we sure that the plant is truly indigenous on the continent of Europe any more than in England, although it is very likely to be so.

Platanthera bracteata is placed upon the list, although with doubt, Dr. Lindley and Sir Wm. Hooker having expressed the opinion that it is identical with *P. viridis* of Europe.

Eriophorum alpinum, a Scandinavian plant of high range,—also found on mountains in Western Europe as far south as the Alps, but scarcely extending into Siberia,—is not rare with us in cold peat bogs, from Pennsylvania to Lake Superior and Maine. It is also a native of Newfoundland, although not mentioned as such by Hooker. I think I have seen specimens from Lower Canada. But no more northern habitats are known except Michaux's, i. e. Lake Mistassins and Hudson's Bay, say lat. 51°. It surely ought to grow in Labrador; but it is nowhere recorded from that region, nor from Greenland.

Eriocaulon septangulare, an Eastern North American plant not ranging beyond lat. 55°, but singularly reappearing only in a few stations in the nearest part of Europe, requires some notice in a different connexion.

It is worth remarking that it is in the interior of the continent, namely, in the Saskatchawan country (long. 95° to 105°,) and not along the coast, that most of the plants of this list attain their highest latitude. • We should expect this, as regards the eastern coast, from the rise of the isothermal lines and of the limit of trees on passing westward, and from the great rise of the isotheral lines in the district referred to. Still it will appear singular that only three of these 56 species are recorded as natives of Labrador,

(namely, *Poa compressa*, already mentioned, *Statice Limonium*, and *Chimaphila umbellata*), until it is noted that the principal Labrador collections known were made between lat. 56° and 58°. Many Newfoundland and Canadian plants doubtless inhabit southern Labrador: but I can add only one of these on the present list, namely, *Calamagrostis arenaria*. Only about a dozen of these 57 species appear to occur north of the 50th parallel on the Pacific coast: but this number includes much the larger part of the species on this list which extend westward to the Pacific at all, even in a lower latitude.

The following 42 species range north of lat. 55°, but do not, as far as we know, cross the 60th parallel:

† Hepatica triloba.
†* Coptis trifolia.
Spiræa salicifolia.
† " Aruncus.
Agrimonia Eupatoria.
† Geum macrophyllum.
† Circæa alpina.
* Saxifraga Aizoon.
† Galium trifidum.
† Galium Aparine.
† " triflorum.
†* Plantago maritima.
† Glaux maritima.
Limosella aquatica.
† Veronica Anagallis.
† " serpyllifolia.
† Brunella vulgaris.
Calla palustris.
Lemna minor.
Potamogeton pusillus.
" compressus.
Potamogeton perfoliatus.
† " natans.
†* Triglochin maritimum.
†* Listera cordata.
†* Streptopus amplexifolius.
Scirpus lacustris.
† " sylvaticus.
† Rhynchospora alba.
† Carex pauciflora.
† " * canescens.
† " stellulata.
† " limosa.
† " Buxbaumii.
" * panicea.
" Œderi.
† Agrostis canina.
" vulgaris.
† Cinna arundinacea.
† Glyceria maritima.
† " distans.
† Poa annua.

Only 8 of these 42 species are recorded as natives of Labrador; namely, those marked with an asterisk in the list; while 29 of them are in Bongard's Florula of the Island of Sitcha (lat. 57°–58°) on the North West coast. These are marked with a (†). Among them are six of the eight Labrador species, namely, all except *Saxifraga Aizoon* and *Carex panicea*.

Two species only of the above list are doubtful natives of the United States; viz. *Galium Aparine*, which here is not found beyond Canada, and only in doubtful situations, but it seems to be truly indigenous on the Northwest coast; and *Poa annua*, a cosmopolite plant, found all round the world in high latitudes. *Agrostis vulgaris* and *A. canina* are in the same category with *Triticum caninum* and *T. repens*,—represented at the north by an indigenous, but generally by an imported stock.

Spiræa Aruncus claims a place in the list of disjoined species. It occurs in the Catskill mountains, New York, and southward along the whole extent of the Alleghanies; but here it ranges no farther northward. It is not a Scandinavian plant; but from France it extends eastward through Northern Asia to Kamtschatka, and thence to Sitcha and the mouth of the Oregon.

The following 63 species cross the 60th parallel, but so far as I can ascertain, are not known to cross the arctic circle on this continent.

