This article was downloaded by: [North Carolina State University]
On: 30 March 2015, At: 01:46
Publisher: Taylor & Francis
Informa Ltd Registered in England and Wales Registered Number:
1072954 Registered office: Mortimer House, 37-41 Mortimer Street,
London W1T 3JH, UK

Transactions of the Botanical Society of Edinburgh

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/tped18>

I. On the Geographical Distribution of the Coniferæ and Gnetaceæ

Robert Brown F.R.G.S. c.

Published online: 01 Dec 2010.

To cite this article: Robert Brown F.R.G.S. c. (1870) I. On the Geographical Distribution of the Coniferæ and Gnetaceæ, Transactions of the Botanical Society of Edinburgh, 10:1-4, 175-196, DOI: [10.1080/03746607009468676](https://doi.org/10.1080/03746607009468676)

To link to this article: <http://dx.doi.org/10.1080/03746607009468676>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

13th May 1869.—ISAAC ANDERSON-HENRY, Esq.,
Vice-President, in the Chair.

Donations to the Library, Herbarium, and Museum were announced.

The following Communications were read:—

I. *On the Geographical Distribution of the Coniferæ and Gnetaceæ.* By ROBERT BROWN, F.R.G.S., &c.

It must be at once patent to any one who has studied the laws regulating the distribution of plants and animals over the globe, that if we expect to arrive at anything like sound generalisations, we must consider the geographical and hypsometrical distribution of faunas and floras, not as a whole, but as divided into classes, orders, and even smaller groups. All plants and animals do not live under the same conditions of existence; hence what may limit or extend the range of one group may have a contrary effect on another, or even none at all. Hence we have the results of zoologists given regarding the distribution of limited groups of the animal kingdom—such as Murray on the mammalia,* Gunther on reptiles,† Selater on birds,‡ and, in a more specialised group, Finsch on the parrots.§ For some time past I have been engaged in the task of attempting to arrange the species of the great and important order of the *Coniferæ* (including *Gnetaceæ*), under certain natural geographical areas, and to ascertain the physical or other causes which have gone to produce this peculiar distribution. This work is not yet concluded, though already the facts collected are of such extent that to give them in detail would far exceed the limits of this paper. In, therefore, briefly sketching the general results to which my investigations have tended, it must be premised that these are merely the abstract of a wide subject, to which I may return at another period.

* Geographical Distribution of Mammals, 1856.

† Proceedings of the Zoological Society of London, 1858.

‡ Journal of the Linnean Society—Zoology, vol. ii.

§ Petermann's Geographische Mittheilungen, 1867.

In the study of the geographical distribution of the coniferæ we are met at the very outset by several difficulties. First, there is the almost impossibility of arriving, in many cases, at the precise localities and habitats of the species, these being too often very vaguely given. Such loose localisation of a species as "North-West America," "Oregon," "California," "Himalayas," "India," "China," and so on, as will be afterwards seen, is worse than useless, as these countries possess several floras widely distinct from each other, and are all very extensive areas. In the second place, there is the difficulty of distinguishing species—a difficulty, I regret to say, rather increased by the publication of every new monograph or revision of the order—each author being apparently intent on cancelling certain species, while in their place he erects others equally dubious. Thus the mere name of a species conveys little meaning to the physical geographer, if he is not at the same time familiar with its affinities to other allied species. He may mark out two areas distinguished by the prevalences of certain nominal species—to all appearance as widely distinct as *Pinus sylvestris* and *Pinus Sabiniana*, while in reality these are so closely allied as to be separated from each other with dubious propriety. Therefore, instead of characterising a distinct phyto-geographical area, they in truth lead to an idea that they are mere "geographical species," derived by the influence of physical causes operating, or which have operated, in the region in which they are found, from the parent species found in the adjoining district. Lastly, there are immense tracts of country, such as Persia, Turkey in Asia, Thibet, and North China, which have been little, if at all, botanically explored, or the species of coniferæ found in these countries are very vaguely known as to localities, heights, and distribution within their own area. Studying the coniferæ in reference to their geographical distribution, I have distinguished great tracts, characterised by a number of species, the majority of which are peculiar to it, as a *Province*. These "provinces" are composed of minor subdivisions, marked by the presence of certain trees not found in the neighbouring subdivisions. These I have called *Regions*, which are again divided into *districts*, distinguished by the prevalence within their borders of some particular tree.

In other words, that tree (or shrub) attains its maximum of development there. In several instances only the "province" can be indicated; in only a few instances do we know the peculiar local distribution sufficiently well to characterise the "district."

For the sake of uniformity, I have in general adopted the nomenclature of Parlatore, in his synopsis of the order in the sixteenth volume of De Candolle's "*Prodromus*,"* supplying such species as he has omitted in apparent ignorance of their having been described, or altering the generic or specific name when I have felt myself at liberty to differ with the synonymy of this otherwise able and distinguished monographer.

Within the limits of the American continent we find a group of coniferæ exclusively confined to this quarter of the world—with the exception of one or two species which are common to the western shores of America and the eastern shores of the Asiatic continent. The northern limit of trees on the American continent corresponds tolerably well with the annual isotherm of 17°·5 Fahr., the July isothermal of 50° Fahr., and the isocheimenal line of 15° Fahr. The northern termination of forest differs on the two sides of the continent. On the eastern or Atlantic side of America no forests are found above the River Egg, in 60° N. latitude, while on the western or Pacific side they extend as far as latitude 66° 44', the climate of that coast being much milder than the other. Kotzebue Sound is the furthest north-western American limit of conifers. North of this, we have the treeless or Eskimo Province, which differs but little in species from one side of the continent to the other. It may be remarked that, as we ascend further to the northward, the uniformity of the geographical distribution of the species is more marked, and that as we go southward the species get more divided into local floras. Dr Hooker has, however, with characteristic perspicuity, divided this Eskimo Province into a number of sub-regions.† South of this the true arboreal tracts of America commence. As far as the country to the east of the Rocky Mountains is concerned, I have for the

* Pp. 345–524. Paris, 1868.

