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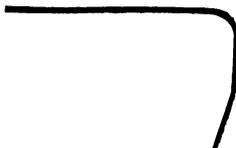
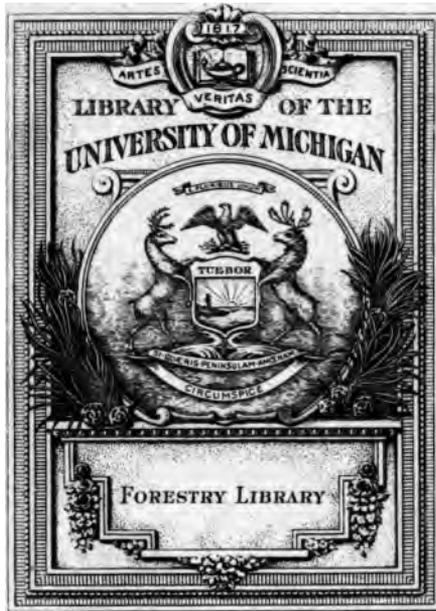
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AND

WILLIAMS AND NORGATE,

1881.







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reverse the direction of rotation and also reverse the direction in which you look along the axis, the direction of twist is not altered.

I suppose myself to have shown :—

(1) That Linnæus's original definition of right-hand twist is exceedingly good, and contains no surplusage.

(2) That in observing contortion it makes no difference whether you imagine yourself within or without the spire, so long as you do not turn yourself round or stand upon your head.

(3) That all botanists are agreed which is a right-hand twist, viz. the clock-hand way.

(4) That the differences in describing the contortion of a corolla-bud arise from some botanists regarding it from the base, others from the tip.

(5) That it is a pure matter of convention whether we reckon the axis of growth of the flower as positive or negative; but that this is the only point of convention remaining to be settled.

(6) That it does not much matter which way it is settled; but that it is of the greatest importance to all botanic describers that it should be settled, definitely and finally, one way or the other.

1-17-34

On the Conifers of Japan.

By MAXWELL T. <sup>John</sup>MASTERS, M.D., F.R.S. & L.S.

Forestry  
S.H.  
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[Read December 2, 1880.]

(PLATES XIX. & XX.)

THE object of the following paper is to give a complete list of the Conifers of Japan known up to the present time, together with incidental remarks on their structure, affinities, synonymy, and geographical distribution. The list was originally drawn up as a guide to the identification of the numerous and well-preserved specimens of Conifers brought from Yesso and various parts of Japan by Mr. Maries, and which were kindly placed in my hands for determination by Messrs. Veitch. The study of these specimens necessitated reference to other Japanese collections, to the Coniferous plants of North-east Asia generally, and, to some extent, to those of the coast of North-west America. In carrying on these investigations, I have had the advantage of studying the collections at Kew (both living and dried), those at the British Museum, those in the museum of Messrs. Veitch (including the original  
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types brought home by the late Mr. John Gould Veitch), as well as living specimens in their nurseries and in various other horticultural establishments. The library at Kew has also been of great service to me in referring to the numerous publications relating to the subject in hand.

In drawing up the list, I have followed the arrangement of the genera adopted by Mr. Bentham in Benth. et Hook. 'Genera Plantarum,' vol. iii. p. 420 (1880). As to the species, I have followed the publications of Murray, Parlatore, Engelmann, and other authors; but I have personally examined all those native to Japan, except in the case of some genera (as *Juniperus* and *Podocarpus*), wherein, from lack of material, I have been constrained to depend chiefly on the labours of others.

The tabular list at pp. 483–485 comprises, in the first column, an enumeration of all the species known to inhabit the Japanese islands, inclusive of Yesso. The succeeding columns are intended to show the distribution of the Japanese Conifers in adjacent countries, as well as to indicate the existence and geographical distribution of nearly allied or "representative species." The columns relating to the mainland of North-east Asia and to the islands of Sachalin and Yesso contain, it is believed, a complete enumeration of the species so far as they are known. In the remaining columns only such species are entered as may be considered representative, very nearly related, or analogous to the Japanese species, or which have some special interest to warrant their introduction. Separate lists are given for the Kurile Islands and for those of Sachalin and Yesso, for the purpose of showing the relation of the Coniferous flora of Japan proper to that of North-east Asia and that of North-west America, between which countries and Japan these islands are situated. These lists must, of course, be looked on as approximately correct only; for, doubtless, much yet remains to be learnt of the floras of these regions.

The authorities specially referred to for indications as to the geographical distribution of particular species have been:—Parlatore in DeCandolle's 'Prodromus,' xvi. sect. 2, 1868; DeCandolle's 'Géographie Botanique;' Tchihatchef's French translation of Grisebach's 'Vegetation der Erde,' enriched as it is by notes of the translator and of M. Fournier; Beinling's memoir 'Ueber die Geographische Verbreitung der Coniferen;' Hildebrand's paper entitled "Die Verbreitung der Coniferen in der Jetztzeit und in den früheren geologischen Perioden," and other general works.

For the Conifers of the Arctic regions, of Siberia, of the north-east coasts of Asia, and the adjacent islands I have consulted Ledebour's 'Flora Rossica,' and Hooker on the Distribution of Arctic plants, Trans. Linn. Soc. vol. xxiii. (paper read June 21, 1860). For species found in Manchuria and Amuria I have turned to Trautvetter and Meyer's enumeration in Middendorff's 'Reise,' to Maximowicz's 'Primit. Flor. Amur.' (1859) p. 260, to Regel's 'Flora Ussuriensis' (1862), to Schmidt's 'Reise im Amurland und auf Sachalin.' For China I have depended on the publications of Bunge (Enum. Plant. Chin.), Ruprecht (Sertum Tianschanicum), Fortune, &c. For the Conifers of Russian America I have trusted to the publications of Ledebour, to Bongard's 'Observations sur la végétation de l'île de Sitka,' Seemann's 'Botany of the Herald,' Rothrock's 'Sketch of the Flora of Alaska.' For North-western America I have referred especially to Hooker's 'Flora Boreali-Americana' and Engelmann's "Monograph of Conifers" in the 'Botany of California'\*

In the detailed enumeration of the species (p. 485 *et seqq.*), the authorities for the names adopted and for the synonyms are cited in full, as also in cases where an illustration is given; but those publications in which no original description is given, but merely a transcript from some other source, are not expressly mentioned, the citation of the author's name alone being in such case sufficient.

The Conifers recorded as native to Japan, inclusive of Yesso, admit of being grouped in 13 genera, of which one only is peculiar to Japan, viz. *Sciadopitys*. Two genera are peculiar to Japan and China, viz. *Cryptomeria* and *Cephalotaxus* (unless the Sumatran *C. sumatrana*, a doubtful species, be included). *Ginkgo*, a Chinese genus, is supposed not to be native in Japan, though often cultivated. *Podocarpus* has representatives both in Japan and China; and its species are widely dispersed in tropical and subtropical regions. *Tsuga* and *Torreya* have each of them species in Japan and on both sides of the North-American continent. Several Japanese genera occur also in the Himalaya Mountains. The other genera which have Japanese representatives are widely distributed, especially in the northern hemisphere.

The 13 genera recorded in Japan comprise 41 species, exclusive of varieties and doubtful natives, thus distributed:—*Thuja* (in-

\* Veitch's very useful 'Manual of the Coniferæ' was issued only as this sheet was passing through the press; hence I have not been able to cite it as frequently as otherwise I should have done.—June 1881.

cluding *Thuyopsis*, *Biota*, and *Chamaecyparis* or *Retinospora*) has three species peculiar to Japan, including *T. japonica* or *Standishii*; *Juniperus* is represented by five species—three peculiar to Japan, two others common to Japan and China; *Cryptomeria* occurs both in Japan and in China; neither *Taxodium* nor *Sequoia* is found in Japan. *Cephalotaxus* is represented in Japan by three endemic species; a fourth occurs in China. One species of Yew (*Taxus tardiva*) is peculiar to Japan; another is common to that country and China. *Torreya* has one Japanese species; others are found in China, Florida, and California—widely separated regions. *Ginkgo* has been already alluded to. *Podocarpus* has three Japanese species; and others occur in China. *Cunninghamia* is exclusively Chinese, and *Sciadopitys* Japanese. *Pinus* has four species in Japan; but none are peculiar—China, North-east Asia, and in one case Europe even affording them a home. Of *Picea* (Spruce Firs) there are five species in Japan, three of which are peculiar; one is found in Corea also, and the others on the mainland of Temperate East Asia. *Tsuga* has two species peculiar to Japan. The Silver Firs (*Abies*) have three endemic species in Japan, and others common to Japan and North-east Asia. *Larix* has one species endemic to Japan and Yesso.

It may therefore be said that there are 41 species of Conifers in Japan, of which no fewer than 22 are supposed to be endemic; but this estimate will no doubt be diminished as our knowledge of the flora of adjacent regions increases.

Seven or eight species are common to Japan and China, the total in China amounting to about 20 species. Nine or ten species are common to Japan and the mainland of North-east Asia, the total number of species recorded from Manchuria and Amuria being 15. Only one species or variety (*Pinus Cembra*, var. *pumila*) is recorded as common to Japan, North Asia, and America, either on the Atlantic or Pacific sides. In Sachalin only 3 species are as yet recorded, all of which occur also in Japan. From Arctic Asia 6 species are known, none of which extends into Japan. In Siberia 14 species are enumerated, only one or two of which are found in Japan. The few species yet known from the Kurile Islands are also met with in Japan. Six species are known to inhabit Kamtschatka, of which *Pinus koraiensis* occurs also in Japan. The remaining species are of the Siberian group. On the other hand, all the species hitherto found in Corea occur also in Japan. The Conifers of the outlying islands

of Loo Choo, Hong Kong, and Bonin are, as might have been expected, of Chinese rather than of Japanese affinity. There is also a large number of species in America, the Himalayas, and Europe; but, with the one exception mentioned, none is common to these regions as well as to Japan.

For various reasons, the figures just given may not be strictly accurate; they are liable to alteration as our knowledge increases, and according to the views entertained by particular botanists as to the identification and limitation of species; but for our present purpose they are sufficiently correct, as it is not likely that the proportions which those figures represent will be materially changed.

Although the species may not be absolutely identical, yet Pines, Larches, Silver Firs, Spruce Firs, Junipers, Yews are represented in each of the geographical districts mentioned. The Hemlock Spruces (*Tsuga*) of Japan have representatives on both sides of the American continent, as well as in the Himalaya. The dwarf Cypressess of Japan (*Thuja* § *Chamæcyparis*) have also representatives on both sides of the American continent; while *Thuja japonica* is so like the *T. gigantea* of the North-west American region that it has been mistaken for it. *Thuja orientalis*, too, may be said to have its American representative in *Thuja occidentalis*. *Picea ajanensis* of the North-east Asiatic regions has, from its similarity, been confused with the *Picea sitkensis* or *Menziesii* of North-west America. *Juniperus nipponica* is almost identical with *J. nana* from Sitka. The curious distribution of the species of *Torreya* has been already referred to.