* Caltha palustris.
Actæa spicata (rubra).
Turritis glabra.
Draba memorosa.
†Stellaria longifolia.
†Spergularia rubra.
Lathyrus palustris.
Fragaria vesca.
* Epilobium palustre.
†* Ligusticum Scoticum.
†* Linnæa borealis.
* Lonicera cærulea.
Galium boreale.
†Achillea Millefolium.
Artemisia Canadensis.
Lobelia Dortmanna.
* Campanula rotundifolia.
†* Ledum latifolium.
* Pyrola chlorantha.
†* Moneses uniflora.
* Primula farinosa.
Naumburgia thyrsiflora.
Utricularia intermedia.
†* Pinguicula vulgaris.
Veronica scutellata.
* Rhinanthus Crista Galli.
Scutellaria galericulata.
Stachys palustris.
†* Menyanthes trifoliata.
Blitum capitatum.
Polygonum amphibium.
†* " aviculare.
Callitriche verna.
" autumnalis.
†* Myrica Gale.
* Alnus incana.
Typha latifolia.
Sparganium simplex.
" natans.
* Triglochin palustre.
Goodyera repens.
Calypso borealis.
Corallorhiza innata.
Smilacina stellata.
†* " bifolia.
* Allium Schœnoprasum.
Juncus filiformis.
" Balticus.
" articulatus.
" bufonius.
Eleocharis palustris.
Scirpus pungens.
†Eriophorum vaginatum.
Carex chordorrhiza.
" aquatilis.
" salina.
† " livida.
† " vesicaria.
Alopecurus aristulatus.
Poa nemoralis.
* " pratensis.
Aira cæspitosa.
Phalaris arundinacea.

Twenty of these marked (*) are in the flora of Labrador; fifteen, marked (†) in that of Sitcha; and nine are common to the two.

It would appear, therefore, that of our Phænogamous plants common to Europe, only

5 do not range north of lat. 40°.
20, or 6 per cent, do not range north of lat. 45°.
56, or 17½ per cent, do not range north of lat. 50°.

113, or 35 per cent, do not pass north of lat. 55°.
155, or 48½ per cent, do not pass north of lat. 60°.
218, or 68 per cent, scarcely, if at all, cross the Arctic circle.

In this inquiry we have thus far left our alpine and even sub-alpine species, common to Europe, wholly out of view, as not properly belonging to our temperate flora, and as expected to extend northward beyond the Arctic circle. In a few cases, however, this expectation is not exactly borne out. For instance, *Viola palustris* is found only in the alpine region of the White Mountains, in Labrador, and perhaps in the Rocky Mountains about lat. 42°, but has not been noticed in arctic America proper. It occurs, however, in Greenland as well as in Kamtschatka.

Potentilla frigida,* or the plant of the White Mountains which I take for it, has not been elsewhere found in this country (unless confounded with some other species) except in Greenland, between lat. 73° and 80°, by Dr. Kane; nor is it known in the north of Europe!

Sibbaldia procumbens, although found in Labrador and Greenland on one side, and on the northern Rocky Mountains and at Unalaschka on the other, has not been detected in Arctic America within the Arctic circle.

Gnaphalium supinum, a rare plant of the White Mountains, has been elsewhere detected upon the continent only at Labrador: and it also occurs in Greenland.

Cassiope hypnoides, found on all our alpine summits, elsewhere occurs only in Labrador and Greenland, on the one hand, and at Unalaschka, below the Arctic circle, on the other.

Phyllodoce taxifolia occurs only on the White Mountains, in Labrador, and in Greenland.

Veronica alpina, although approaching the Arctic circle both east and west, is not recorded as crossing it, though it probably does so.

Salix phylicifolia occurs only on the White Mountains and in Labrador.

Juncus trifidus, an abundant plant in our alpine districts, is not recorded from any other part of North America, excepting Newfoundland!

Carex capitata, although found on Hudson's Bay and on the Rocky Mountains, is not recorded from within the Arctic circle.

Phleum alpinum, found in Labrador, Greenland, and Unalaschka, is not recorded from within the Arctic circle. On the other hand *Aira atropurpurea*, a Lapland species found on the

* The habitat of this rare plant has been casually left out of the Manual of Botany of N. U. States, p. 118. It was discovered, out of flower, by Dr. Robbins (who has long been one of the most zealous and successful explorers of New England botany), at a single station in the alpine region of the White Mountains of New Hampshire, where it is still rather abundant. Later the indefatigable Prof. Tuckerman detected it on Mount LaFayette, of the Franconia range. These are the only stations known on this continent.