† Transactions of the Linnean Society, vol. xxiii. (1862), p. 251.

most part adopted the divisions assigned by Dr Cooper, my study having tended to conclusions almost identical with his. To his admirable memoir I refer for other details.*

I. The LACUSTRIAN PROVINCE comprehends the country surrounding the great lakes, south of the Eskimo Province. It may be divided into—

A. *The Alonquin Region*, bounded southward by a line drawn from Newfoundland to Lake Superior, thence northerly to Hudson's Bay.

Characteristic species :—

Thuja occidentalis, L.		Taxus canadensis, L., &c.
------------------------	--	---------------------------

B. *The Athabaskan Region*.—This is circumscribed by a line drawn from thence to the Rocky Mountains, the southern boundary line keeping more northward as it runs west.

Characteristic species :—

Pinus Banksiana, Lamb.		Larix pendula, Soland.
Picea balsamea, Linn.		Abies alba, Ait.
Abies nigra, Ait.		

As I shall afterwards show, in all likelihood this region extends right across the Rocky Mountains to the Pacific, where it is distinguished by the presence of *Abies alba* var. *arctica*, Parl. (*Abies arctica*, Murr.), and that the Aliaskan range of mountains running down the peninsula of Aliaska, is the southern boundary of this region. South of that range commences the true Pacific flora.

C. *The Canadian Region* lies south of this, but is not so well marked, as the valleys have the flora of one region and the mountains another.

Characteristic species :—

Pinus Strobus, L.		P. resinosa, Soland.
Abies canadensis, Linn.		

II. THE APPALACHIAN PROVINCE comprises the following regions :—

A. *The Alleghany Region*, bounded by a line drawn south of Nova Scotia down into Georgia, and again sweeping nearly straight northward, ending near New York. The area circumscribed comprehends one region.

* Smithsonian Report, 1858, p. 246, and 1860, p. 438.

Characteristic species :—

<i>Pinus inops</i> , <i>Ait.</i>	<i>Picea Fraseri</i> , <i>Pursh.</i>
<i>P. pungens</i> , <i>Michx.</i>	<i>Juniperus virginiana</i> , <i>Linn.</i>
<i>P. rigida</i> , <i>Mill.</i>	

To the west and south the line is not well marked, but in the south-east the line between it and the next region is the metamorphic rocks of the hills, those of later date corresponding to the change in soil characteristic of the sandy flat country.

B. *Carolinian Region*, is well marked. The western boundary line runs through New Jersey, Pennsylvania, Maryland, East Virginia, the two Carolinas, Georgia, and cuts off the peninsula of Florida. The southern limit is not yet fixed, as we are sufficiently ignorant of the natural history of Florida as to render the geographical distribution of its coniferæ still a problem.

Characteristic species :—

<i>Pinus serotina</i> , <i>Michx.</i>	<i>Chamæcyparis sphæroides</i> , <i>Spach.</i>
---------------------------------------	--

This last species marks the "cedar swamps," so characteristic of some portions of this region. The other regions may be tolerably well marked by the boundaries of the State, the names of which they bear:—C. *Tennessee*, D. *Ohio*, and E. *Mississippi*, distinguished by the presence of *Taxodium distichum*, Rich.; *Pinus mitis*, Michx.; *P. Taeda*, Linn., &c.

III. THE CAMPESTRIAN PROVINCE comprises the great prairies of—A. *Texas*, B. *Illinois*, C. *Saskatchewan*, D. *Dacotah*, and E. *The Comanche Indian Country*. It is distinguished by an almost entire absence of trees, forest being only found round its borders; but, as it has a group of plants and animals almost peculiar to itself, it deserves the prominence of being marked off as a special region. The abrupt termination of the mountain region to the westward, and the forest to the east, make an entire change in the phytogeography. These prairies seem to be due to the want of moisture sufficient for tree growth, though their distance from the rain-laden sea-breeze does not prevent their acquiring sufficient for the purposes of agriculture.

IV. THE CAURINE PROVINCE.—This comprehends all the region to the west of the Rocky Mountains north of 33°

N. latitude, and contains a group of coniferæ almost peculiar to it. It is so broken up by mountains, and with so many different climates, that it contains more distinct regions and districts than any other portion of America. The Cascade range of mountains, which also, under the name of Sierra Nevadas, runs longitudinally through North-West America, divides the country into two great regions—the one to the west of the range (A), and the other to the east of it (B). The region to the west of the Cascade is a moist, forest-clothed country; while the moist breezes of the Pacific, being intercepted by the mountains, the eastern side of the Cascade, and on to the Rocky Mountains, except where local circumstances bring about a few exceptions, is very dry, and, in some cases, even a desert—thinly scattered with, or wholly wanting in trees. Accordingly, both great regions are distinguished by peculiar faunas and floras. First, then, the region to the west of the Cascade is divided into various districts, distinguished by the predominance of some particular species of conifer. I have reasons to fix the commencement of the true Pacific flora south of the peninsula of Aliaska, the species found north of that belonging to the flora of the eastern side of the Rocky Mountains—in all probability, to the Athabaskan Region of the Lacustrian Province. In most maps, the Rocky Mountain range is prolonged in a straight line corresponding to the general trend of these mountains to the Northern Ocean. Mr W. H. Dall, of the late Collins' Overland Telegraph Expeditions, has pointed out that this is an error. About lat. 64° N., the Rocky Mountains trend to the westward, and meet the coast range (a lower range lying between the Cascades and the Pacific) in a confined high rolling country, the distinctive characteristics of both ranges being lost. These mountains, however, soon appear to merge into one high volcanic range, trending to the westward, and afterwards to the southward, and forming the backbone of the peninsula of Aliaska. A gap occurs to the northward, between the Mackenzie and Porcupine Rivers, filled with low rolling hills. Along the shores of the Northern Ocean, from the mouth of the Mackenzie westward, a separate range exists, following the trend of the shore, nearly parallel with the southern volcanic range, and terminating in a few high