The large number of endemic species with one endemic genus, leads to the inference that Japan may have formed a special centre whence Conifers have migrated elsewhere. This view seems more probable than the assumption that Japan has received any but a small proportion of its Conifers from elsewhere. Numerically, as might be expected, the alliance is greatest between Japan and China and the mainland to the north of the latter empire. The approximation to the American flora, especially to that of the east side of that continent, is numerically extremely small; indeed there is not a single Conifer common to Eastern America and Japan. But when representative species are taken into account, the relation is shown to be closer, though still less than that (illustrated by other orders of flowering plants) pointed out by Dr. Asa Gray. In his well-known essay on the Botany of

Japan\*, Dr. Gray calls special attention to the analogies between the floras of the Eastern United States and that of Japan. From his address to the American Association the following list of Conifers is taken, from among the numerous other plants, showing the analogy of the American and Japanese floras :—

<i>Atlantic.</i>	<i>Pacific.</i>	<i>Japan and N.E. Asia.</i>
PINUS.		
resinosa.		densiflora.
Strobilus.	monticola.	excelsa.
TSUGA.		
canadensis.	Mertensiana.	Sieboldii and diversifolia.
THUYA.		
occidentalis.	gigantea &c.	japonica.
TAXODIUM.		
distichum.		heterophyllum.
CUPRESSUS (Chamæcyparis).		
thuyoides.	nutkaensis.	pisifera and obtusa.
TAXUS.		
canadensis.	brevifolia.	cuspidata.
TORREYA.		
taxifolia.	californica.	nucifera and grandis.

Dr. Gray concludes (and he is supported by Oliver and others) that a very peculiar analogy exists between the floras of Tertiary Central Europe and the recent floras of the Eastern American States and Japan. It is supposed that, at some period of the Tertiary epoch, N.E. Asia was united to the north-western part of America, probably along the line now occupied by the Aleutian Islands. Assuming the former existence of land-communication between the three continents in the extreme north, the prevalence of a relatively warm climate, as indicated by the fossil plants found in arctic regions, then it is supposed that on the access of the Glacial Period, plants were driven southwards in various directions, according to local circumstances not as yet fully determined. In this way it is suggested that some plants found a refuge in Asia, some in Eastern, and some in Western America†. The presence of northern types in Japan may be accounted for on such a supposition. But, in addition, there is a large proportion of species which appear to be endemic in Japan, and of which we have no traces northwards. These are so numerous in the case

\* A. Gray, Botany of Japan, U.S. Exploring Expedition, p. 433 (1858); also Address to the American Association for the Advancement of Science, Dubuque (1872). Hooker, Flora of N.E. Asia and N.E. America. Gardeners' Chronicle, Aug. 17, 1878, p. 216.

† Murray, 'Geographical Distribution of Mammals' (1866), p. 47.

of the Conifers as to lead to the conclusion before expressed, that Japan must for these plants be taken as a centre of dispersal. That there has been a migration from the polar regions southward is admitted on all sides; and that many species have been stopped in their southward course by the increasing temperature, is illustrated by the distribution of the Conifers in Japan. Some species, as I learn from Mr. Maries, occur in the lowlands of Yesso and on the mountains of the central island, as if the climate of the more southern lowlands were too hot for them, or offered such advantages to other species that the Conifers were crowded out by the more vigorous growth of their competitors. On the other hand, tropical or subtropical types, such as *Podocarpus*, are not able to extend far to the north.

Not a single species is common to Europe and Eastern America. If, however, we look to the genera, we find them, as has already been said, with the exception of the one or two supposed endemic Japanese genera, belting the globe and represented in every part of the northern hemisphere. A certain number of representative species have also been pointed out; and the "representation" must necessarily be closer between some species than between others. This relative closeness of affinity may, in the absence of more direct evidence, afford a clue to the direction in which migration has taken place. Adverting, therefore, to the list of representative Conifers spoken of by Dr. Gray, it will be seen that the representative species of Japan and of Western North America are more closely allied than those of Japan and of Eastern North America: compare, for instance, *Picea ajanensis* and *Thuja japonica* (Japan) and *P. sitkensis* and *T. gigantea* (N.W. America). Moreover the number of representative species in relation to those of Japan is greater, though only slightly so, on the western than on the eastern side of the American continent. The facts are too few to base safe inferences on; but it is at least a reasonable conjecture that Japan did not receive its special Coniferous flora from the north, because so few of the arctic species or of those from Northern Asia or Northern America are found in Japan. *Abies alba* and the Oregon and British-Columbian species, none of which occurs in Japan, are instances in point. Moreover, forms which were common in the arctic regions (and, indeed, in various parts of what is now temperate Europe) in the Miocene epoch, and which exist now in a living state in America under conditions which are not dissimilar to those which may be

met with in Japan, nevertheless have not hitherto been discovered in any part of Japan—e. g. *Sequoia*. It is also at least possible, assuming Japan to have been a distinct centre, that at some time migration may have taken place principally westward to Asia, and to a less extent eastward to the Pacific side of America.

With reference to the fossil species of this order, it behoves me to speak with great diffidence, inasmuch as I have made no special study of them. Judging, however, from the great range of variation in existing species, and the stages of growth they pass through, it would seem that the data upon which the student of fossil plants has often to deal must be peculiarly unsafe as guides to the discrimination of species in this order. Where the different stages or forms of growth exist, as they sometimes do, on the same tree or shrub, as in the Chinese Juniper, there is no difficulty about the matter; but this fortunate state of things is the exception rather than the rule. Take, for instance, the numerous Japanese forms of the *Retinospora*-group. These forms belong to different genera, are widely different one from another and from the perfect tree; and for the most part they preserve their characters without change, at least under cultivation. The consequence is that they are taken as so many distinct species by those who have not had the opportunity of seeing the passage from the one to the other. The student of fossil plants, meeting with analogous isolated forms, would be almost certain to enumerate them all as separate and distinct species; the evidence before him would not suggest any other course. The instance of *Abies bifida* and *A. firma* is another case in point. The two stages represented by those names are so different, the internal anatomical structure of the leaves and the arrangement of the resin-canals so very distinct, that they have been considered as belonging to separate species. Large cultivated specimens in our nurseries are so different that they are, with very good reason, sold as separate species; and the workmen accustomed to handle them, and whose appreciation of the points of difference between forms is often much keener than that of the professed botanist, are apt to express the greatest astonishment when told that *A. bifida* and *A. firma* are one and the same. The evidence in support of this statement is given under the head of *A. firma*. Such cases (and they are not infrequent in Conifers) should make descriptive botanists pause before establishing new species.

Whatever caution may be deemed necessary as to the interpre-

tation to be put on the fossilized remnants of plants, so far as their specific identity is concerned, there is no reason to doubt the existence of representatives of many existing genera in various epochs of the world's history. *Glyptostrobus*, *Taxodium*, *Sequoia*, and *Ginkgo* may be specially mentioned, on account of their existence in high northern latitudes where they can no longer grow, their wide distribution in former times, and the very important inferences that have been drawn from these circumstances. It is noteworthy that neither *Taxodium* nor *Sequoia* has hitherto been found in a living state in Japan\*.

Before leaving the subject of the distribution of Japanese Conifers, a word may be said as to the occurrence of certain trees (often of peculiar organization) in the immediate vicinity of the temples in Japan, China, Tibet, &c. In some of these cases the trees are not known in a wild state, the aboriginal stocks being either extinct or lurking in some of the all but unknown districts of the Chinese empire, Tibet, or Central Asia. Among such may be mentioned, as worthy the attention of the students of Buddhist lore, *Cupressus funebris* (China, Sikkim), *Abies Fortunei* (China), *Abies Kampeferi* (China), *Cryptomeria japonica*, *Sciadopitys verticillata*, *Ginkgo biloba*, and certain species of *Pinus*.

Mention has already been made of the various forms under which one and the same species occur. Carrière has called these transitional or immature forms "larval" stages; and I have alluded to them under the head of Stasimorphy in my 'Vegetable Teratology.' In many cases the appearances depend simply on greater or less energy of growth at particular times. Arrest and progress of growth in more or less regular alternation and intermittence will generally account for the diversity in form and arrangement of the leaves. The tufted leaves of the Pines and

\* See Heer, 'Catalogue of North-Greenland Miocene Plants' (1866); also 'Ueber einige fossile Pflanzen von Vancouver und britisch Columbien,' 'Die mioäne Flora und Fauna Spitzbergens,' 'Primit. Flor. fossilis Sachalinensis' (1878), "Zur Geschichte der Ginkgoartigen Bäume" in Engler's Bot. Jahrb. i. (1880), p. 1, and 'Flora fossilis arctica;' Asa Gray, Address, *op. cit.*; Hildebrand, "Verbreitung der Conif. in der Jetztzeit und in den früheren geologischen Perioden" (1861), Verhandl. d. natur. Ver. für Rheinland und Westphal., neue Folge, viii. (this memoir gives a complete list of the existing and fossil species of Conifers known at the time of publication, together with indications of their geographical distribution); F. Schmidt, 'Die mioäne Flora von Sachalin,' 1880; Engler, 'Versuch einer Entwicklungsgeschichte der Pflanzenwelt, &c. (1879); J. Starkie Gardner in 'Nature,' 1881, *passim*.

Larches indicate an arrest in growth of the axis ; but it is very common to find a shoot elongating, and bearing the leaves in scattered spirals. Sometimes these spirally arranged and scattered leaves in *Pinus* are merely the bud-scales or "perulæ" which have assumed a leafy development. Such leaves also have essentially the same anatomical structure as the ordinary ones. So, in the case of the *Retinosporas*, in the "larval" state the leaves are free and detached from the stem, but in the mature plant the leaves remain in adhesion with, or never separate from, the stem, except at the tips. The internal structure of the various forms of the leaves in *Retinospora* and *Juniperus* is essentially the same, but more spongy in the faster-growing leaves. In *Libocedrus decurrens* it seems as if the axillary bud were also adherent to the stem, and uplifted with it during its growth ; for it proceeds from the stem, not at the organic base of the leaf, but at the point where the leaf becomes detached from the stem. This may be the result of an arrest of growth. But if this be so, it is by no means easy to determine what causes the arrest, what stimulates the progress, particularly when these are confined to one or a few branches. Similarity of surroundings and outward conditions naturally engenders a similar disposition of parts: thus in the leading shoot of a *Picea* the leaves are in scattered spirals, while on the horizontal branches the spiral is so masked by the crowding of the leaves and the twisting that occurs at their base that there is a pseudo-distichous arrangement, and the uppermost leaves are often shorter than the lower ones. In the leading shoot, in such cases, we have an analogous arrangement to what occurs in *Lycopodium*; on the lateral branches the arrangement suggests that of *Selaginella*. The interest attaching to these varied forms of one and the same individual is enhanced by their suggestiveness in regard to the possible lineage of the species, a matter hardly more than broached. They may possibly represent the condition of some progenitor ; or such a genus as *Retinospora* (so called) may be one in course of formation. The student of fossil plants might help us to the solution of this problem.

In the following table the single line — indicates the occurrence of a species, the double line = that of a genus, in the district to which the column refers. The distribution of the fossil genera is not indicated in detail.

TABLE showing the names of the Conifers native to Japan, their Geographical Distribution and that of nearly allied or representative species.