White Mountains, is remarkable for not being found in Labrador, nor in Greenland that I am aware of, while it occurs on the Northwest Coast below lat. 60°, but nowhere in Siberia, Kamtschatka, &c., nor was it known in Arctic America until lately collected between Point Barrow and Mackenzie river, by Capt. Pullen, according to Mr. Seemann.

As to our subalpine list: *Alsine Grœnlandica* is wrongly said in the Manual to be European, as it has not been found beyond Greenland. It also occurs in Labrador, and with us as far south as the low Shawangunk Mountains in the southern part of New York; but is entirely unknown in Canada and in Arctic America.

Carex gynocrates, which we should expect to be alpine and arctic, but which is not known as either in this country, is connected with Lapland by the intermediate station of Greenland. Excepting this and *Juncus stygius* (which has already been commented on), and perhaps also *Euphrasia officinalis*, all our strictly subalpine species, as well those enumerated as to have been expected to be so, which are common to us and to Europe, extend northward along the central region of the continent quite to the Arctic sea-coast. While, curiously enough, eleven, or one-third of our strictly alpine species common to Europe,—all but one of them arctic in the Old World,—are not known to cross the arctic circle on this continent. This, however, might perhaps have been expected, as it seems almost certain that the interchange of alpine species between us and Europe must have taken place in the direction of Newfoundland, Labrador and Greenland, rather than through the polar regions; and this a critical study of the distribution of our plants northward would be likely to show.

Adding accordingly a dozen alpine or subalpine species, we have about 230 Phænogamous species common to Europe, or 72 per cent, which have not been detected within the Arctic circle upon the American continent.

Our species common to Europe which do extend into the Arctic zone,—exclusive of all those enumerated in the three lists of alpine, subalpine, and the seven *should-be* alpine or subalpine species given on p. 63, are these (52 in number):

Dicotyledoneæ.

Ranunculus aquatilis, var.
" flammula, var.
" sceleratus,
Nasturtium palustre.
Cardamine pratensis.
" hirsuta.
Arabis hirsuta.
Barbarea vulgaris.
Erysimum cheiranthoides.
Drosera rotundifolia.
Parnassia palustris.
Honkenya peploides.
Mœhringia lateriflora.
Stellaria longipes.
" uliginosa.

Stellaria crassifolia.
" borealis.
Sagina nodosa.
Lathyrus maritimus.
Potentilla Norwegica.
" Anserina.
" fruticosa.
" palustris.
Epilobium angustifolium.
Myriophyllum spicatum.
Hippuris vulgaris.
Ribes rubrum.
Viburnum Opulus.
Artemisia Canadensis.
Taraxacum Dens-leonis.
Vaccinium Oxycoccus.
Arctostaphylos Uva-Ursi.
Cassandra calyculata.
Andromeda polifolia.
Pyrola rotundifolia.
Pyrola minor.
Primula Mistassinica.
Mertensia maritima.
Gentiana detonsa.
Chenopodina maritima (?)
Alnus viridis.
Juniperus communis.

Monocotyledoneæ.

Luzula pilosa.
" parviflora.
" campestris.
Juncus bulbosus.
Eriophorum polystachyon.
" gracile.
Carex vulgaris.
Festuca ovina.
Triticum repens.
Hierochloa borealis.

If any interesting relation is to be traced between the more or less boreal range of our temperate species common to Europe, and the natural classes or orders they severally belong to, the means of instituting the comparison are at hand in the various foregoing lists. The subjoined columns give a comparison in this respect between our 52 non-alpine plants which extend into the Arctic zone, and the almost equal number whose northern limit is between the 40th and the 50th parallels. It shows nothing, however, except the diminution of the number of the orders, and of non-glumaceous Endogens, in high latitudes.

Non-alpine species of the above list with their boreal limit with the Arctic circle.		Non-alpine species with their boreal limit between lat. 40° and 50°.	
Ranunculaceæ,	3	Ranunculaceæ,	2
Cruciferæ,	6	*Nymphæaceæ*,	1
Droseraceæ,	1	Cruciferæ,	2
Parnassiaceæ,	1	Droseraceæ,	1
Caryophyllaceæ,	7	Caryophyllaceæ,	1
Leguminosæ,	1	*Oxalidaceæ*,	2
Rosaceæ,	4	*Geraniaceæ*,	1
Onagraceæ,	3	Leguminosæ,	1
Grossulaceæ,	1	Rosaceæ,	3
Caprifoliaceæ,	1	*Lythraceæ*,	1
Compositæ,	2	Onagraceæ,	2
Ericaceæ,	6	Compositæ,	1
Primulaceæ,	1	Primulaceæ,	2
Borraginaceæ,	1	*Scrophulariaceæ*,	2
Gentianaceæ,	1	Borraginaceæ,	1
Chenopodiaceæ,	1	Chenopodiaceæ,	3

Betulaceæ,	1
Coniferæ,	1
Dicotyledoneæ,	42
Juncaceæ,	4
Cyperaceæ,	3
Gramineæ,	3
Monocotyledoneæ,	10
21 orders,	52 species.