peaks near the mouth of the Colville River. This range has long been marked as the Romanzoff Mountains, being a landmark for whalers who pass Point Barrow. For the southern volcanic range, Mr Dall proposes the name of the Aliaskan Mountains. The gap before mentioned leads to unexpected faunal differences. The west coast fauna is bounded on the north by the Aliaskan Mountains, while the valley of the Youkon possesses a northern and eastern fauna. Birds like *Colaptes auratus*, *Ampelis garrulus*, &c., abound, the western or midland faunal types of *Colaptes* (*hybridus* or *mexicanus*) being wanting.* South of this is a district (1.) which, from the name of the Indians who, under various tribal names, inhabit it, may be called the *Kalosh District*, distinguished by forests of *Thujaopsis borealis*, Carr., and the absence of various species which make their appearance subsequently. The next district (2.) begins with the forests of *Abies Douglasii*, Lindl., in 54° N. lat., and extends to about 43° N. lat. From the prevalence of the Douglas fir, it may be called the *Douglasian District*. In addition to this species, the most characteristic trees are *Abies Mertensiana*, Lindl.; *Picea amabilis*, Dougl.; *P. grandis*, Dougl.; *Abies Menziesii*, Dougl.; *Thuja gigantea*, Nutt.; *Juniperus Henryana*, R. Br. min. &c. (3.) *The Umpqua District*, from 43° to about 42° N. lat., distinguished by the forests of *Cupressus fragrans*, Kell. Here *Libocedrus decurrens*, Torr., first begins to make its appearance on the mountains. (4.) *The Sequoian District* begins with the forests of *Sequoia sempervirens*, in 42° N., confined to the western slope of the coast range. This inferior range hitherto has not interfered with the distribution of species. However, in this latitude, it possesses a flora peculiar to its own sides, and divides California into two districts—1st, that which we have already spoken of (the Sequoian); and 2d, the one between the Coast range and the Cascades. (5.) *The Sequoian District* possesses as characteristic species, in addition to *Sequoia sempervirens*, *Pinus insignis*, Dougl.; *Pinus muricata*, Dougl.; *P. tuberculata*, Don; *P. Coulteri*, Don; *Picea bracteata*, Don; *Torreya californica*, Hook.; *Cupressus MacNabiana*, Murr.; *C. macrocarpa*,

* Proceedings of the Boston Natural History Society, vol. xii. Nov. 4, 1868, p. 144; and in "Die Telegraphen—Expeditionen auf dem Yukon in Alaska," in Petermann's "Geographische Mittheilungen," 1869, p. 861, tafel 19.

Benth., &c.; while the second district is marked by the presence of *Pinus Sabiniana*, Dougl.; *P. Lambertiana*, Dougl. *P. Balfouriana*, Oreg Com.; *Cupressus Lawsoniana*, Murr.; and *Sequoia* (*Wellingtonia*) *gigantea*, Lindl. The region east of the Cascade may be divided into two—1. A *Northern* or *Youkon District*, very little known, scattered thinly with *Pinus contorta*, Dougl., and *P. ponderosa*, Dougl. 2. A *Kootanie District*, commencing near Fraser River. Here, through the Columbia gap in the Cascades, the moist breezes penetrate, and we have forest clothing the hills almost to the water's edge. Its southern termination may be said to be when the moist influence of these breezes ceases. 3. The *Shoshonne District* comprehends all the desert arid tracks between the Cascades and the Rocky Mountains. In all likelihood, it is divisible into several districts; but we are as yet too ignorant of the botanical features of a great portion of it to decide this with any certainty. It is better, therefore, to allow it to remain as I have given it. One of the most characteristic conifers in it is *Juniperus occidentalis*, Dougl. *Pinus ponderosa* and *P. contorta*, covering dry, arid tracts, without underbrush, are the other most characteristic, though not peculiar, trees. It comprehends Cooper's *Wasatch* and *Padonean Regions*.

C. *The Colorado Desert* region (equivalent to Cooper's *Nevadian*, which name is apt to confound this with the flora of the Sierra Nevadas, with which it has nothing in common). It comprehends the Colorado desert, Lower California, and Arizona. There are few coniferæ in it—its characteristic trees and shrubs being species of *Populus*, *Yucca*, *Fremontia*, *Strombocarpa pubescens*, *Algaroba glandulosa*, *Cereus giganteus*, *C. Thurberi*, and other *Cactaceæ*, &c.

D. The last region in North West-America is the *Montane*. On the mountain ranges throughout the province, no matter in what latitude, after an average height of 4000 feet is reached—the height varying with latitude—a group of pines are found nowhere else. These are *Pinus flexilis*, James; *P. cembroides*, Zucc.; *P. monophylla* (*Fremontiana*), Torr.; *Abies Pattoniana*, Jeff.; *Larix Lyallii*, Parl.; *L. occidentalis*, Nutt., &c. There is also a fauna peculiar to the same elevation, as well as an extensive alpine her-

baceous flora, many species of which are also found through the Arctic regions.*

V. THE MEXICAN PROVINCE may be divided into three regions.

A. *The New Mexican*, comprising the region of which the state of that name is the centre.

Characteristic species :—

<i>Pinus Greggii</i> , <i>Engl.</i>		<i>Pinus edulis</i> , <i>Engl.</i>
<i>Abies Engelmanni</i> , <i>Parry.</i>		<i>Picea concolor</i> , <i>Engl.</i>

B. *The Aztec or Mexican Region proper.*

Characteristic species :—

<i>Pinus</i> <i>Teocote</i> , <i>Ch.</i> and <i>Sch.</i>		<i>Pinus</i> <i>pseudo-Strobus</i> , <i>Lindl.</i>
<i>patula</i> , <i>Schred.</i> and <i>Deppe.</i>		<i>ayachuite</i> , <i>E. Ehr.</i>
<i>Chihuahua</i> , <i>Engl.</i>		<i>Taxodium mucronatum</i> , <i>Ten.</i>
<i>Montezumæ</i> , <i>Lamb.</i>		<i>Cupressus Lindleyi</i> , <i>Klotsch.</i>
<i>β. macrophylla</i> , <i>Lindl.</i>		<i>thurifera</i> , <i>Humb.</i>
<i>Lindleyana</i> , <i>Gordon.</i>		<i>Juniperus mexicana</i> , <i>Schiede.</i>
<i>Hartwegii</i> , <i>Lindl.</i>		<i>tetragona</i> , <i>Schlecht.</i>
<i>leiophylla</i> , <i>Schiede</i> et		<i>flacqida</i> , <i>Schlecht.</i>
<i>Deppe.</i>		<i>Taxus globosa</i> , <i>Schlecht.</i>
<i>oocarpa</i> , <i>Scheede.</i>		

C. *The Guatemalan Region.*—Southern Mexico and Northern Central America.

Characteristic species :—

<i>Pinus filifolia</i> , <i>Lindl.</i>		<i>Cupressus Benthami</i> , <i>Endl.</i> (which
<i>tenuifolia</i> , <i>Humb.</i>		is, however, also got further
<i>Picea religiosa</i> , <i>Benth.</i>		north.)