	Japan.	Arctic Asia.	Siberia; Kamtschatka.	Kurile Islands.	Manchuria; Amuria.	China.	Sachalin.	Yesso.	Arctic America.	North-west America.	East America.	Himalaya.	Europe.	Fossil genera.
LIBOCEDRUS .....														
decurrens .....														
macrolepis .....														
THUYA .....														
dolabrata .....														
japonica .....														
orientalis .....														
pisifera .....						?								
obtusata .....														
excelsa (nutkaensis) .....														
gigantea .....														
occidentalis .....														
THUYITES .....														
CUPRESSUS .....														
funebria .....											?			
CUPRESSITES &c. ....														
JUNIPERUS .....														
rigida .....														
nipponica .....														
conferta .....														
taxifolia .....														
chinensis .....														
davurica .....														
communis .....														
—, var. nana .....														
sphaerica .....														
virginiana .....														
Sabina .....														
pseudo-Sabina .....														
occidentalis .....														
JUNIPERITES .....														
CRYPTOMERIA .....														
japonica .....														
VOLTZIA .....														
TAXODIUM .....														
heterophyllum .....														
distichum .....														
SEQUOIA .....														
gigantea .....														
sempervirens .....														
CEPHALOTAXUS .....														
drupacea .....														
pedunculata .....														
umbraculifera .....														
Fortunei .....														

TABLE (continued).

	Japan.	Arctic Asia.	Siberia; Kamtschatka.	Kurile Islands.	Manchuria; Amuria.	China.	Sachalin.	Yesso.	Arctic America.	North-west America.	East America.	Himalaya.	Europe.	Fossil genera.
<b>TAXUS</b> .....														
<i>cuspidata</i> .....														
<i>tardiva</i> .....														
<i>baccata</i> .....														
<b>TAXITES</b> .....														
<b>TORREYA</b> .....														
<i>nucifera</i> .....														
<i>grandis</i> .....														
<i>californica</i> .....														
<i>taxifolia</i> .....														
<b>GINKGO</b> .....														
<i>biloba</i> .....	?													
<b>PODOCARPUS</b> .....														
<i>Nageia</i> .....														
<i>cæsia</i> .....														
<i>appressa</i> .....														
<i>macrophylla</i> .....														
<i>chinensis</i> .....	?													
<i>cuspidata</i> .....	?													
<i>grandifolia</i> .....	?													
<i>japonica</i> .....	?													
<i>koraiana</i> .....	?													
<b>CUNNINGHAMIA</b> .....														
<i>sinensis</i> .....	?													
<b>CUNNINGHAMITES</b> .....														
<b>SCIADOPITYS</b> .....														
<i>verticillata</i> .....														
<b>PINUS</b> .....														
<i>densiflora</i> .....														
<i>Thunbergii</i> .....														
<i>parviflora</i> .....							?							
<i>koraiensis</i> .....														
<i>Cembra</i> .....														
—, var. <i>pumila</i> .....														
<i>silvestris</i> .....														
<i>Massoniana</i> .....														
<i>Bungeana</i> .....														
<i>contorta</i> .....														
<i>Khasya</i> .....														
<i>Banksiana</i> .....														
<b>PINITES</b> .....														
<b>PICEA</b> .....														
<i>obovata</i> .....														
—, var. <i>Schrenkiana</i> .....														
<i>Maximowiczii</i> .....														
<i>polita</i> .....														
<i>Alcockiana</i> .....							?							
<i>ajanensis</i> .....														
<i>Glehnii</i> .....														

TABLE (continued).

	Japan.	Arctic Asia.	Siberia; Kamtschatka.	Kurile Islands.	Manchuria; Amuria.	China.	Sachalin.	Yesso.	Arctic America.	North-west America.	East America.	Himalaya.	Europe.	Fossil genera.
<i>Picea tianschanica</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>sitkensis</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>alba</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>nigra</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>excelsa (Link)</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>orientalis</i> .....	..	?	..	..	..	..	..	..	..	..	..	..	?	..
<b>TSUGA</b> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Sieboldi</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>diversifolia</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>canadensis</i> .....	..	..	..	..	..	..	..	..	?	..	..	..	..	..
<i>Mertensiana</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Pattoniana</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>dumosa</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>PSEUDOTSUGA</b> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Douglasii</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>ABIES</b> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>firma</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>brachyphylla</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Veitchii</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>homolepis</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Mariesii</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>sachalinensis</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>sibirica</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Fortunei</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>ABLETITES</b> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>LARIX</b> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>leptolepis</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>davurica</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Kaempferi</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>sibirica</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>pendula</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Species .....	41	6	14	5	20	23	5	8	7	18	7	7	9	

*Enumeration of the Coniferous Plants of Japan and neighbouring Countries.*

*LIBOCEDRUS, Endl., Parlatores, Benth. et Hook.*

*L. MACROLEPIS, Benth. et Hook. Gen. Pl. iii. p. 426.*

*Calocedrus macrolepis, Kurz, in Trimen's Journal of Botany, 1873, p. 196, tab. 133. fig. iii.*

Yunan, Hotha, *Anderson!*

Mr. Bentham refers this plant to *Libocedrus*, thus extending the geographical distribution of this genus, already sufficiently remarkable, inasmuch as one species is native of New Zealand, two others of Chile, and another of the Rocky Mountains between 38° and 41°. The Yunan plant has the habit of *Thuya* § *Thuyopsis*, and is intermediate between it and true *Libocedrus*. The genus is known also in a fossil state in deposits of the Miocene period.

THUYA, *Linn.*; *Benth. et Hook.*

§ *Thuyopsis*, *Benth. et Hook.*

T. DOLABRATA, *Linn. Suppl.* p. 420 (1781); *Thunberg, Flora Japonica*, p. 266; *Lambert*; *Miquel*.

*Platycladus dolabrata*, *Spach, Hist. Veg. Phan.* xi. p. 337 (1842).

*Thuyopsis dolabrata*, *Sieb. et Zucc. Fl. Jap.* ii. p. 34, t. 119, 120; *Endlicher*; *Lindley and Gordon*; *Carrière*; *Gordon*; *Henk. et Hochst.*; *Parlatore, in DC. Prod.* xvi. 2, p. 460; *Franchet et Savatier*; *Koch*.

In Japonia, *Kämpfer!*; in montanis Kioussiou, ad Nagasaki, *Oldham*, 799!; Nippon, *Thunberg!*, *Siebold!*, *Buerger!*; Yokohama, *Maximowicz!*; Yokoska, *Savatier*; Yeddo, *Fortune!*, *Reeves!* An undershrub in the mountains of Central Japan, alt. 7000–8000 feet, *Maries!*

VAR. NANA, *Sieb. et Zucc. l. c.*; *Endlicher*; *Carrière*.

VAR. VARIEGATA, *Gord. Suppl.* p. 100; *Pinetum*, ed. 2, p. 400; *Carrière*.

VAR. LÆTE-VIRENS.

*Thuyopsis læte-virens*, *Lindl. in Gard. Chron.* 1861, p. 56; *Carrière*; *Henk. et Hochst.*

*Thuyopsis dolabrata nana*, *Gordon, Pinetum*, ed. 2, p. 399. Yokohama, *Maximowicz!*

*Carrière* considers this distinct from var. *nana*; but *Gordon* treats them as identical.

§ *Macrothuya*, *Benth. et Hook.*

T. JAPONICA, *Maximowicz in Diagn. Plant. Jap. decas* 1 (1866), p. 26, in *Mélanges Biolog. St. Pétersbourg*, t. vi.; haud *T. japonica* hort. Angl.

*Thuya Standishii*, *Carrière, Traité Général*, ed. 2, p. 108 (1867) *Gordon, Pinetum*, ed. 2, p. 408; *Mast. in Gard. Chron.* Sept. 28, 1878, p. 397.

*Thuyopsis* ? *Standishii*, *Gordon, Suppl.* p. 100 (1862).

*Thuya gigantea*, *Parlatore in DC. Prod.* xvi. 2, p. 457 (1868); *Koch*; (haud *Nuttall*).

*Thuya gigantea*, var. *japonica*, *Franchet et Savatier, Enum. Plant. Jap.* i. p. 469 (1875).

“In Japonia spontanea?, in urbe Yedo vidit cultam cl. Maximowicz! Fortasse ex America boreali introducta,” *Franchet et Savatier, l. c.* In ins. Nippon ad montes una cum *T. dolabrata* crescens, *Maries in litt.*!

This is a plant of much interest—from its structure, as it has been placed sometimes in *Thuyopsis*, sometimes in *Thuya*; from its history, because it has been supposed to be cultivated only in Japan, and to have been introduced from Western America, and to be, in fact, only a cultivated variety of *T. gigantea*, Nutt. As a genus, *Thuyopsis* was separated from *Thuya* on account of the presence of five seeds to each fertile scale, the true *Thuyæ* having but two. The plant before us has, in cultivation, usually three seeds to each fertile scale, as has also the American *T. gigantea*, which is therefore included in the section *Macrothuya* by Bentham and Hooker.

Up till lately it has not been known in a wild state in Japan; but Mr. Maries assures me that the plant grows on the mountains of Central Japan, together with *T. dolabrata*; and plants are now growing in Messrs. Veitch's nursery, from seed sent home from this district by him.

On the assumption that it was of American origin, the differences that exist between it and *T. gigantea*, though intrinsically slight, become of much interest. Mr. Syme, whose knowledge of cultivated Conifers is so thorough, concurred with Parlatore in considering our present plant a form of *T. gigantea*; but at the time that he expressed that opinion he was not aware of the existence of *Thuya japonica* in Japan in any other than a cultivated form.

From the American *T. gigantea* the Japanese plant may be distinguished by its branches, which are more rounded and not so flattened as in *T. gigantea*, in which they are even concave on the lower surface—by its leaves, which are oblong-obtuse, not broadly ovate and sharply acuminate, and which are moreover marked by a conspicuous gland—and by its cones, which are more nearly globose than in the American plant, in which they are oblong. The scales of the cone in the two species follow nearly

the same rule as the leaves. Lastly, the seeds in the Japanese plant are nearly equal to the scales in length, and the wing of the seed is nearly entire, while in *T. gigantea* the seeds are distinctly shorter than the scales, and the wing is deeply notched.

Mr. Syme (*in litt.*) points out to me that the bark of the young Japanese plant is rough and shaggy, while that of the American plant is quite smooth. To the same accurate observer I am indebted for the note that the male catkins of the Japanese plant more nearly resemble those of *T. dolabrata* than they do those of *T. gigantea*. Mr. Syme leans to the view that at some remote period the Japanese imported *T. gigantea* from America, and that, under cultivation and the general conditions of life in Japan, the plant has taken on its varietal character.

§ *Biota, Benth. et Hook.*

*T. ORIENTALIS*, *Linn. Sp. ed. 1* (1753), p. 1002; ed. 2, p. 1422; *Thunberg, Flora Jap.* (1784) p. 266; *Richard; Siebold et Zucc. Flor. Jap.* ii. p. 31, et t. 118; *Miquel; Loudon et aliorum.*

*Biota orientalis*, *Endl. Syn. Conif.* (1847) p. 47; *Lindl. et Gordon, Journ. Hort. Soc.* v. p. 205; *Carrière; Gordon; Parlatores in DC. Prod.* xvi. 2, p. 461; *Koch; Franchet et Savatier.*

In regione montana insularum Nippon et Sikok; Nagasaki, *Oldham!*; Yokohama, *Maximowicz!*; Yokoska, *Savatier, ex Franchet et Savatier, Buerger!, Fortune!*

Var.  $\beta$ . PENDULA, *Parlatores in DC. Prod.* xvi. 2, p. 462.

*Cupressus pendula, Thunberg, Fl. Jap.* p. 265.

*Biota pendula, Endlicher; Carrière; Gordon.*

*Thuja pendula, Lambert; Sieb. et Zucc. Fl. Jap.* ii. p. 30, t. 117; *Miquel.*

*T. filiformis, Lodd. in Bot. Reg.* (1842) t. 20.