Polygonaceæ,	1
Urticaceæ,	1
Cupuliferæ,	1
Betulaceæ,	1
Coniferæ,	1
Dicotyledoneæ,	31
Typhaceæ,	1
Lemnaceæ,	1
Naiadaceæ,	3
Hydrocharidaceæ,	1
Orchidaceæ,	2
Liliaceæ,	1
Juncaceæ,	2
Cyperaceæ,	6
Gramineæ,	3
Monocotyledoneæ,	20
30 orders,	51 species.

Considered as to size and duration of the plants in connection with geographical range, our 320 species common to Europe, are divided as follows:

Only 3 of them are trees, namely, the Chestnut, White Birch, and Yew; and the latter is no tree in this country. All three have been and generally are still taken for peculiar American species, perhaps correctly. None of them extend north quite to lat. 50°, the Chestnut not beyond 45°. Two of them range a little south of lat. 40°, and one, the Chestnut, considerably south of lat. 36°. Their geographical distribution, taken in connexion with the comparatively restricted area of trees, favors the suspicion that these are specifically different from the European species.

Only 15 species are shrubs. All of them occur as far north as lat. 60°, or else are alpine, and 10 grow within the arctic circle.

Then 12 are suffruticose or suffrutescent plants, all of them arctic-alpine or subalpine, and with their southern limit under lat. 40°, except two; namely, *Arctostaphylos Uva-ursi*, which ranges from the arctic shores to lat. 35° and across the whole breadth of the continent at its widest part; and *Chimaphila umbellata*, which, from its northern limit of about 55°, is equally broadly distributed over the continent, and extends southwards even into Mexico.

The remaining 290 species are all herbs; and about 260 of them are perennials. Of the 30 annuals and biennials, few have a high boreal range, but at least 20 of them are among our species of widest southern range.

The Southward Range in this Country of our Phænogamous Species common to Europe.

This is not a subject of so much interest as the northern range. The subjoined table exhibits the main facts of the case, as well as I can now determine them, as respects our species which are neither alpine nor subalpine.

No. of species.	Whose boreal limit is	Of these the southern limit is beyond Lat. 30°.	Lat. 36° 30'.	Lat. 40°.	Found on DeCandolle's list of species of *vast area*; out of the whole No. (column 1.)	those rang'g S. of 40° (columns 3, 4, 5).
52	+66° 30′	6 spec.	11 spec.	16 spec.	10 spec.	9 species.
63	+60°–66°	9 "	16 "	8 "	11 "	9 "
42	+55°–60°	16 "	9 "	7 "	10 "	10 "
57	+50°–55°	17 "	12 "	16 "	10 "	10 "
36	+45°–50°	10 "	10 "	8 "	7 "	7 "
15	+40°–45°	4 "	3 "	4 "	1 "	1 "
5	+40°	2 "	2 "	1 "	0 "	0 "

DeCandolle's list (in Geogr. Bot. p. 564, et seq.) of Phænogamous species of vast area comprises those which, in their actual dispersion, are estimated to be diffused over at least one-third of the terrestrial surface of the globe. It therefore rarely includes maritime plants, although these are so wide-spread. Nor does it include several of our species which as wild plants have better claim than some which are admitted. Indeed a large proportion of those common to Europe which range south of lat. 36° 30′ are very widely spread species.

For example, the six *amphigæan* species which range from within the arctic circle to south of the 30th parallel, or to the Gulf of Mexico, are *Ranunculus aquatilis*, *Nasturtium palustre*, *Cardamine hirsuta*, *Drosera rotundifolia*, *Taraxacum Dens-leonis*, (probably introduced southward) and *Luzula campestris*, all but one nearly cosmopolite, and that one (*Drosera*) diffused over most northern temperate regions.