VI. TROPICAL AMERICAN OR COLUMBIAN PROVINCE.—The higher ranges of mountains of equatorial America produce the following characteristic species :—

<i>Podocarpus silicifolia</i> , <i>Klotsch.</i>		<i>P. macrostachya</i> , <i>Parl.</i>
<i>P. Sprucei</i> , <i>Parl.</i>		<i>P. taxifolia</i> , <i>Kunth.</i> (Also in Peru.)

* These phyto-geographical regions will be fully described in the author's separate work on the Phyto-geography and Forest Trees of North-West America, now in preparation. Those to the northward have been already to some extent described in various papers in the Transactions of this and the Royal Geographical Society, in my memoir *Das Innere der Vancouver Insel* (Petermann's Geogr. Mitt. 1869, heft i.-iii. tafel i.), in various papers in Cassell's "Illustrated Travels," and *Vancouver Island Explorations* (Victoria, V. I., 1865).

VII. BRAZILIAN PROVINCE.—The Brazilian Andes and the mountains in the vicinity of the upper reaches of the Amazons.

Characteristic species :—

Gnetum paniculatum, <i>Spruce.</i>	Ephedra humilis, <i>Wedd.</i> (Bo-
Leyboldi, <i>Tul.</i>	livia.)
amazonicum, <i>Tul.</i>	Tweediana, <i>Fisch. et Mey.</i>
thoa, <i>R. Br.</i> (English	(Buenos Ayres.)
Guiana.)	americana, <i>Humb.</i>
nodiflorum, <i>Brong.</i>	(Buenos Ayres.)
(French Guiana.)	triandra, <i>Tul.</i>
venosum, <i>Spr. et Benth.</i>	Araucaria braziliensis, <i>A. Rich.</i>
macrostachyum, <i>Spr. et</i>	Podocarpus Sellowii, <i>Klotzsch.</i>
<i>Benth.</i>	

VII. CHILIAN PROVINCE, comprising Peru, Chili, and Patagonia. It is divisible into—

A. *The Araucarian Region*—Chili and Peru.

Characteristic species :—

*Ephedra andina, <i>Pöppig.</i>	Lepidothamnus Fonki, <i>Phil.</i>
Araucaria imbricata, <i>Pav.</i>	*Podocarpus oleifolia, <i>Don.</i>
chilensis, <i>Endl.</i>	* chilina, <i>Rich.</i>

B. *The Magellanic Region*, comprising Patagonia.

Characteristic species :—

†Fitzroya patagonica, <i>Hook. fil.</i>	†Podocarpus nubigena, <i>Lindl.</i>
Saxe-Gothæa conspicua, <i>Lindl.</i>	† andina, <i>Pöppig.</i>

These regions, more especially the *Magellanic*, have some connection with the Australasian in the nature of the genera, and indeed (in herbaceous species) with species too.

VIII. THE ANTILLES PROVINCE.—The West Indies and Florida.

Characteristic species :—

Pinus cubensis, <i>Griseb.</i> (Cuba.)	Torreya taxifolia, <i>Arn.</i> (Florida.)
occidentalis, <i>Swartz.</i> (San	Podocarpus coriacea, <i>Rich.</i> (Ja-
Domingo, Cuba.)	maica and Montserrat.)
Juniperus bermudiana, <i>Linn.</i>	P. Purdieana, <i>Hook.</i> (Jamaica.)
(Bermuda and Florida.)	aristulata, <i>Parl.</i> (Cuba.)

* Those marked * are common to Peru and Chili. The others are, as far as we yet know, peculiar to Chili.

† Those marked † are common to Chili and Patagonia.

It thus seems as if this province could be divided into at least two regions—A. *The Floridan*, and B. *The West Indian*. The species are, however, so few in number, as scarcely to admit of such generalisations being indulged in. Notwithstanding the proximity of these islands to Central America, and their similarity of climate, the two countries do not possess a single species in common.

IX. JAPANESE PROVINCE.—Asia, near Behring Straits, is closely connected with the opposite American shores, and, accordingly, we need not be surprised to find that some species of coniferæ are common to both sides. The Asiatic islands included in the Japanese Archipelago, and the greater portion of the peninsula of Kamschatka, are, however, sufficiently distinct in species to merit being divided off into a separate province. The connection of the Japanese and the North-West American floras has been pointed out by various observers, and the similarity of the zoology of the two provinces has been also remarked.* That these islands, the opposite Asiatic and American coasts, were originally part of one continent, there can, I imagine, be but little doubt. The Japanese province resolves itself into two very natural and extensive regions. These are—

A. *The Cipangian† Region*, comprising all the Japanese islands north-west to the Kuriles.

Characteristic species :—

<i>Pinus densiflora</i> , Sieb. et Zucc.	<i>Abies obovata</i> , Ant. (Kuriles only).
Thunbergii, Parl.	aragagi, Sieb.
parviflora, Sieb. et Zucc.	<i>Picea brachyphylla</i> , Parl.
<i>Larix leptolepis</i> , Endl.	firma, Ant.
<i>Abies Alcoquiana</i> , Veitch.	selenolepis, Parl.†

* Spence Bates, in Lord's "Naturalist in British Columbia," vol. ii. &c. ; vide also Asa Gray on the Flora of Japan, in Mem. American Acad. of Arts and Sciences, vol. vi. n. s. ; and Miquel, in the Transactions of the Royal Academy of Sciences of Amsterdam, 1866 ; and in the Archives Néerlandaises, 1867.

† The old voyagers, in search of a North-West Passage, used to speak much of the land of *Cathay* (China) and *Cipango* (Japan), which they hoped to reach. The phrases have now become classical.

‡ *Picea Veitchii*, Lindl., changed by Parlatore to the present name, on account of Roehl having already applied Mr Veitch's name to a Mexican species of *Pinus*.