In Japonia, *Thunberg, Siebold, Buerger!, Maximowicz!*; in montibus Hakone, *Savatier; Yeddo, Fortune!*; in China, *Fortune!, Reeves!*

This plant (the Chinese *Arbor vitæ* of our gardens) is remarkable for the great variations it presents in the shape of its cones, its habit, foliage, &c. Hence, in gardens, a very large number of seedling variations are met with, while other varieties represent simply the immature or "larval" form of the species.

Several of these forms are described by Endlicher; others are figured and described in Hoopes's 'Book of Evergreens,' p. 334 &c.). The plant, though truly wild in Japan and in China, has

been cultivated for a very long series of years, and the varieties carefully selected and propagated.

The variety *pendula*, which is very distinct-looking, from its weeping slender branchlets and free, not congenitally adnate leaves, produces cones from which seedlings of the ordinary form of *T. orientalis* have been raised.

Fig. 1.



*Thuya pisifera*. Foliage and cones from a cultivated specimen; nat. size and magnified.

§ *Chamæcyparis*, *Benth. et Hook.*

*T. PISIFERA*. (Fig. 1.)\*

*Retinispora pisifera*, *Sieb. et Zucc. Fl. Jap.* ii. p. 39, t. 122 ;

\* The illustrations in this paper are reproductions from those which have appeared in the 'Gardeners' Chronicle.'

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*Gordon*; *Miquel*; *Syme in Gard. Chron.* vol. v. 1876, p. 237, fig. 44.

*Chamæcyparis pisifera*, *Sieb. in Endl. Conif.* p. 64, *ex Parlatore in DC. Prod.* xvi. 2, p. 465; *Franchet et Savatier*; *Carrière*; *Miquel*.

*Cupressus pisifera*, *Koch, Dendrol.* ii. p. 170 (1873).

In Japonia, *Kæmpfer*!; in montanis Kioussiou, prope Nangasaki, *Siebold*!, *Oldham* 401!; Nippon in monte Fudsi et in jugo Hakone, *Buerger*!; Yokohama, *Maximowicz*!; Yokoska, *Savatier ex Franchet et Savatier, Fortune*!, *Veitch*!, *Wright*!, *Buerger*!; Yunan, ubi culta, *Anderson*!

There are numerous seedling variations in gardens, distinguished by their golden or silvery-white variegation, especially in the spring months, their dwarf habit, &c.

Var. SQUARROSA.

*Chamæcyparis squarrosa*, *Sieb. et Zucc. in Endl. Conif.*, *ex Franchet et Savatier*; *Parlature in DC. Prod.* xvi. 2, p. 467; *Miquel*.

*Retinispora squarrosa*, *Sieb. et Zucc. Fl. Jap.* ii. p. 40, t. 123!; *Gordon*; *Carrière, Traité*, ed. 2, p. 137; *Koch, Dendrologie*, ii. p. 171.

*Chamæcyparis ericoides*, *Carrière, Traité Gen.* ed. 1, p. 140.

*Cupressus squarrosa*, *Laws.*, *ex Gordon*.

I refer this to *T. pisifera* on the authority of Mr. Syme, who, in writing to me in August 1879, mentions having found a pisiferoid sport from *squarrosa*, differing only in being somewhat more glaucous. Meehan refers it to *T. obtusa*; but Siebold's type specimens confirm the accuracy of Mr. Syme's conclusions.

Var. LEPTOCLADA.

*Chamæcyparis squarrosa leptoclada*, *Endlicher*.

*Retinispora leptoclada*, *Zucc.*, *ex Gordon, Pinet.* ii. p. 365; *Carrière, Traité*, ed. 2, p. 139; *Rev. Hort.* 1869, p. 95, c. ic.

Var. PLUMOSA. (Fig. 2.)

*Chamæcyparis obtusa plumosa*, *Carrière, Traité*, ed. 2, p. 791.

*Retinispora plumosa*, *hort.*, *Syme in Gard. Chron.* vol. v. 1876, p. 236, fig. 42 (ramus et strobili).

I follow Mr. Syme in treating this as a variety of *T. pisifera*. The cones are smaller than those of *T. pisifera*,

their scales smoother and more even. The greatest proof of their identity consists in the fact, made known by Mr. Syme, "that the *B. plumosa* of gardens occasionally throws out branches with all the characteristics of *pisifera*."

Fig. 2.



*Thuya pisifera*, var. *plumosa*. Foliage and cones from a cultivated plant ;  
nat. size and magnified.

Var. *FILIFERA*. (Fig. 3.)

*Retinospora filifera*, *Standish, ex Gordon, Pinetum*, ed. 2, p. 364 ; *Syme in Gard. Chron.* vol. v. (1876), p. 237, fig. 43 (ramulus et strobili).

Mr. Syme regards this either as a variety of *pisifera* analogous to the pendulous form of *T. (Biota) orientalis*, or as a form of *orientalis* itself.

*T. OBTUSA*. (Fig. 4.)

*Chamæcyparis obtusa*, *Sieb. et Zucc. in Endl. Conif.* p. 63 ; *Carrière, Traité*, ed. 2, p. 129 ; *Franchet et Savatier ; Parlatore in DC. Prod.* xvi. 2, p. 466 ; *Miquel*.

*Retinispora obtusa*, *Sieb. et Zucc. Fl. Jap.* ii. p. 38, t. 121 ;  
*Miquel* ; *Syme in Gard. Chron.* vol. v. (1876) p. 236, fig. 41.  
*Cupressus obtusa*, *Koch, Dendrol.* ii. p. 168.

Fig. 3.



*Thuya pisifera*, var. *filifera*. Foliage and cones from a cultivated plant ;  
nat. size and magnified.

In regionibus montanis silvas efformans Kioussiou circa Nangasaki, Mohnike, Nippon ad Yokohama, *Maximowicz* ! ; Yokoska, *Savatier*, *Siebold* !, *Oldham* 354 !

Of this species several varieties or cultivated forms exist to which specific names have, inappropriately as it turns out, been given. Most of them are interesting morphologically, and as showing the possible range of variation in these plants. They

are also desirable plants for gardens. The more important of them may be here specified:—

Var. LYCOPODIODES, *Carrière, Traité Gén.* ed. 2, p. 132.

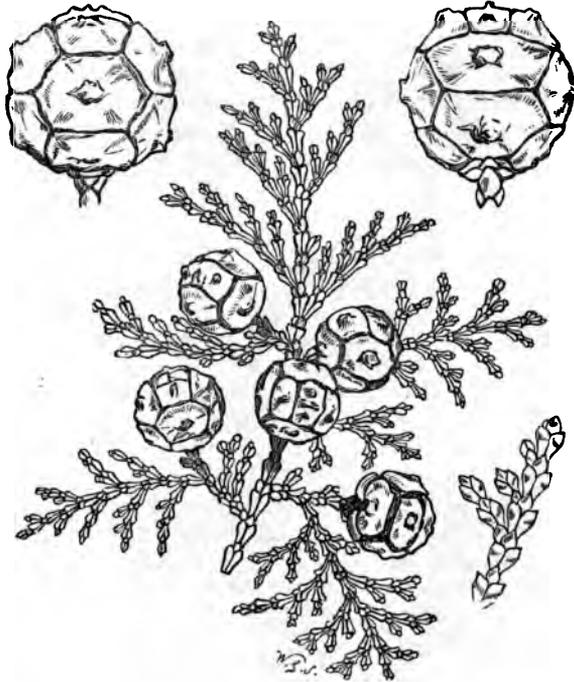
*Retinospora lycopodioides, Gordon; Parlatores in DC. Prod.* xvi. 2, p. 466; *Koch, Dendrol.* ii. p. 169.

Var. PYGMÆA, *Carrière, Traité Gén.* ed. 2, p. 131.

*Retinospora obtusa pygmæa, Gordon; Parlatores in DC. Prod.* xvi. 2, p. 466; *Koch, Dendrol.* ii. p. 169.

*Thuja pygmæa, hort.*

Fig. 4.



*Thuja obtusa.* Foliage and cones from a cultivated plant; nat. size and magnified.

Var. NANA, *Carrière, Traité Gén.* ed. 2, p. 131.

*Retinospora obtusa nana, hort. cum varietatibus aureo nec non argenteo variegatis.*

Var. KETELEERII, *hort. Standish; Parlatores in DC. Prod.* xvi. 2, p. 466; *Koch, Dendrol.* ii. p. 169.

## Var. BREVIRAMEA.

*Chamæcyparis breviramea*, *Maxim. Mélanges Biol.* vi. p. 25 (1866); *Miquel*; *Franchet et Savatier*.

"In littore boreali ins. Kioussiou mare Japoniæ mediterraneum spectans inter *C. obtusam* crescens," *Maximowicz!*, *Franchet et Savatier*; sæpe in hort. Yedoensibus culta.

## Var. PENDULA.

*Chamæcyparis pendula*, *Maxim. Mélanges Biol.* vi. p. 25 (1866); *Miquel*; *Franchet et Savatier*.

In hortis urbis Yeddo, *Maximowicz, Savatier*.

This is like the *pendula* form of *Biota orientalis*.

Fig. 5.



*Thuya obtusa*, var. *filicoides*. Foliage and cones from a cultivated plant; nat. size and magnified.

## Var. FILICOIDES. (Fig. 5.)

*Retinospora filicoides*, *hort.*, *Syme in Gard. Chron.* vol. v. (1876) p. 235, fig. 40 (ramus et strobili); *Gordon, Pinetum*, ed. 2, p. 363.

Mr. Syme regards the cones of this as identical with those of *obtusum*, only that they are smaller.

*Thuyites*, the fossil representative of *Thuya*, is found in the Miocene, Wealden, and Oolite strata.

In addition to the species and forms above mentioned, others are named in gardens and garden-catalogues. Such are:—*Retinospora ericoides*, *pseudo-squarrosa*, *juniperoides*, *decussata* (= *T. orientalis*), *decurvata*, *dubia*, *japonica*, *Devriesiana*, *tetragona*, &c. It is impossible, with the material at command, to assign these forms to their sources. In gardens, indeed, the same name is often applied to different plants. Thus there are different plants bearing the names of *japonica*, *squarrosa*, and *ericoides*. Of the latter one is a form of *T. occidentalis*, another of *T. obtusa*, a third of *T. pisifera*, a fourth of *T. sphæroidea*, &c. As the history and course of development are not known, it is impossible to disentangle the confusion. Most of them are juvenile forms or immature states of some species of *Thuya* or Juniper, some have arisen as bud-variations, others as seedling varieties. Very few are known in the wild state, even in Japan\*.

\* M. Carrière says, in the 'Revue Horticole' for 1880, pp. 36, 93, and 177, that *Retinospora Ellwangeriana* is a "larval" form of *Thuya occidentalis*, *R. dubia* of *Thuya* sp., *R. juniperoides* of *Thuya orientalis*. *Biota meldensis* [onoe] supposed to be a hybrid between *Biota orientalis* and *Juniperus virginiana* [is now known to be a form of *T. orientalis*]. *R. squarrosa* is mentioned as a larval form of some unknown species; *R. pseudo-squarrosa* as a seedling variety of *T. (Chamæcyparis) sphæroidea*; and *C. andelyensis* is said to have had a similar origin from the same type, although it has been re-baptized by English nurserymen as *Retinospora leptoclada* (not of Siebold). M. Carrière gives the following synonymy:—

1. *R. DUBIA*, Carr. *Traité Général des Conifères*, ed. 2, p. 141; *Chamæcyparis ericoides*, hort.; *Thuya japonica*, hort.; *Thuya ericoides*, hort.; *Thuya Devriesiana*, hort. Germ.