And the 9 which range from near the arctic circle to the same low latitude are *Spergularia rubra*, *Polygonum amphibium* and *aviculare*, *Callitriche verna* and *autumnalis*, *Typha latifolia*, *Juncus bufonius*, *Eleocharis palustris*, and *Scirpus pungens*. (*Caltha palustris*, which is on DeCandolle's list, does not extend quite so far south.) And among the 16 which range from lat. 55°–60° down to lat. 30° are such plants as *Agrimonia Eupatoria*, *Veronica Anagallis* and *serpyllifolia*, *Limosella subulata*, *Brunella vulgaris*, *Lemna minor*, *Potamogeton perfoliatus* and *natans*, *Scirpus lacustris*, and *Poa annua*,—a few of them not really indigenous there. One hardly to be expected is *Hepatica triloba*, which occurs in Florida.

Of our alpine species common to Europe, of course none occur south of Northern New York. And as to the eleven on the sub-

alpine list, only two have been observed anywhere in the Alleghanies, (and these only south of lat. 36° 30′), viz. *Scirpus cæspitosus* and a form of *Trisetum subspicatum*. None of the rest are known in the Eastern United States so far south as lat. 40°.

The re-appearance of some northern species in high southern latitudes is another matter, and to be considered under the head of *disjoined species*.

The range of our amphigæan species might be considered in reference to the stations they affect or the medium in which they grow; but this would be likely to bring out no important results beyond the familiar ones that aquatic, palustrine and maritime species are among those of widest range in latitude. The lists already given enable any botanist to do it.

The Species common to this Country and to Europe in respect to the size of the Orders and Genera they belong to.

The species which we possess in common with Europe, being generally speaking those of widest geographical range, form good materials ready to our hands, as far as they go, for the enquiry whether there is any assignable relation between the size of a natural group and the area occupied by the species;—a subject which DeCandolle has briefly discussed, as regards families. By gathering the *data* from the table which begins on p. 208, it will be seen that our nine largest families (as enumerated in order on p. 213) come a little nearer to comprising half our amphigæan species than they do to half our whole number of species: i. e., they contain 158 species, or two less than half. But the tenth family, *Labiatæ*, being very poor in these common species, brings up the number to only 162, or barely two above half of the 320. And our different large families present such marked differences in the ratio of their amphigæan species,* that it is clear no results of the least moment are to be obtained in this way.

To be of any value, at least upon our limited scale, the comparison should be made with genera, as Mr. Darwin suggests; and from some investigations of his own, this sagacious naturalist inclines to think that species in large genera range over a wider area than the species of small genera do. Our 320 amphigæan species evidently tend to confirm this view. They belong to 171

* Compositæ,	out of	273	species,	9	are common to Europe.	
Cyperaceæ,	"	213	"	48	"	"
Gramineæ,	"	162	"	32	"	"
Leguminosæ,	"	91	"	4	"	"
Rosaceæ,	"	71	"	16	"	"
Ericaceæ,	"	62	"	19	"	"
Scrophulariaceæ,	"	54	"	10	"	"
Orchidaceæ,	"	51	"	10	"	"
Ranunculaceæ,	"	49	"	10	"	"
Labiatæ,	"	49	"	4	"	"

genera. Of these only 18, or 10·5 per cent, are monotypic, while 13·3 per cent of our whole number of genera are monotypic: 23 genera or almost 13 per cent contain only two or at most three good species apiece, and about as many more have only four or five good species. Therefore 64 of the smaller genera, or 37 per cent, fully come up to the general average of species to genus in our Phænogamous plants generally, viz. three each (supra, p. 216); while on the other hand, 15, or 8 per cent, are very large genera, such as *Carex, Solidago, Cyperus, Salix, Allium, Galium, Trifolium, Gentiana, Ranunculus*, &c. Though many of these are not very large genera in our region, nor do those that are large particularly abound in amphigæan species.

Comparison of the Flora of the Northern United States with that of Europe in respect to the Similar or Related Species.

Two floras may be, perhaps, as nearly related through their allied as through their identical species: at any rate, the comparison in this respect is equally important to be made. Such comparisons, however, are much more difficult, owing to the impossibility of estimating the degrees of resemblance among species, or at least of expressing them in any precise or definite way, or of bringing shades of difference to any common standard. In theory, indeed, only one grade of resemblance is supposed to be expressed in genera. But genera,—even those whose circumscription is either clearly defined in nature (which is far from being always the case) or is generally agreed upon, are by no means groups of equal value throughout; and the species of every genus, when several or numerous, resemble each other in very unequal degrees.

Still no two analogous but geographically separated floras of any size are so well known, as to their Phænogamia, and afford generally such facilities for the comparison of their related species, as those of the Northern United States and of Northern Europe.