Sciadopitys verticillata, Sieb. et Zucc.	Juniperus conferta, Parl.
Thujopsis dolabrata, Sieb. et Zucc.	Taxus tardiva, Laws.
Chamaecyparis pisifera, Sieb. et Zucc.	Cephalotaxus pedunculata, Sieb. et Zucc.
C. obtusa, Sieb. et Zucc.	C. drupacea, Sieb. et Zucc.
C. squarrosa, Sieb. et Zucc.	Torreya nucifera, Sieb. et Zucc.
Juniperus rigida, Sieb. et Zucc.	Podocarpus nagela, R. Br.
	Podocarpus macrophylla, Don.

B. *The Kamschatkan Region*, comprising a part of the Amur River Region near the coast, and all Kamschatka, cut off by a range stretching down from the Arctic Sea and joining the Altaic Range, which again limits the southern range of the Siberian flora.

Characteristic species :—

Pinus Cembra, Linn., var. *pumila*.

(This is also found at Kotzebue Sound. I am, however, inclined to believe it a member of the Athabaskan American flora (*ut antea*) common to the Asiatic coast, rather than belonging to the flora under question.)

<i>Pinus koraiensis</i> , Sieb. and Zucc.	<i>Abies polita</i> , Ant. (Japan & Corea).
(Japan, Kamschatka, and Corea).	<i>Picea holophylla</i> , Parl.
	<i>Abies Menziesii</i> , Dougl.

(The last mentioned is one of the most remarkable members of the characteristic North-West American flora, which stretches down to the Kurile Islands in stragglers. It has also been found in Eastern Siberia and Japan.)

Many of the Japanese coniferæ, though nominally distinct, are closely allied to the North-West American species, as has been well shown by Mr Murray in his well-known work on the Japanese Coniferæ.*

X. CATHAYAN PROVINCE.—China, south of the Altai Mountains, seems to have some coniferæ peculiar to it, but we know too little of the flora of China, more especially of the northern portion, to map out its phyto-geography with any approach to precision. It appears, however, that the Corean flora is more allied to the Japanese than to the

* Proceedings of the Royal Horticultural Society, 1862.

Chinese, and that the coniferæ, at least of Cochin-China, are members of the Indian province.

Characteristic species:—

Pinus Massoniana, <i>Lamb.</i>	Cunninghamia sinensis, <i>R. Br.</i>
Larix Kæmpferi, <i>Lamb.</i>	Cryptomeria japonica, <i>Don.</i>
Abies Fortunei, <i>Parl.</i>	

(Also Japan, but probably introduced, as several of the Japanese ornamental plants appear to have been, from China.)

Glyptostrobus heterophyllus, <i>Endl.</i>	Cephalotaxus Fortunei, <i>Hook.</i>
Juniperus taxifolia, <i>H. & A.</i>	Torreya grandis, <i>Fortune.</i>
sphærica, <i>Lindl.</i>	Gingko biloba, <i>Linn.</i>
	Podocarpus chinensis, <i>Wall.</i>

XI. INDIAN PROVINCE, comprehending the species of coniferæ belonging to the warmer portion of India and Cochin-China, &c., distinct from those found on the higher reaches of the Himalayas. It is nearly connected with the Indo-Malayan Province, to be presently described.

Characteristic species:—

Pinus longifolia, <i>Roxb.</i>	Podocarpus latifolia, <i>Wall., &c.</i>
--------------------------------	---

Limited as are the number of species, they are, though not all *peculiar* to this province, yet so *characteristic* of it, as to justify us in dividing it into a separate province.

XII. INDO-MALAYAN PROVINCE.—Some years ago Mr Alfred Wallace showed in a paper, which is now becoming almost classical,* and more recently in his work on the “Malay Archipelago,”† that the fauna of the islands of the Malay Archipelago might be divided into two distinct faunas—the one of the islands nearest the Indian continent partaking of the characteristics of the fauna of India—hence the name he applied to it. The other was of the peculiar Australian character, he therefore designated it the *Austro-Malayan*. He does not seem to have claimed for this division the merit of also holding good with regard to the floras; but if his grand generalisation is sound, one

* Journal of the Royal Geographical Society, vol. xxxiii. (1863), p. 217.

† London, 1869.

would think that this would also hold true. In studying the coniferæ of the Malay Archipelago, I have found that the species resolve themselves into two groups on either side of "Wallace's Line,"—the only exceptions being so doubtful that they almost confirm the law,—I have therefore kept up his name, though I ought to remark, as far as we yet know, only two of the coniferæ of the Malay Archipelago have been found in India, and not one in Australia.

Characteristic species (of Indo-Malayan Province):—*

Gnetum Griffithsii, <i>Parl.</i>	Cephalotaxus sumatrana, <i>Miq.</i>
neglectum, <i>Blume.</i>	Podocarpus Blumei, <i>Endl.</i>
β microcarpum, <i>Blume.</i>	Beccarii, <i>Parl.</i>
scandens, <i>Roxb.</i> (also in Sikkim.)	falciformis.
funiculare, <i>Blume.</i>	polystachya, <i>R. Br.</i>
Dammara Motleyi, <i>Becc.</i>	†leptostachya, <i>Blume.</i>
Pinus Merkusii, <i>Jungh. et de</i>	Rumphii, <i>Blume.</i>
<i>Vriese.</i>	Teysmanni, <i>Mig.</i>
†Dacrydium elatum, <i>Wall.</i>	amara, <i>Blume.</i>
Beccarii, <i>Parl.</i>	neglecta, <i>Blume.</i>
Phyllocladus hypophylla, <i>Hook.</i>	cupressina, <i>R. Br.</i>
<i>fil.</i>	Cunningii, <i>Parl.</i>

XIII. AUSTRO-MALAYAN PROVINCE.—The species in this province are fewer than in the former, possibly for the reason that the botany of the islands nearer India has been more closely studied than the others. They are as follows:—

Characteristic species:—

Gnetum latifolium, <i>Blume.</i>	Podocarpus bracteata, <i>Blume.</i>
Dammara alba, <i>Rumph.</i>	