2. *R. ELLWANGERIANA*, Carr. *Rev. Hort.* 1869, p. 349, cum ic.; *Thuya Ellwangeriana*, hort. [a form of *Thuya occidentalis*].

3. *R. JUNIPEROIDES*, Carr. *Traité*, ed. 2, p. 140; *Rev. Hort.* 1869, p. 307, cum ic.; *Juniperus ericoides* hort.; *Chamæcyparis decussata*, hort.; *Retinospora recurvata*, hort.; *R. glauca*, hort.; *R. squarrosa*, hort., non Sieb.; *Cupressus ericoides*, hort.; *Retinospora rigida*, Carr. MSS. = *T. orientalis*.

4. *R. LEPTOCLADA*, Zucc., Carr. *Rev. Hort.* 1869, p. 95, cum ic.; *R. squarrosa*, hort., non Sieb. et Zucc.; *Chamæcyparis squarrosa leptoclada*, Endl.; *Retinospora squarrosa leptoclada*, hort., non Gordon; *Chamæcyparis leptoclada*, Henk. et Hochst.; *Retinospora argentea*, hort.

5. *R. MELDENSIS*, Carr. *Traité*, ed. 2, p. 103; *Juniperus meldensis*, hort.; *Biota meldensis*, Laws.; *B. orientalis*, var. *meldensis*, Carr. *Traité*, ed. 2, p. 103 (*Hoopes*, l. c. p. 339); *Thuya meldensis*, hort.; *T. hybrida*, hort.; *T. orientalis meldensis*, hort.

CUPRESSUS, *Linn.*; *Benth. et Hook.*

C. FUNEBRIS, *Endlicher, Conif.* p. 58; *Parlatore in DC. Prod.* xvi. 2, p. 471, *et auct.*

Cupressus pendula, *Staunt. Embassy*, i. p. 525, t. 41; *Lamb. Pinus*, ed. 2, p. 124, t. 66; *Loud. Arbor.* iv. p. 2479, fig., excl. syn.

In China ad busta et tumulos tantum plantata, *Staunton, Fortune!* Colitur etiam in Sikkim et in Bootan *Hook. fl.* qui putat plantam ex Thibeto allatam.

C. *Corneyana* (Knight, Synopsis), *Parlatore, l. c.* p. 470, is not known in a wild state, and there is no authority for the statement that it is a native of Japan: see Veitch, *Manual*, p. 239.

JUNIPERUS, *Linn.*; *Benth. et Hook.*

J. RIGIDA, *Sieb. et Zucc. Fl. Jap.* ii. p. 109, t. 125; *Parlatore in DC. Prod.* xvi. 2, p. 480; *Miquel*; *Endlicher*; *Carrière.*

J. communis, *Thunberg, Fl. Jap.* p. 264, excl. syn.

In Japonia, *Wright!*; *Veitch.*

J. NIPPONICA, *Maxim. Mél. Biol.* vi. p. 374; *Franchet et Savatier.*

In alpinis provinciæ Nambu, Nippon borealis, *Maximowicz, Tschonoski!*

J. LITTORALIS, *Maxim. Mél. Biol.* vi. p. 375 (1867); *Franchet et Savatier.*

Juniperus conferta, *Parlatore in DC. Prod.* xvi. 2, p. 481 (1868).

In arenosis maritimis Kioussiou, *Wright!*; Yeddo, *Maximowicz*; Yokoska, *Savatier*; Nambu, *Maximowicz*; Yesso prope Hako-date, *Maximowicz!*

J. TAXIFOLIA, *Hook. et Arn. Bot. Beechey's Voy.* p. 271; *Par-*

6. R. ANDELYENSIS; R. squarrosa leptoclada, *Gord., non Endl.*; Chamæcyparis sphaeroidea andelyensis, *Carr. Traité*, ed. 2, p. 123; Thuya leptoclada, *hort.*; R. leptoclada, *hort. Angl., non Zucc.*, a form of T. (*Chamæcyparis*) *sphaeroidea.*

7. R. SQUARROSA, *Sieb. et Zucc. Fl. Jap.* ii. p. 40, t. 123, *non hort.*; R. ericoides, *Zucc.*, *Widdringtonia ericoides*, *Knight*; Chamæcyparis squarrosa, *Sieb. et Zucc.*; Cupressus squarrosa, *Laws.*

8. R. PSEUDO-SQUARROSA, *Carr. Traité*, ed. 2, p. 140; R. squarrosa, *hort., non Sieb. et Zucc.*; Thuya squarrosa, *hort.*, a form of T. (*Chamæcyparis*) *sphaeroidea.*

See also Meehan, in *American 'Gardeners' Monthly*, May 1881, and Hochstetter cited in *'Gardeners' Chronicle*, March 12, 1881; Hoopes, *'Book of Evergreens*, pp. 331, 359; Veitch, *'Manual of Coniferæ'* (1881), p. 241.

*lature in DC. Prod.* xvi. 2, p. 481; *Miquel*; *Franchet et Savatier*; *Sieb. et Zucc.*; *Endlicher*; *Carrière*; *Antoine*.

Ad promontorium Siriki Saki vel in insula Yakuno Sima, *Wright!*; Loo-Choo, *Wright*; China, *Fortune!*; Bonin Sima, *Wright!*; *Seemann!*

J. CHINENSIS, *Linn. Mant.* p. 127; *Parlatore in DC. Prod.* xvi. 2, p. 487; *Sieb. et Zucc. Fl. Jap.* ii. p. 58, t. 126, 127; *Miquel*; *Endlicher*; *Franchet et Savatier*; *Carrière*; *Gordon*.

J. barbadosis et J. virginica, *Thunb.*

J. japonica, *hort.*, ex *Carrière*, *Traité*, ed. 2, p. 31.

Synonyma indica præterivi. "Huc probabiliter *J. procumbens*, *Sieb. Fl. Jap.* ii. p. 59, t. 157. fig. 2," *Franchet et Savatier*.

In montanis Japoniæ, *Thunberg!*, *Siebold*, *Small*; in montibus Hakone frequens, *Savatier* 1189. In Himalayæ regione temperata, *Cachemir*, *Tibet*; China, *Daniel!*, *Fortune!*; *Hongkong*, *Hance!*; *Corea*, *Siebold*.

J. DAVURICA, *Pallas*, ex *Parlatore in DC. Prod.* xvi. 2, p. 482, et *auct. var.*; *Schmidt*, *Reise im Amurlande und auf Sachalin*; *Maximowicz*, *Primit. Fl. Amur.* (1859), p. 260.

In Sibiria altaica; prope flum. Amur, *Maximowicz*.

J. COMMUNIS, *Linn.*, *Parlatore in DC. Prod.* xvi. 2, p. 479, et *auct.*; *Schmidt*, *Reise im Amurlande und auf Sachalin*; *Maximowicz*, *Primit. Fl. Amur.* p. 260.

In Europa, Sibiria, Davuria, Kamtschatka, America boreali.

#### CRYPTOMERIA, *Don*; *Benth. et Hook.*

C. JAPONICA, *Don in Trans. Linn. Soc.* xviii. 2, p. 166, t. 13. f. 1; *Brongniart*; *Sieb. et Zucc.* tab. 124, 124<sup>b</sup>; *Endlicher*; *Miquel*; *Carrière*; *Gordon*; *Henk. et Hochst.*; *Parlatore in DC. Prod.* xvi. 2, p. 438; *Hook. Ic. Pl.* t. 668; *Franchet et Savatier*; *Koch*.

*Cupressus japonica*, *Linn. fil.* (1781); *Thunb. Fl. Jap.*; *Gærtner ex Parlatore*, l. c.

*Taxodium japonicum*, *Brongniart in Ann. des Sc. Nat.* sér. 1, vol. xxx. p. 183.

Var. ELEGANS = *C. elegans*, *Veitch in Gordon*, *Pinet.* ed. 2, p. 73; *Siebold*.

In montanis vastas silvas efformans, *Siebold*; *Kiousiou* circa *Nangasaki*, *Kæmpfer!*, *Thunberg!*; *Nippon*, *Perfetti*; *Simoda*, *Will. et Morr.*; *Yokohama* et *Yokoska*, *Savatier*; *Yesso*

circa Hakodate, *Maximowicz omnes ex Franchet et Savatier, Albrecht!*, *Siebold*. In Chinæ montibus prov. Che Kiang, *Fortune*; Shanghae, *Fortune!*; Chusan, *Home*; Amoy, *Swinhoe!*; Yunan, *Anderson!*

Numerous forms and varieties of this are cultivated in Japan and in this country, such as vars. *Lobbi*, *nana*, or *pygmaea*, *dacrydioides*, *araucarioides*, *pungens*, *macrocephala*, *spiralis*, *variegata*, and *viridis*. Descriptions of most of these will be found in M. Carrière's 'Traité Général,' ed. 2 (1867), p. 192 *et seq.*, and in Gordon's 'Pinetum.' In addition, there are specimens in the herbaria, and also in gardens, of a curiously twisted form called var. *torta* by Maximowicz. With reference to the variety known as *elegans*, Gordon, as we have seen, considers it a distinct species, probably on account of its cones, which he describes as similar to those of *C. japonica*; but the scales are, in general, longer and much thinner. The plant as cultivated, with its more spreading and less "decurent" leaves, which assume a bronzy colour in autumn and winter, suggests the notion that it is an immature, or, as M. Carrière calls it, "larval" form of *C. japonica*, analogous to those so commonly found in certain forms of *Thuja* &c. In English-grown cones I have not noted the distinguishing characters pointed out by Mr. Gordon. *C. japonica* is described as the largest tree in Japan.

TAXODIUM, *Endl.*; *Benth. et Hook.*

*T. HETEROPHYLLUM*, *Brongniart in Ann. Sc. Nat. sér. 1, vol. xxx.*  
p. 184.

*Thuja lineata*, *Poiret, Dict. Suppl. v. p. 305.*

*T. pensilis*, *Staunton, Embassy, p. 436.*

*Schubertia japonica*, *Spach, Hist. Veg. Phan. xi. p. 352* (syn. ex *Parlatore*).

*Glyptostrobus heterophyllus*, *Endl. ex Parlatore in DC. Prod. xvi. 2, p. 439.*

In China, *Staunton!*, *Fortune n. 46!*, *Reeves!*; secus vias prope Canton et Whampoa, *Hance!*

The curious *Taxodium sinense pendulum* = *Glyptostrobus pendulus*, *Bot. Mag. t. 5603*, is referred by *Parlatore* to the South-east American *T. distichum* as var.  $\beta$ . *microphyllum*.

Fossil plants referred to the genera *Sequoia*, *Glyptostrobus*, and *Taxodium* are found in Miocene and Eocene deposits.

CEPHALOTAXUS, *Sieb. et Zucc.*; *Benth. et Hook.*

*C. PEDUNCULATA*, *Sieb. et Zucc. Flor. Jap. Fam. nat.* ii. p. 108, et *Fl. Jap.* ii. t. 133; *Parlatore in DC. Prod.* xvi. 2, p. 503; *Endlicher*; *Carrière*; *Gordon*; *Henk. et Hochst.*; *Franchet et Savatier*.