If we judge of their relationship from the large proportion of the genera common to the two, we might infer it to be very close. After correcting a little the numbers published in the former article, on p. 216 *et seq.*, we count 326, or not much less than one-half of the 681 genera as belonging also to Europe. This indicates a great *amount* of related vegetation in the two floras, no doubt; but of the *degree* of relationship, taken comparatively, it gives us no correct idea, until we know how many of the genera common to the two are almost cosmopolite, or are wide-spread over the cooler parts of nearly the whole northern hemisphere; and how many are peculiar or strictly characteristic. Now, on going over the list, I find that an extraordinarily large proportion of the genera common to our flora and to Europe belong also

to the floras of almost all the temperate regions of the world. Out of the 326 genera,

284, or 87 per cent are diffused around the northern hemisphere, or over the greater part of it;

201, or 61 per cent, extend into the tropics or cross the equator.

177, or considerably over half, are both widely diffused over the northern temperate zone and extend into or beyond the tropics:—leaving

18, or only 5½ per cent, as nearly peculiar to Eastern North America and to Europe; and very few even of these are strictly peculiar.

A simple enumeration of them will show how trivial a part these 18 American-European genera play in the two floras. They are:

Bellis,	Fedia,
Cakile.	Hottonia,
Calla,	Liparis,
Carpinus,	Melampyrum,
Cassandra,	Narthecium,
Cercis,	Ostrya,
Convallaria,	Scheuchzeria,
Corema,	Subularia,
Dupontia.	Waldsteinia.

Most of these are very small genera, four if not five of them having only a single species each. *Cercis* actually extends to California, and south to near the tropical line. *Dupontia* is a purely arctic genus, to which our species, so called, is referred with much misgiving. *Hottonia* is said to have a third species in Java, which would exclude it from the present list. Moreover, five of these genera are represented only by identical species.

The special resemblance of our flora to that of Europe, it is clear, is not owing simply either to the large proportion of genera in common, or to any thing striking or important in the few genera nearly or quite peculiar to the two. The latter, indeed, are insignificant in our flora, and not to be compared, as to any features they impart, with the much more numerous and really characteristic genera which are shared by the Eastern United States and Eastern temperate Asia. We must look for it in the species, partly in the identical ones (already noticed), and partly in those which closely answer to each other in the two floras.

The citation of *representative species*, to be of much value, should be more critical than it generally is in such comparisons. The degrees of affinity should be classified as strictly as the subject admits of, under several heads; beginning with the plants so closely related in each that they form a sort of *limbo* between

the regions of identical and of allied species on either side, and which may or may not be reckoned specifically the same, according to our varying knowledge, and according to the views which different authors take respecting species. A good analysis of the subjects of comparison might perhaps be made into,

1. *Geographical Varieties*, or those cases in which the American plant is always or generally distinguishable from the European in some point or other, and is not unlikely to be reckoned specifically different even by sound botanists.

2. *Very Close Representative Species*, admitted as distinct, but not unlikely many of them to be reduced to geographical varieties.

3. *Strictly Representative Species*, pretty exactly answering to each other in the two floras, but of which there can be little if any question of specific identity.

4. *Strictly Congeneric Species*, but not falling into either of the former categories.

5. *Divergent Congeneric Species*, where the American type belongs to a different section or subgenus from the European.

To which these might be added, 6th, species of strictly analogous or representative genera.

I must not attempt here anything beyond an enumeration, made *currente calamo*, of such examples in question as occur to me under the first three heads:

1. *American Geographical Varieties, which not only have been, but are not unlikely to be again distinguished as Species, and therefore to be merged in No. 2.*

Ranunculus repens, Amer.:	formerly R. Marilandicus, &c.
Actæa spicata, vars. alba and rubra:	A. alba and rubra.
Nasturtium palustre, fructu brevi:	N. hispidum, &c.
Ribes rubrum, Amer.:	R. albinervium.
Solidago virgaurea, Amer., vars.:	S. humilis and multiradiata.
Monotropa Hypopitys, Amer.:	M. lanuginosa.
Statice Limonium, var.:	S. Caroliniana.
Samolus Valerandi, var. Amer.:	S. floribundus.
Lycopus Europæus, var. sinuatus:	L. sinuatus.
Stachys palustris, vars:	S. aspera, glabra, cordata, &c.
Myosotis palustris, var. laxa:	M. laxa.
Castanea vesca, var. Americana:	C. Americana.
Betula alba, var. populifolia:	B. populifolia.
Taxus baccata, var. Canadensis:	T. Canadensis.
Trisetum subspicatum, var. molle:	T. molle.