XIV. THE AUSTRALASIAN PROVINCE.—Australia and the neighbouring islands have, as has been long familiar to all physical geographers, a peculiar flora as well as fauna. This flora is of a mass so peculiar as to constitute a very natural and great phyto-geographical region, though in

* De Boer: Conif. Arch. Ind. (teste Parlatores, *lib. cit.*)

† Those marked with a dagger † are species common to both sides of the line.

reality it contains various subordinate floras, each region being in importance almost equivalent to the provinces in other parts of the world. For the present, however, we must consider them merely as regions of the great Australasian province. They are as follows :—

A. *The Polynesian Region*, comprising the Fiji Islands. It has but two species peculiar to the islands, as well as characteristic of them, viz. :—

Dammara macrophylla, *Lindl.* | *Dammara vitiensis*, *Seem.*

B. *Eastern Australia and the Northern Part of New South Wales.*

<i>Araucaria Bidwilli</i> , <i>Hook.</i>	<i>Frenela Endlicheri</i> , <i>Parl.</i>
<i>Eutaeta Cunninghami</i> , <i>Ait.</i>	<i>Muelleri</i> , <i>Parl.</i>
<i>Dammara robusta</i> , <i>C. Moore.</i>	<i>Fremantlei</i> , <i>F. Mull.</i>
<i>Frenela MacLAYANA</i> , <i>Ferd. Mull.</i>	<i>verrucosa</i> , <i>All. Cunn.</i>
<i>Parlatorei</i> , <i>Ferd. Mull.</i>	<i>Podocarpus spinulosa</i> , <i>R. Br.</i>
<i>rhomboidea</i> , <i>Endl.</i> (also	<i>elata</i> , <i>R. Br.</i>
in Tasmania and is-	<i>ensifolia</i> , <i>R. Br.</i>
lands lying between it	<i>alpina</i> , <i>R. Br.</i> (also
and New South Wales.)	in Tasmania.)
<i>Moorii</i> , <i>Parl.</i>	

C. *Southern Part of New South Wales, South Australia, and Victoria.*

<i>Actinostrobus pyramidalis</i> , <i>Mig.</i>	<i>Frenela Roei</i> , <i>Endl.</i>
<i>acuminatus</i> , <i>Parl.</i>	<i>Gulielmi</i> , <i>Parl.</i>
<i>Frenela subcordata</i> , <i>Parl.</i>	<i>robusta</i> , <i>All. Cunn.</i>
<i>canescens</i> , <i>Parl.</i>	<i>Podocarpus Drouyniana</i> , <i>Ferd.</i>
<i>Drummondii</i> , <i>Parl.</i>	<i>Mull.</i>

D. *Tasmania.*

<i>Arthrotaxus cupressoides</i> , <i>Don.</i>	<i>Dacrydium tetragonum</i> , <i>Hook.</i>
<i>taxifolia</i> , <i>Hook.</i>	<i>Pherosphaera Hookeriana</i> , <i>Arch.</i>
<i>selaginoides</i> , <i>Don.</i>	<i>Phyllocladus rhomboidalis</i> , <i>Rich.</i>
<i>Frenela Gunnii</i> , <i>Endl.</i>	<i>Podocarpus alpina</i> , <i>R. Br.</i> (also
<i>Diselma Archeri</i> , <i>Hook. fil.</i>	in S. E. Australia.)
<i>Dacrydium Franklinii</i> , <i>Hook. fil.</i>	<i>β Laurencii</i> , <i>Hook. fil.</i>
(also at Port Macquarrie.)	

E. *New Zealand.*

<i>Dammara australis</i> , <i>Lamb.</i> (also	<i>Libocedrus Doniana</i> , <i>Endl.</i>
in E. Australia.)	<i>Bidwilli</i> , <i>Hook.</i>

Dacrydium cupressinum, <i>Soland.</i>	Podocarpus Totara, <i>Don.</i>
laxifolium, <i>Hook. fil.</i>	ferruginea, <i>Don.</i>
Colensoi, <i>Hook.</i>	nivalis, <i>Hook.</i>
Kirkii, <i>Ferd. Mull.</i>	spicata, <i>R. Br.</i>
Phyllocladus trichomanoides, <i>Don.</i>	dacrydioides, <i>A. Rich.</i>

F. *New Caledonia, New Hebrides, and Norfolk Island.*—Though I have included Norfolk Island in this region, yet that island has all its species peculiar to itself. It is, however, so close to the others, that I cannot but think that further exploration will show species on other islands common to it also. Those marked with an asterisk are peculiar to this island:

Araucaria Rulei, <i>Ferd. Mull.</i>	Dacrydium taxoides, <i>Brongn.</i>
*Eutacta excelsa, <i>R. Br.</i>	araucarioides, <i>Brongn.</i>
*Cookii, <i>R. Br.</i>	Podocarpus minor, <i>Carr.</i>
Dammara ovata, <i>C. Moore.</i>	Novæ - Caledoniæ, <i>Viell.</i>
obtusa, <i>Lindl.</i> (New Hebrides.)	usta, <i>Brongn.</i>
Moorii, <i>Lindl.</i>	tenuifolia, <i>Carr.</i>
Frenela sulcata, <i>Parl.</i>	Viellardii, <i>Parl.</i>
subcordata, <i>Parl.</i>	

XIV. THE THIBETO-HIMALAYAN PROVINCE.—This province appears to stretch away into Persia, and to join the Caucasian. The species found on it, on the Himalayas, and on the borders of Hindostan and Thibet, are best known. The others are but vaguely described, while large portions of the region over which it seems to stretch is simply a *terra incognita*. The following seem to be characteristic of the province:—

Ephedra alte, <i>C.A. Mey.</i> (Mount Sinai and Persia.)	Picea Webbiana, <i>Wall.</i>
Pinus persica, <i>Strangw.</i> (Persia.)	Abies dumosa, <i>Don.</i>
Gerardiana, <i>Wall.</i>	Cupressus torulosa, <i>Don.</i>
excelsa, <i>Wall.</i>	Juniperus recurva, <i>Hamilt.</i>
Cedrus Deodara, <i>Rox.</i>	pseudo-Sabina, <i>Fisch.</i>
Larix Griffithii, <i>Hook. fil. et Thoms.</i>	and <i>Mey.</i> (also on the Altai range, in Siberia.)
Abies Smithiana, <i>Lamb.</i>	Podocarpus neriifolia, <i>Don.</i>
Picea Pindrow, <i>Boyle.</i>	