*Taxus Harringtonia*, *Knight, Synops. Conif.* p. 51; *Forbes, Pinet. Woburn.* 217, t. 66; *Loudon*.

*Taxus Inukaja*, *Knight, Synops. Conif.* p. 51.

In Japonia, *Kämpfer*!; in regionibus montanis Kioussiou, prope Nangasaki, *Oldham*!; in montibus Kamagona, *Veitch*!; Nippon, in provincia Nambu, *Siebold*; *Tschonoski*; Yokoska, *Savatier ex Franch. et Savat.* ubique culta. In China, Chusan, *Fortune*, ♂!

Var. *FASTIGIATA*, *Carrière, Traité Conif.* ed. 2, p. 717; et *Rev. Hort.* 1863, p. 349.

*Podocarpus koraiana*, *hort.*

Var. *BUEGERI*, *Maximowicz, Mém. Biol.* vii. p. 563.

*Cephalotaxus Buergeri*, *Miquel, Prolusio Flor. Jap.* p. 333.

Japan, *Buerger*!

*C. DRUPACEA*, *Sieb. et Zucc. Flor. Jap.* ii. p. 66, t. 130, 131, ined.; *Parlatore in DC. Prod.* xvi. 2, p. 504; *Endlicher*; *Carrière*; *Gordon*; *Henk. et Hochst.*; *Miquel*; *Franchet et Savatier*.

*Taxus baccata*, *Thunb. Fl. Jap.* p. 275, *fide Parlatore*.

*Cephalotaxus coriacea*, *hort.*, *fide Carrière*.

In Japonia circa Nangasaki, *Siebold*!, *Oldham*!, *Maximowicz*; in montibus Kamagona, *Veitch*!; in insula Tsusima, *Wilford*; Nippon in provincia Nambu, *Tschonoski*; circa Yokoska, *Savatier*; Kunagawa, *Fortune*!

Some writers, as Koch, refer the Chinese *C. Fortunei*, Hook., to this species.

*C. UMBRACULIFERA*, *Sieb. MSS. in Endl. Syn. Conif.* p. 239, *ex Parlatore in DC. Prod.* xvi. 2, p. 504; *Carrière*; *Gordon*; *Henk. et Hochst.*

In Japonia, *Siebold*.

A doubtful species. Gordon (ed. 2, p. 70) cites Fortune's *Torreya grandis* as identical.

*TAXUS*, *Linn.*; *Benth. et Hook.*

*T. OUSPIDATA*, *Sieb. et Zucc. Fl. Jap.* t. 108, *ex Parlatore in DC.*

*Prod.* xvi. 2, p. 502; *Miquel*; *Endlicher*; *Carrière*; *Gordon*; *Koch*; *Franchet et Savatier*.

In Manshuria austro-orientali, *Maximowicz*!; ad promontorium Siriki-Saki vel in insula Yakuno-sima, *O. Wright*; Yokohama, *Maximowicz*!; Yesso, *Albrecht*!, *Siebold*!, *Buerger*!

*Carrière* refers this in his last edition to *T. baccata*.

*T. TARDIVA*, *Laws.*, ex *Henk. et Hochst.* p. 361; *Parlatore in DC. Prod.* xvi. 2, p. 502.

In Japonia, *Siebold*.

A doubtful species, supposed to be a variety of the preceding. *Parlatore* refers the *T. adpressa* of gardens to this species.

*T. BACCATA*, *Linn.*, *Parlatore in DC. Prod.* xvi. 2, p. 500, et auct.

VAR. MICROCARPA, *Schmidt, Reise im Amurlande und auf Sachalin*.

#### TOBREYA, *Arnott*; *Benth. et Hook.*

*T. NUCIFERA*, *Sieb. et Zucc. Fl. Jap.* ii. t. 129; *Parlatore in DC. Prod.* xvi. 2, p. 505; *Endlicher*; *Carrière*; *Gordon*; *Franchet et Savatier*; *Miquel*.

*Taxus nucifera*, *Linn. Sp. Pl.* ed. 1, p. 1040, ed. 2, p. 1472; *Thunberg, Fl. Jap.* p. 275; *Richard, Conif.* p. 21, t. 2. f. 3.

In montibus insularum Nippon et Sikok; juxta Nangasaki, *Thunberg, Siebold*!; Yokohama, *Maximowicz*!; Yokoska, *Savatier*.

*T. GRANDIS*, *Fortune in Gord. Pinet.* 326; *Parlatore in DC. Prod.* xvi. 2, p. 505.

In Chinæ borealis montibus Che-Kiang, *Fortune*!

#### GINKGO, *Linn.*; *Benth. et Hook.*

*G. BILOBA*, *Linn. Mant.* ii. pp. 313, 314; *Parlatore in DC. Prod.* xvi. 2, p. 507; *Thunb. Fl. Jap.* p. 358; *Sieb. et Zucc. Fl. Jap.* ii. p. 109, t. 136; *Franchet et Savatier*.

*Salisburia adiantifolia*, *Smith in Linn. Trans.* iii. p. 330; *Bunge, Enum. Pl. Chin. bor.*; *Loudon*; *Lindley*; *Gordon*; *Endlicher*; *Carrière*; *Miquel*.

Only known as a cultivated plant in China and in Japan.

Yunan, *Anderson*!; in Japonia, *Thunberg*!; Nangasaki, *Maximowicz*!, *Oldham*!

Although this is now an isolated type among Conifers, yet it has numerous allies among fossil plants. Prof. Heer (*Engler's*

Jahrbücher, 1880) traces the genus back to the Carboniferous epoch, and thence through the Secondary and Tertiary periods. He considers it the type of a section *Salisburiceæ*, comprising eight genera and sixty-one species!, which were generally dispersed in the temperate and arctic zones of the northern hemisphere.

The drupe-like fruit, both in external appearance and in internal structure, resembles closely that of *Cycas*. The perisperm is covered with a brown membrane, the lower half of which is adherent to the shell. The cotyledons are two in number, retained within the seed, thick, oblong, appressed, and shortly petioled; the radicle is superior, short; the plumule, which ascends between the stalks of the cotyledons, is triangular, and the first leaves are arranged on the  $\frac{1}{2}$  plan in all the specimens of germinating plants that I have examined; but as the leaves on the growing shoots are mostly distichous, these specimens were probably exceptional. A note of M. Gay's in the Kew herbarium states that in the contracted flowering shoots the arrangement of the scales and leaves is on the  $\frac{5}{8}$  plan.

PODOCARPUS, *L'Hérit.*; *H. B. K.*; *Parlatore*; *Benth.*  
*et Hook.*

P. NAGEIA, *R. Br.*, *ex Parlatore in DC. Prod.* xvi. 2, p. 508; *Sieb. et Zucc. Fl. Jap.* ii. p. 71, t. 135; *Maximowicz, Mém. Biol.* vii. p. 562; *Miquel*.

In Japoniæ montibus, *Kämpfer*, *Thunberg*, *Siebold*; Nangasaki, *Maximowicz!*, *Oldham!*; Yokoska, *Savatier*.

Var. ROTUNDIFOLIA, *Maximowicz in Regel, Garten Flora*, 1864, p. 37; P. ovata, *Henk. et Hochst.* p. 381, *fide Maximowicz*; *Franchet et Savatier*.

Var. ANGUSTIFOLIA, *Maximowicz, l. c.*; *Franchet et Savatier*.  
In Japonia, *Siebold!*, *Oldham!*

P. CÆSIA, *Maximowicz, Mém. Biol.* vii. p. 561; *Franchet et Savatier*.

In urbe Nangasaki rarius culta. E Japonia meridionali ortam suspicatur cl. auctor.

P. APPRESSA, *Maximowicz, loc. cit.*

In urbe Yeddo rarius culta.

P. MACROPHYLLA, *Don in Lambert, Pinus*, ed. 2, p. 123, et

ed. 3, n. 75; *Parlatore in DC. Prod.* xvi. 2, p. 517; *Sieb. et Zucc. Fl. Jap.* t. 133; *Endlicher*; *Carrière*; *Gordon*; *Miquel*; *Henk. et Hochst.*; *Maximowicz*.

*Taxus macrophylla*, *Thunb. Fl. Jap.* p. 276.

In collibus inter frutices. Kioussiou circa Nangasaki, *Thunberg*!; ad Yokoska, *Savatier*, *Oldham*!; Yunan, *Anderson*!

P. CHINENSIS, *Wall. Cat.* 6051, *ex Parlatore in DC. Prod.* xvi. 2, p. 516; *Endlicher*; *Carrière*; *Gordon*.

P. Maki, *Sieb. et Zucc.* t. 134, *ex Parlatore, l. c.* p. 516.

"In China et probabiliter in Japonia ubi in hortis culta," *Siebold*!, *Macartney*!; Mt. Loo Choo, *Shearer*!

*Species non satis cognita e Japonia in hortis Europæis introductæ.*

P. CUSPIDATA, *Endl., ex Parlatore in DC. Prod.* xvi. 2, p. 509.

P. GRANDIFOLIA, *Endl., ex Parlatore, l. c.* p. 509.

P. JAPONICA, *hort. Bogor., ex Parlatore, l. c.* p. 518.

*Podocarpus* occurs in strata of Miocene and Eocene age.

CUNNINGHAMIA, *R. Br.*; *Benth. et Hook.*

C. SINENSIS, *R. Br. in Rich. Conif.* p. 80, t. 18. f. 3; *Parlatore in DC. Prod.* xvi. 2, p. 432; *Loudon*; *Sieb. et Zucc. Fl. Jap.* ii. p. 7, t. 103; *Forbes in Pinetum Woburnense*, tab. 57; *Endlicher*; *Carrière*; *Gordon*; *Miquel*; *Murray*.

*Pinus lanceolata*, *Lamb. Pin.* ed. 1, vol. i. p. 52, t. 34.

*Cunninghamia lanceolata*, *Lamb. Pin.* ed. 2, p. 59, t. 37, et ed. 3, p. 96, t. 53; *Hook. Bot. Mag.* t. 2743.

*Belis jaculifolia*, *Salisb. in Linn. Trans.* viii. p. 315; *B. lanceolata*, *Sweet, Hort. Brit.* p. 475.

In China australiore, *Bradley*!; *Staunton*!; *Fortune*! In Japonia culta, Yokohama, *Maximowicz*!

The fossil representative of this, *Cunninghamites*, has been found in the Keuper and Chalk deposits.

SCIADOPITYS, *Sieb. et Zucc.*; *Benth. et Hook.*

S. VERTICILLATA, *Sieb. et Zucc. Fl. Jap.* ii. p. 1, tabb. 101, 102; *Miquel*; *Endlicher*; *Carrière*; *Gordon*; *Murray, Pines and Firs of Japan* (1863), p. 109, fig.; *Henk. et Hochst.*; *Parlatore in DC. Prod.* xvi. 2 (1868), p. 435; *Koch*; *Franchet et Savatier*; *Lindley in Gard. Chron.* 1861, pp. 22, 360 (fig.); *Dickson in Report Bot. Congress London*, 1866, p. 124.

*Taxus verticillata*, *Thunb. Fl. Jap.* p. 276, excl. syn.; *Kämpfer, Amœn.* cx. p. 883, icon. ccxviii.