2. *Very Close Representative Species, almost all of them more or less liable to be reduced to Geographical Varieties.*

Northern United States.	*Northern Europe.*
Pulsatilla Nutalliana,	P. vulgaris.
Delphinium exaltatum,	D. elatum.
Berberis Canadensis,	B. vulgaris.
Nymphæa odorata,	N. alba.
Nuphar Kalmiana,	N. lutea.
Arabis lyrata,	A. petræa.
Sisymbrium canescens,	S. Sophia.
Cakile Americana,	C. maritima.
Viola Muhlenbergii,	V. canina.
Elatine Americana,	E. triandra.
Geranium Carolinianum,	G. dissectum.
Impatiens pallida and fulva,	I. noli-tangere.
Geum album,	G. urbanum.
Potentilla paradoxa,	P. supina.
Rubus strigosus,	R. Idæus.
Amelanchier Canadensis,	A. vulgaris.
Epilobium coloratum,	E. tetragonum.
Tillæa simplex,	T. aquatica.
Sedum telephioides,	S. Telephium.
Chrysosplenium Americanum,	C. oppositifolium.
Cornus Canadensis,	C. Suecica.
Sambucus pubens,	S. racemosa.
Galium trifidum.	G. palustre.
Valeriana sylvatica,	V. dioica.
Nardosmia palmata,	N. frigida.
Antennaria plantaginifolia,	A. dioica.
Ledum latifolium,	L. palustre.
Veronica Americana,	V. Beccabunga.
Melampyrum Americanum,	M. pratense.
Lithospermum latifolium,	L. officinale.
Euphorbia obtusata,	E. platyphylla.
" commutata,	E. Peplus.
Fagus ferruginea,	F. sylvatica.
Juniperus Virginiana,	J. Sabina.
Allium Canadense,	A. vineale.
Veratrum viride,	V. album.
Narthecium Americanum,	N. ossifragum.
Eleocharis rostellata,	E. multicaulis.
Scirpus pungens, &c.,	S. triqueter.
Hordeum pusillum,	H. maritimum.
Elymus striatus,	E. Europæus.
" mollis,	" arenarius.

3. *Strictly Representative Species, probably few of them to be confounded.*

Northern United States.	*Europe.*
Atragene Americana,	A. alpina.
Clematis ochroleuca,	C. integrifolia.
Ranunculus alismæfolius,	R. Lingua.
" abortivus,	R. auricomus.
Isopyrum biternatum,	I. thalictroides.
Aconitum reclinatum,	A. Lycoctonum.
Nasturtium lacustre,	N. amphibium.
Draba arabisans,	D. incana.
Lepidium intermedium,	L. ruderale.
Senebiera didyma,	S. Coronopus.
Tilia Americana,	T. Europæa,
" heterophylla,	T. argentea.
Staphylea trifolia,	S. pinnata.
Acer spicatum,	A. Tartaricum.
" saccharinum,	A. platanoides.
Hedysarum boreale,	H. obscurum.
Cercis Canadensis.	C. Siliquastrum.
Prunus Virginiana,	P. Padus.
Rubus triflorus,	R. saxatilis.
Pyrus (Sorbus) Americana,	P. aucuparia.
Ribes floridum,	R. nigrum.
Saxifraga Virginiensis,	S. nivalis.
" Pennsylvanica.	S. hieracifolia.
Hydrocotyle interrupta,	H. vulgaris.
Sium lineare,	S. latifolium.
Cornus sericea and stolonifera,	C. sanguinea.
Lonicera grata,	L. Caprifolium.
Sambucus Canadensis,	S. nigra.
Viburnum lantanoides,	V. Lantana.
Fedia radiata,	F. olitoria, &c.
Aster flexuosus,	A. Trifolium.
Bidens connata,	B. tripartita.
" chrysanthemoides,	B. cernua.
Artemisia Ludoviciana,	A. vulgaris.
Gnaphalium purpureum,	G. sylvaticum.
Hieracium Canadense,	H. prenanthoides, &c.
Azalea calendulacea,	A. Pontica.
Ilex opaca,	I. Aquifolium.
Diospyros Virginiana,	D. Lotus.
Androsace occidentalis,	A. elongata.
Trientalis Americana,	T. Europæa.
Hottonia inflata,	H. palustris.
Mentha Canadensis,	M. arvensis.
Myosotis verna,	M. stricta.
Gentiana Saponaria,	G. Pneumonanthe.
Asarum Canadense,	A. Europæum.
Corema Conradii,	C. alba.
Ulmus Americana,	U. pedunculata.