XV. RUSSO-SIBERIAN PROVINCE.—Russo-Siberia may be

probably divided into three phyto-geographical regions—
A. That part of Siberia north of a range running south near the Lena and westward to the East Cape ; B. Siberia to the Ural Mountains, with Eastern Russia ; and, C. The rest of Russia east of the Baltic.* The southern limit of the Siberian flora in Asia I take to be the Altai and Yablonoi Mountains. Taken as a province, the characteristic species of conifers are as follows :—

<i>Ephedra monosperma</i> , Gmel.	<i>Picea sibirica</i> , Turcz.
<i>Larix davurica</i> , Fisch.	<i>Juniperus davurica</i> , Pall.
<i>Larix Ledebourii</i> , Endl.	(Altai.)
<i>Pinus Cembra</i> , Linn.	<i>pseudo-Sabina</i> , Fisch.
<i>Abies obovata</i> , Ant.	et Mey.
β <i>Schrenkiana</i> , Fisch.	
(Kirghis desert, &c.)	

The last species is also found on the Himalayas, throughout the flora of the Altai, &c.; is connected with the former province (XIV.)

XVI. THE CAUCASIAN PROVINCE, comprising the Caucasus and its continuations :—

Characteristic species :—

<i>Ephedra procera</i> , Fisch. et Mey.	<i>Juniperus drupacea</i> , Labill.
<i>lomatolepis</i> , Schrenk.	<i>excelsa</i> , Breb. (on to
<i>stenosperma</i> , Schrenk.	Persia.)
<i>Cedrus Libani</i> , Barr.	<i>fœtidissima</i> , Willd.
<i>Abies orientalis</i> , Linn.	(also in Greece.)
<i>Picea cilicica</i> , Ant. et Kotsch.	

This province seems to be connected in one direction with the Mediterranean Province, on the other with the Himalayan. For instance, *Cedrus libani* is but doubtfully distinct from *C. Deodara*, and so on.

XVII. NORTHERN EUROPEAN PROVINCE.

Characteristic species :—

<i>Pinus sylvestris</i> , Linn.		<i>Abies excelsa</i> , DC., &c.
---------------------------------	--	---------------------------------

This province (or it is only a region of the great Germanic flora) is more distinguished by the collective indi-

* "Many years ago, Gmelin considered the Yenesei River as the boundary between the Asiatic and European floras. Here, in addition to new plants, new animals also begin to make their appearance."—Prof. *Flora Sibirica*, xlv.

viduals of one or two species forming forests than by a number of species.

XVIII. MID-EUROPEAN OR GERMANIC PROVINCE extends south to about the Carpathians.

Characteristic species :—

Pinus maritima, <i>L.</i>	Larix europæa, <i>DC.</i>
Cembra, <i>Linn.</i>	Picea pectinata, <i>Du Roi, &c.</i>

XIX. MEDITERRANEAN PROVINCE.—This is a most extensive province, the species throughout which are widely scattered. It includes the countries bordering the Mediterranean, &c., and may be divided into the following regions :—

A. *Iberian and North African*, comprising Spain, Portugal, and North Africa immediately adjoining.

Characteristic species :—

Ephedra nebrodiensis, <i>Tn.</i> (also throughout Sicily.)	Cedrus atlantica, <i>Man.</i> (var. of <i>C. libani</i> , <i>Barr.</i>)*
fragilis, <i>Duf.</i>	Picea Pinsapo, <i>Borr., &c.</i>
alata, <i>Decsne.</i> (N. Africa only.)	

B. *Italian*, comprising the middle region of the Mediterranean shores.

C. *The Cyprian*, comprising Greece and other islands. This flora joins in with that of the Caucasus.

Though these two latter regions are indicated, yet they can be but little more than indicated. Though there seems a natural bent of the species to group themselves into these regions, yet it is difficult on paper to map them out by lists of species. The following species are found within their limits :—

Ephedra vulgaris, <i>Rich.</i> (also in Himalayas.)	Pinus pyrenaica, <i>Lapeyr.</i>
Pinus Pineæ, <i>Linn.</i> (also in Azorean region.)	Laricio, <i>Poir.</i> (also Western Asia.)
halepensis, <i>Mill.</i> (also Palestine and Georgia.)	Picea cephalonica, <i>Loud.</i>
Pinaster, <i>Soland.</i> (all Mid. region.)	Cupressus sempervirens, <i>Linn.</i> (Also in India), &c.

* *Cedrus atlantica*, Manetti in Cat. Hort. Madoet Suppl. p. 8. *Cedrus libani* γ *atlantica*, Parlatores, in *Lib. cit.* p. 408.

D. *The Azorean Region*, comprising the Canaries and neighbouring Atlantic islands.

Characteristic species—

Pinus Hamiltoni, <i>Lindl. et Gord.</i>		Juniperus Cedrus, <i>Webb.</i>
canariensis, <i>Ch. Sm.</i>		brevifolia, <i>Ant.</i>

Besides some other species common to the mainland.

XX. ABYSSINIAN PROVINCE.—Africa has so very few coniferæ that we are sometimes puzzled into what geographical group to throw its species. For instance, Abyssinia is only known to possess one species of conifer, but that is peculiar to it. The species is *Juniperus procera*, Hochst.; and therefore, provisionally for it, we must make out Abyssinia as a special province of coniferous distribution. Of a like nature are some of those which follow.

XXI. DAMMARAS PROVINCE.—Characterised by the remarkable *Welwitschia mirabilis*, Hook. fl.*

XXII. MADAGASCAR AND MAURITIUS.

Characteristic species:—

Widdringtonia Commersonii, <i>Endl.</i>		Callitris quadrivalvis, <i>Vent.</i> (also
Ephedra altissima, <i>Def.</i>		in Barbary.)