*Pinus verticillata*, *Sieb., ex Parlatores, l. c.*

Var. VARIEGATA, *Gordon, Pinetum*, ed. 2, p. 377.

In Japonia, *Thunberg!*, *Kämpfer!*; in regione orientali insulæ Nippon; in monte Kojasan provinciæ Kii, *Siebold!*; in collibus prope Konagawa, *Oldham!*; juxta Nangasaki, *Mohnike!*; Yokohama, *Maximowicz!*; Yokoska, *Savatier!*; sæpe plantata et tunc in multis locis an revera sit spontanea dubitatur (*Franchet et Savatier!*, *Maximowicz!*, *Oldham!*)

The fact that this fine tree is so often met with planted in the enclosures around the temples has given rise to the surmise that it may have been introduced by the Buddhists; but the tree is not known in any other country than Japan. Numerous varieties exist in Japanese gardens.

The so-called leaves of this plant are phylloid shoots, as pointed out by Dr. Alexander Dickson in the Report of the London Botanical Congress of 1866. Confirmation of this view is afforded by the subdivision of the leaf-like organs, and the existence in the fork so formed of a little axis bearing at its summit a verticil of pseudo-leaves\*. The seedlings have two linear cotyledons.

PINUS, *Linn. pro parte; Benth. et Hook.*

*P. DENSIFLORA*, *Sieb. et Zucc. Fl. Jap.* ii. p. 22, t. 112!; *Endlicher!*; *Carrière!*; *Murray!*; *Henk. et Hochst.!*; *Parlatore in DC. Prod.* xvi. 2, p. 388; *Gordon, Pinetum*, ed. 2, p. 233; *Engelmann, Revision of the Genus Pinus* (1880), p. 16, adnot. 10.

*P. japonica?*, *Antoine, Conif.* p. 23.

*P. pinea*, *Gord. Pinet.* ed. 1, p. 179, ex parte.

*P. Massoniana*, *hort. alig.*

Per totam Japoniam, *Siebold!*, *Maximowicz!*, *Veitch!*, *Oldham!*, *Wright!*, *Maries!*; Korea, *Oldham!*; in China boreali, *Daniel!*

*Engelmann (l. c.)* places this in his § 4. *Sylvestres*, a group characterized, *inter alia*, by its peripheral ducts. In the type specimens of *Siebold* in the Kew herbarium, however, I find the resin-canals variable, the larger ones often parenchymatous.

\* *Masters*, 'Vegetable Teratology,' p. 523, adnot.; *Carrière*, in 'Revue Horticole,' 168, p. 150, cum ic.

*P. THUNBERGII*, *Parlatore in DC. Prod.* xvi. sect. post. p. 388 (1868); *Engelmann, Revision*, p. 22, adnot. n. 26.

*P. silvestris*, *Thunb. Fl. Jap.* p. 274, non *Linn.*

*P. Pinaster*, *Loud. Arboret.* 2218; *Gordon, Pinet.* p. 176, ed. 1, non *Soland.*

*P. rubra*, *Siebold in Verhand. van het Batav. Genootsch.* vol. xii., ex *Endlicher.*

*P. Massoniana*, *Sieb. et Zucc. Fl. Jap.* ii. p. 24, t. 113, 114; *Endlicher*; *Carrière*; *Murray*; *Henk. et Hochst.*, non *Lambert.*

Per totam Japoniam, *Oldham* 561!; in China, *Maximowicz*!; Korea, *Oldham*!

This is included in Engelmann's group 6. *Ponderosa*, to which parenchymatous ducts are assigned. Cultivated specimens in the Kew arboretum show this arrangement, and are, moreover, remarkable for their large ovoid acuminate buds covered with dense white silky hairs.

*P. PARVIFLORA*, *Sieb. et Zucc. Fl. Jap.* ii. p. 27, t. 115 (1842); *Endlicher*; *Carrière*; *Gordon*; *Murray*; *Henk. et Hochst.*; *Parlatore in DC. Prod.* xvi. 2, p. 404; *Syme in Gard. Chron.* November 16, 1878, p. 624, fig. 103; *Engelmann, Revision*, p. 15, adnot. 2.

*P. Cembra*, *Thunb. Fl. Jap.* p. 274, non *Linn.*

In Japoniæ provinciis borealibus in insulas Kurilas usque procedens; in ins. Yesso, *Maries*!; *Oldham* 518, 807 et 808!; *Siebold*!; Yokohama, *Maximowicz*!; in ins. Nutka?

Engelmann includes this in his sect. 1. *Strobis*, with ducts peripheral, not surrounded by strengthening cells; and my observation of the leaves of Siebold's type specimen agrees with that of Engelmann. *P. heterophylla*, Presl in herb. Hænke, is referred to this species by Engelmann. If correctly so, the identification is the more important as it extends the distribution of the species to Nutka island.

*P. KORAIENSIS*, *Sieb. et Zucc. Fl. Jap.* ii. p. 28, t. 116 (1842); *Endlicher*; *Carrière*; *Gordon*; *Murray*; *Henk. et Hochst.*; *Koch*; *Parlatore*; *Engelmann, Revision*, p. 16.

*P. Strobis*, *Thunb. Fl. Jap.* p. 275 (1784), nec *Linn.*

In Koraia, in Kamtschatka et in insula Koraginsk teste *Siebold*; in montibus Fakonïæ. Colitur in Japonia, *Tschonoski*!; *Maries*!; *Veitch*! In Manchuria ad fl. Ussur, *Maach*!

Engelmann places this in his § 2. *Cembra*, marked, among

other things, by parenchymatous ducts. In Siebold's type specimens such an arrangement is seen. The leaves have few or no hypoderm- or strengthening-cells, and the central woody bundle is inversely heart-shaped on transverse section, the point being upwards. This corresponds with the three-sided form of the leaf.

*P. CEMBRA*, *Linn. Sp. Pl.* 1000, *et auct.*; *Parlatore in DC. Prod.* xvi. 2, p. 403 (1868); *Engelmann, Revision*, p. 16, adnot. 4.

In toto Alpium jugo, in Carpatis valles, in Rossia boreali; per omnem Sibiriam borealem et alpinam frequens.

Var.  $\beta$ . *PUMILA*, *Parlatore, l. c.*; *Maximowicz, Primit. Fl. Amur.* p. 260 (1859).

*P. mandshurica*, *Rupr. ex Regel, Tent. Fl. Ussur.* p. 149; *Murray in Pinet. Brit.* part 17; *Maximowicz, l. c.*

In Davuria, Sibiria orientali, Kamtschatka, insulis Kurilibus, et in America arctica ad sinum Kotzebue, in ins. Sachalin, *Schmidt!*

*P. SILVESTRIS*, *Linn. Sp. Pl.* 1000, ed. 2, 1418, *et auct.*; *Parlatore in DC. Prod.* xvi. 2, p. 385 (1868), c. synonym. et varr. plurim.; *Engelmann, Revision*, p. 16, adnot. 8.

In Europa arctica, boreali et media; in Asia arctica et boreali-orientali; in Sibiria omni a montibus Uralensibus ad Altaicos, in Sibiria orientali et in Davuria et prope fl. Amur, Caucasus, Asia Minor, Persia.

*P. MASSONIANA*, *Lambert, Pinet.* ed. 1, t. 12 (1803), ed. 2, p. 16, t. 8, et edit. 3, p. 20, t. 8, non aliorum; *Parlatore in DC. Prod.* xvi. 2, p. 389 (1868); *Engelmann, Revision*, p. 16, adnot. 11.

? *P. silvestris*, *Loureiro, non Linn., ex Parlatore, l. c.*

*P. sinensis*, *Lamb. Pinet.* ed. 3, p. 47, t. 29; *Antoine*; *Endlicher*, excl. syn.; *Carrière*, excl. syn.; *Gordon*, quoad plant. Sinens. et excl. syn.

Hongkong, *Champion!*, *Hinds!*; China, *Macartney!*, *Reeves!*, *Seemann!*; Formosa, *Oldham 554!*

Engelmann points out the distinctive characters of this Chinese species, and even refers Griffith's 4992, from Afghanistan, to this species with some hesitancy. The resin-canals in a leaf of the type specimen are numerous, parenchymatous, and surrounded by strengthening-cells.

P. BUNGEANA, *Zuccarini in Endl. Conif.* p. 166; *Parlatore in DC. Prod.* xvi. 2, p. 398 (1868); *Engelmann, Revision*, p. 16.

In China boreali (*Bunge*); *Bushell!*; *Fortune!*

This is included by Engelmann in his § 5. *Halepenses* with peripheral ducts. I find the leaves three-sided in section, with a double layer of hypoderm and four peripheral resin-canals surrounded by strengthening-cells.

P. KHASIA, *Royle, ex Parlatore in DC. Prod.* xvi. 2, p. 390, c. syn.

Yunan, *Anderson, ex Kurz in Trimen's Journal of Botany*, 1873, p. 193.

Nepal, Khasia.

This belongs to the East-Himalayan flora rather than to the Chino-Japanese; but its presence in Yunan affords an interesting example of the gradual commingling of two floras.

The fossil representatives of this genus (= *Pinites*) occur in deposits of all ages, from the Miocene to the Coal-formation.

PICEA, *Link (haud Don); Benth. et Hook.*

P. OBOVATA, *Ledebour, Fl. Altaica*, iv. p. 201, *Ill. t.* 499; *Link; Carrière (ex Parlatore); Regel, Fl. Ussur.* p. 149 (1862); *Maximowicz, Primit. Fl. Amur.* (1859), p. 260.

*Abies obovata, Loudon, Arbor. Brit.* iv. p. 2329; *Gordon; Henk. et Hochst.*

*Pinus obovata, Antoine, Conif.* p. 96, t. 37. f. 2; *Endlicher; Parlatore in DC. Prod.* xvi. 2, p. 415 (1868).

P. *Abies, Pallas, fide Parlatore.*

In Europa boreali-orientali et in Asia boreali in insulis Kurilis, *Pallas*; Manchuria prope fl. Amur, *Maximowicz 576!*; Irentia, *Turczaninow!*; prope fl. Ussur, *Maack!*

Resin-canals two or none.

Var.  $\beta$ . SCHRENKIANA, foliis longioribus.

*Picea Schrenkiana, Fisch. et Mey. in Bull. Acad. Pét.* x. p. 253; *Carrière.*

*Picea Schrenkiana, Antoine, Conif.* 97; *Endlicher.*

*Abies Schrenkiana, Lindl. et Gord. Journ. Hort. Soc. Lond.* v. p. 212.

*Pinus orientalis*  $\beta$ . *longifolia, Ledeb. Flor. Ross.* iii. p. 671, *fide Parlatore.*

*Pinus obovata, var.  $\beta$ . Schrenkiana, Parlatore in DC. Prod.* xvi. 2, p. 415 (1868).