Ulmus fulva,	U. montana.
Celtis occidentalis,	C. australis.
Morus rubra,	M. nigra.
Urtica gracilis,	U. dioica.
Parietaria Pennsylvanica,	P. officinalis.
Platanus occidentalis,	P. orientalis.
Corylus Americana,	C. Avellana.
Carpinus Americana,	C. Betulus.
Ostrya Virginica,	O. vulgaris.
Alnus serrulata,	A. glutinosa.
Salix lucida, &c.,	S. pentandra, &c.
Populus tremuloides,	P. tremula.
Abies balsamea,	A. pectinata.
" nigra and alba,	" excelsa.
Larix Americana,	L. Europæa.
Sagittaria variabilis,	S. sagittifolia.
Cypripedium pubescens,	C. Calceolus.
Smilax rotundifolia, &c.,	S. aspera.
Polygonatum biflorum,	P. multiflorum.
" giganteum,	" officinale.
Erythronium Americanum and albidum,	E. dens-canis.

I omit, for the most part, the large genera, in which it becomes a nice question rightly to pair off representative species.

In all these lists it is sometimes the case that the species or forms of the second column also are indigenous to the United States, or to North America.

Adding now our about 115 closely representative species (of the second and third lists) to the 320 identical ones, we have a total of 435, or over one-fifth of our Phænogamous species, as the same as, or very much like European plants; and enough more of good representative forms might be selected from the large genera (Carex, Salix, Quercus, Juncus, &c.) to bring the proportion up to nearly one-third.

Equally prominent European features of our flora might be traced in the fourth list, if filled out. Here the greater number of allied species would fully make up for the somewhat less close affinity, and so exhibit an equal amount of resemblance. And this brings me to remark that,

Finally, it is in the number of familiar European forms,—especially of those most striking to the eye and most effective in the landscape,—that the general likeness of the vegetation, and the preponderant share of the botanical affinity of our flora to that of northern Europe consists. This might be illustrated in a variety of ways.

A very large part of the more conspicuous and popularly well-known European genera are represented here;—if not in indigenous, at least in naturalized plants, which the common observer never thinks of eliminating. Illustrations of so familiar a fact are superfluous.

Of trees and shrubs,—the most conspicuous members of a flora, and many of them among the most abundant in individuals,—I find only eleven genera in the British flora which are not in ours likewise; and five of these are probably not truly indigenous to Great Britain. Of the remainder we have here genera strictly analogous to each, except to *Erica*, *Daphne*, and *Ulex*. On the other hand, indeed, we have 46 extra-European genera of trees and shrubs, showing our superior richness in this respect, which has often been remarked upon: but, excepting Heaths, Furze, and Tamarisks, we lack scarcely any North European arborescent or woody type.

As to glumaceous plants,—likewise so prolific in individuals,—only three British genera of *Cyperaceæ* and 9 of Grasses are wanting here.

A vast preponderance of our species throughout belong to genera common to Europe. This has already been noted, as respects the orders, in my former article (p. 216). It is equally true as to the genera, as the following data serve to show.

The Phænogamous genera in our flora, as has been already stated, average three species apiece; and fully half of them are represented by more than one species. But of the 353 extra-European genera, as many as 234, or 66 per cent are represented in our flora by only one species; and of the remaining 34 per cent only 34 genera exceed the general average of 3 species. Only eleven of these, I believe, have as many as 9 species, and six of them have from 10 to 18, which is the maximum. On the other hand 40 of our genera common to Europe are represented in our flora by 9 or more species (not excluding the naturalized ones), and the 34 larger genera average as much as ten indigenous species apiece.

As to the relative number of species in our 34 largest amphigæan genera, it may be interesting to note that their sum in our flora is 637 species; in the Flora Germanica of Koch, 621;—the naturalized plants not being excluded; but these are quite as numerous in the German flora as in ours. Also 20 of these genera are larger in our flora than in the German. If the admitted species were brought to a common standard, the numbers would tell more decidedly in our favor. The large genera of which we possess the superior number of species are *Carex* (132 in our flora to 109 in the German), *Aster* (38 to 8), *Solidago* (35 to 1), *Panicum* (20 to 7), *Polygonum*, *Cyperus* (19 to 7), *Quercus* (18 to 5), *Eupatorium* (16 to 1), *Platanthera* (16 to 2), *Eleocharis* (16 to 7), *Hypericum*, *Polygala*, *Vaccinium* (11 to 5), *Utricularia* (11 to 4), *Scutellaria* (10 to 4), *Rhynchospora* (10 to 2), *Glyceria*, *Rubus*, *Viburnum* (10 to 3), and *Smilax* (10 to 1).

(*To be continued.*)