XXIII. CAPE OF GOOD HOPE AND NATAL.

Characteristic species:—

Widdringtonia juniperoides, <i>Endl.</i>		Podocarpus Meyeriana, <i>Endl.</i>
natalensis, <i>Endl.</i>		falcata, <i>R. Br.</i>
cupressoides, <i>Endl.</i>		elongata, <i>L'Herit.</i>
Podocarpus Thunbergii, <i>Hook.</i>		

XXIV. GUINEA, in which is found alone *Podocarpus Mannii*, Hook. fl.

As these regions become better explored, some of the provinces will be shown to be merely arbitrary, and not natural. In the present state of our knowledge they are, however, useful, if for nothing better than as pegs to hang our knowledge on.

* As I have adopted Professor Parlatore's arrangement, I have put *Welwitschia* among the *Gnetaceæ*. Dr Hooker, however, originally described it as a member of the *Cycadaceæ*.

GENERAL CONCLUSIONS.

1. Coniferæ are found all over the globe ; but they affect cool situations. Whenever a northern species wanders southward of the region where it obtains its maximum of development (such as *Abies Douglasii* to Mexico), it climbs to an elevation where the mean temperature approximates to that in which it is found farther northward, and *vice versa*.

2. Each species spreads in the direction of the least (α) meteorological change, and (β) physical change. Mountain ranges are, next to meteorological conditions, the most important elements affecting the range of species.

3. Each species has, in all likelihood, an isotherm of its own, and the whole Order only prospering within certain limits, these limits not being very wide.

4. Temperature is not so important to the growth of coniferæ as moisture. This is the all-important element in the growth of forests ; the great steppes of Asia and prairies of America being almost entirely due to the absence of sufficient moisture for the prosperity of trees. Trees require at least from fifteen to sixteen inches of rain during the growing season. The dense forests, for instance, of the western slope of the Cascades is wholly due to the abundant supply of rain that region obtains. Its effect is well seen in the treeless aspect of San Diego, in southern California, which has an annual rain-fall of only eight and a half inches, while Sitka, in the territory of Alaska, is deluged under the enormous rain-fall of nearly seven and a half feet per annum !

5. Each species has a region where it obtains its maximum of development. Out of this region it decreases in individuals, as well as in the vigour and general appearance of these individuals.

6. Each *natural* genus seems to have been created in the centre, in which the greater number of its species is found. That these centres of creation have undergone many modifications by great geological changes since their original creation there can be but little doubt, and many of these anomalies of the distribution of plants may be thus explained. The question of the origin of these species does

not, I conceive, come within the province of this paper. With the modification stated, I consider that I am justified in saying (though with much diffidence, as many illustrious naturalists hold an entirely contrary opinion), that the idea of specific centres is not yet established as a "perfect delusion."* When we find a large number of closely allied species of a genus wholly confined to one limited district, we may conclude that these species have originally sprung from some parent type.

7. The range of species is no way, however, limited to systematic classification, species of one genus being found in widely distant localities. There may, however, have been some original connection between these localities.

8. It is most erroneous to say that in every case climate, elevation, &c., do not affect the distribution of plants and animals. Whatever may have been the effect of former geological and physical changes—as exemplified in distributing the Malayan flora and fauna—this is not so in some other parts of the world, such as North-West America, &c.

9. Geological structure of a country has a considerable influence in limiting the distribution of a species—for instance, *Sequoia sempervirens* is bounded by the metamorphic sandstone of the coast range, and the line of junction between the Carboniferous rocks of the Illinois region with the Cretaceous and Tertiary, is a distinct limitation of many species of trees—by rendering the soil more porous and drier.

Such, in a few words, are a few of the general conclusions I have arrived at as far as I have gone. I beg that they will be received merely as *primitiæ*—a sort of programme of a more extended essay which I may crave permission to lay before the Society at another time. I may mention, that since this paper was written, the treatise of Dr Hildebrand, "Die Verbreitung der Conifern in der Jetztzeit und in den früheren geologischen Perioden," † who also quotes Th. Beinling, "Ueber die geographische Verbreitung der Conifern," has reached me. As both authors

* Bentham: Address to the Linnean Society, May 24, 1869. "Proceedings," lxxviii.

† "Verhandlungen des naturhistorischen Vereines der preussischen Rheinlande und Westphalens. Zweite Hälfte." Bonn, 1861, p. 199.

appear to treat the subject from a totally different standpoint from mine, I have nothing to remark regarding their elaborate memoirs further than to recommend their general accuracy and the painstaking work displayed in them.

II. *On the Distribution of Forests in North-West America, with Notes on the Deciduous Trees and Shrubs.* By ROBERT BROWN, F.R.G.S., &c.

[This paper will form a portion of the author's "Horæ Sylvanæ," now in course of publication. An abstract of the general conclusions is given in the foregoing paper, as well as in "Die Wälder im Nordwestlichen Amerika," in Petermann's "Geographische Mittheilungen," 1860, p. 308.]

III. *Notes of an Excursion to Clova in April 1869.* By Professor BALFOUR and Mr BELL. Communicated by Professor BALFOUR.

Dr Balfour stated that as the Highland mountains were seldom visited by botanists in spring, he thought that it might be useful to take an excursion to Clova before the commencement of the summer session. Accordingly, on the 22d April last, he, along with one of his sons and Mr William Bell, started for Kirriemuir. They were conveyed by dogcart from Kirriemuir to Clova, and took up their quarters at the Ogilvy Arms Hotel, now kept by Mr James Alexander, where they were comfortably accommodated. On the day of their arrival they paid a visit to Loch Brandy and the rocks in its vicinity. There were few flowering plants to be seen. Those noticed were *Saxifraga oppositifolia* in full flower, *Eriophorum vaginatum* and *Luzula campestris* (small form). Many good mosses, however, were met with, such as *Mnium subglobosum*, *M. cinclidioides*, *Bryum duvalii*, *Splachnum sphaericum*, *Hypnum molle*, *Fontinalis squamosa*, &c. On the 23d they paid a visit to Glen Fee, and collected the following species:—*Arctostaphylos Uva-ursi*, *Vaccinium Vitis-Idæa*, *Pyrola media*, *Empetrum nigrum*, *Viola sylvatica*, *Anemone nemorosa*, *Eriophorum angustifolium*, *Draba incana*, *D. verna*, *Caltha palustris*, *Lycopodium clavatum*, *alpinum*, *Selago*, *selaginoides*, and *Woodsia hyperborea*. They met also with old specimens of *Oxytropis campestris*, and a great number of cryptogam-