*P. ALCOCKIANA*, *Carrère, Conif. ed. 2, p. 343; Mast. in Gard. Chron. Feb. 14, 1880, p. 212, c. ic. (See figs. 7, 8, 9.)*

*Abies Alcoquiana*, *J. G. Veitch, in Gard. Chron. 1861, p. 23, et 1862, p. 308; Gordon; Murray, pro parte.*

*Pinus Alcoquiana*, *Parlatore in DC. Prod. xvi. 2, p. 417 (1868).*

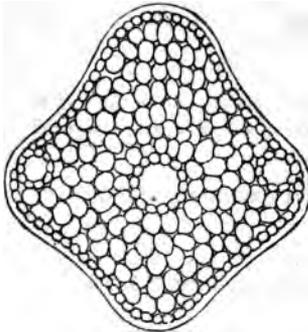
*Abies bicolor*, *Maximowicz, Mém. Biolog. t. 6 (1866), p. 24, in Bull. Acad. Imp. Sc. St. Pétersb. t. x.*

*Nomina hortensia*: *Abies excelsa*, var. *acicularis*; *A. obovata*, var. *japonica*, *Hort. Petrop.*

*Hab.* Mongolia, ad fluv. Amur et Ussur, *Maximowicz!*; in ins. Sachalin, *Glehn!*; in ins. Nippon montibus, *Veitch!*, *Maximowicz!*, *Oldham!*, *Maries!*

Nearly allied to *P. obovata*. The resin-canals (fig. 7) are sub-epidermal.

Fig. 7.



Plan of transverse section of leaf of *Picea Alcockiana*, magnified.

Fig. 8.



Scales and seeds from the type specimen of *P. Alcockiana*.

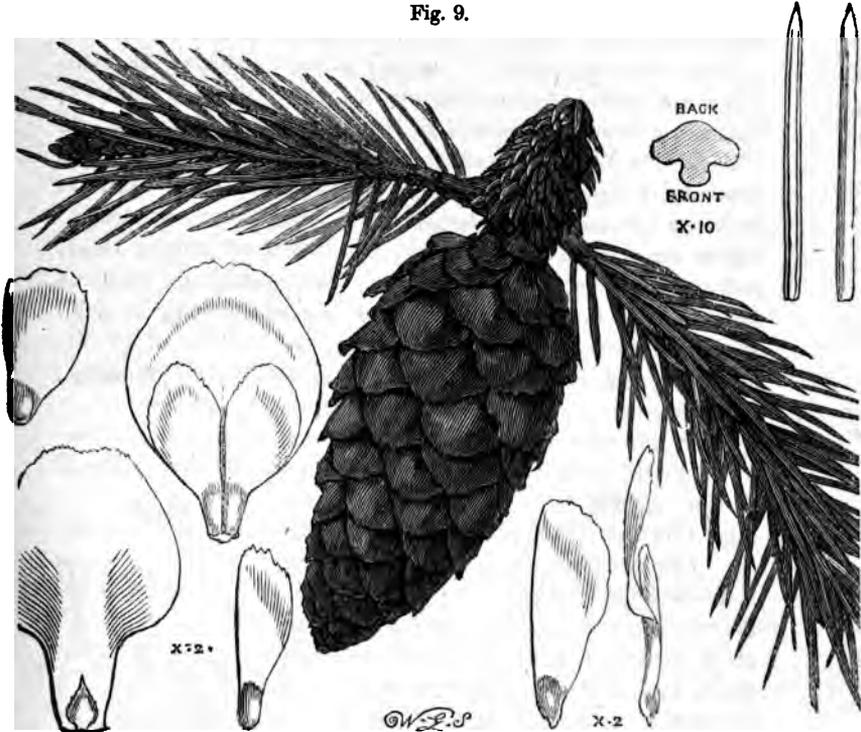
*P. AJANENSIS*, *Fischer, Florul. Ochotensis, Trautvett. et Meyer, Fl. Ochot. in Middendorff, Reise, p. 87, t. 22-24 (1856); Regel, Fl. Ussur. p. 149; Maximowicz; Carrère; Mast. in Gard. Chron. Jan. 24, 1880, p. 115, et Oct. 2, 1880, p. 427, c. ic.*

*Abies ajonensis*, *Lindl. et Gordon, Journ. Hort. Soc. Lond. v. p. 212.*

*Pinus Menziesii*, *Parlatore in DC. Prod. xvi. 2, p. 418 (1868), quoad plantam Asiaticam (synonymis exclusis).*

*Abies Alcoquiana*, hort plurim., *Murray, Pines and Firs of Japan, p. 66, quoad folia; J. G. Veitch, in Gard. Chron. 1861, p. 23, specimina autem typica in Museo Veitchiano cum descriptione haud congruunt.*

Fig. 9.



*Picea Alcockiana* (cultivated specimen). Cones, leaves, scales, and seeds: enlarged.

*Abies sitchensis*, Koch, *Dendrologie*, ii. pl. 2 (1873), p. 247, haud Bongard.

*Picea jezoensis*, Maximowicz, in *Bull. Acad. Imp. Sc. St. Pétersb.* xv. p. 235.

*Hab.* in Mongolia prope flumen Amur, Maximowicz!; in ins. Yesso ad Sapporo, Maries, n. 74!

Var. *MICROSPERMA*, Mast. loc. *suprà cit.*

? *Abies jezoensis*, Siebold et Zucc. *Flor. Japon.* ii. p. 19, t. 110.

*Abies microsperma*, Lindl. in *Gard. Chron.* 1861, p. 22; Veitch, in *Gard. Chron.* 1862, April 5, p. 308; Murray.

*Picea ajanensis*, var. *japonica*, Maximowicz, iter secund.

*Hab.* in ins. Yesso, Veitch!; Maximowicz!; Maries!; Oldham 814! 979!

This Spruce has been confounded with the *P. sitchensis* or

*Menziesii* of North-west America, from which it differs in its flatter, less deeply keeled, and blunter leaves. In the American species, moreover, there are usually no resin-canals. In cultivation the habit and general aspect of the two trees are different; but upon this point very little, if indeed any, reliance can be placed. Dr. Engelmann states (*in litt.*) that he has examined a cone of the typical *P. sitkensis*, in which he found the bracts to be lanceolate, remarkably large, half as long as the scarcely undulate scale, while in *P. ajanensis* the bracts are minute, short and oval, and the scales are undulate. Maximowicz also describes the bracts of *P. ajanensis* as minute, suborbicular (*Primit. Fl. Amur.*). Maximowicz further indicates two varieties of *P. ajanensis*—var. *α. genuina*, with cone-scales markedly denticulate; the other, var. *β*, with cone-scales subentire.

With reference to the position of the resin-canals, they appear to be on the *upper* surface of the leaves, and therefore different in that respect from the leaves of many other Conifers. In describing the species in the 'Gardeners' Chronicle,' as also in the mention made of it in the 'Journal' of this Society, vol. xvii. p. 549, I fell into the error of describing the upper surface as dark green, the lower surface as glaucous. This is, indeed, *apparently* true of the lateral shoots; but the *real* disposition is exactly the reverse. In order to avoid further confusion, I would here call attention to the leaves on the erect leader-shoots and to those on the side-branches respectively. On the erect shoots the leaves are not twisted at the base, but are erect and appressed to the stem, the glaucous surface being next the axis, somewhat concave and abundantly provided with stomata; the midrib is continued throughout the whole length of this surface, and may be excurrent into a "mucro" (fig. 11). The green convex surface is external, marked with three ridges, and in the furrows between the central larger and the lateral smaller ridges are placed the resin-canals. It terminates in a flat rhomboidal

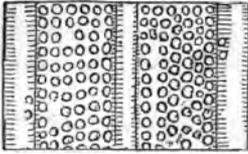


Portion of shoot and  
leaves of  
*Picea ajanensis*.

surface, into which the midrib is not prolonged (figs. 10, 12). On the horizontal side-shoots the leaves are spreading and more or less twisted at the base, so that the green surface is now uppermost, the glaucous surface beneath, whence arises the apparent

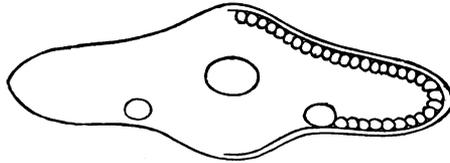
Fig. 11.

X·30·



Apparent under, real upper, surface of the leaf of *Picea ajanensis* from horizontal branch.

Fig. 12.



Diagrammatic section of leaf of *P. ajanensis*, in its real position.

position of the resin-canals on the upper (really lower) surface of the leaf. It may be further noted that on the side-shoots, while the leaves on the underside of the branch spread away more or less horizontally and are twisted, those on the upperside of the branch are placed parallel to the long axis of the branch and are not twisted. Their position therefore is exactly the same as that of the leaves on the leader-shoot. The resin-canals are in contact with the palissade-cells, and are nearest to the green surface of the leaves. It is the green surface which is ordinarily most exposed to the light, the glaucous and specially stomatiferous surface, beneath which there are no palissade-cells, being furthest from the light. *Picea sitkensis* has the glaucous leaf-surface next the axis, as also many Junipers.

On the leader-shoot of *Abies Nordmanniana* the leaves are so twisted that the glaucous surface is away from the axis. It is probable, nay, in some cases, it is certain, that the position of the leaves varies in different stages of growth and according to different circumstances; but such a movement by torsion cannot affect the internal disposition of the anatomical elements\*.

The resin-canals, when present, are placed on the side of the leaf furthest from the palissade-cells; but in *P. ajanensis* the resin-canals are in contact with them. Dr. Engelmann has pointed out to me "that in all the Abietineæ, probably in all the Coniferæ, the vascular bundle consists of an upper layer of wood-

\* Masters, "Note on Morphology and Physiology of the Leaves of certain Conifers," Journ. Linn. Soc. Bot. vol. xvii. p. 547.

cells and a lower one of bast-cells. In *Piceas* (Spruces) the bast-cells and the ducts are on the same side; and the stomata in the flat-leaved Spruces (e. g. *P. ajanensis*) mostly on the opposite side." This is in accordance with the observations of Bertrand and MacNab; and I can myself abundantly confirm it even in the case of the species which has given rise to these remarks.

P. GLEHNII, *Fr. Schmidt, Reise im Amurlande und auf der Insel Sachalin*, 1866, p. 176, fig.; *Mem. Acad. Imp. Sc. St. Pétersb. sér. 7, t. xii. n. 2*; *Masters, in Gard. Chron.* 1880, March 6, p. 300, c. ic. xylogr. (See fig. 13.)

In ins. Sachalin, *Fr. Schmidt*!; in ins. Yesso, *Maries*, n. 72!; ? in Manchuria, ad flum. Ussur, *Maack*!

This species closely resembles *P. Alcockiana* or *P. obovata*, but may be distinguished from the former by the hairy branches, the less prominent pulvini, the thinner cone-scales, persistent bracts, and wider wing to the seed. From *P. obovata* it differs in the pulvini and in the shorter broader wing to the seed (*Schmidt*). The buds have a curious appearance of being embedded within the apex of the branches, owing to the abrupt passage from the thick and crowded pulvini to the thinner bud-scales. The cones are cylindrical, generally about 2 inches long, but sometimes scarcely 1 inch. The leaf-structure is the same as that of *P. Alcockiana* and *P. obovata*.

Traces referred to this genus have been found in the Miocene and Cretaceous deposits.

#### TSUGA, *Carr. ; Benth. et Hook.*

T. SIEBOLDI, *Carr. Conif.* p. 186; ed. 2, p. 245.

*Pinus* Arragi, *Siebold, ex Parlatores*.

*Abies* Tsuga, *Sieb. et Zucc. Fl. Jap.* ii. p. 14, t. 106; *Gordon; Henk. et Hochst.; Murray, Pines and Firs*, p. 84; *Franchet et Savatier; J. G. Veitch, Gard. Chron.* 1862, p. 308.

*Pinus* Tsuga, *Endlicher, Conif.* p. 83; *Antoine, Parlatores in DC. Prod.* xvi. 2 (1868), p. 428.

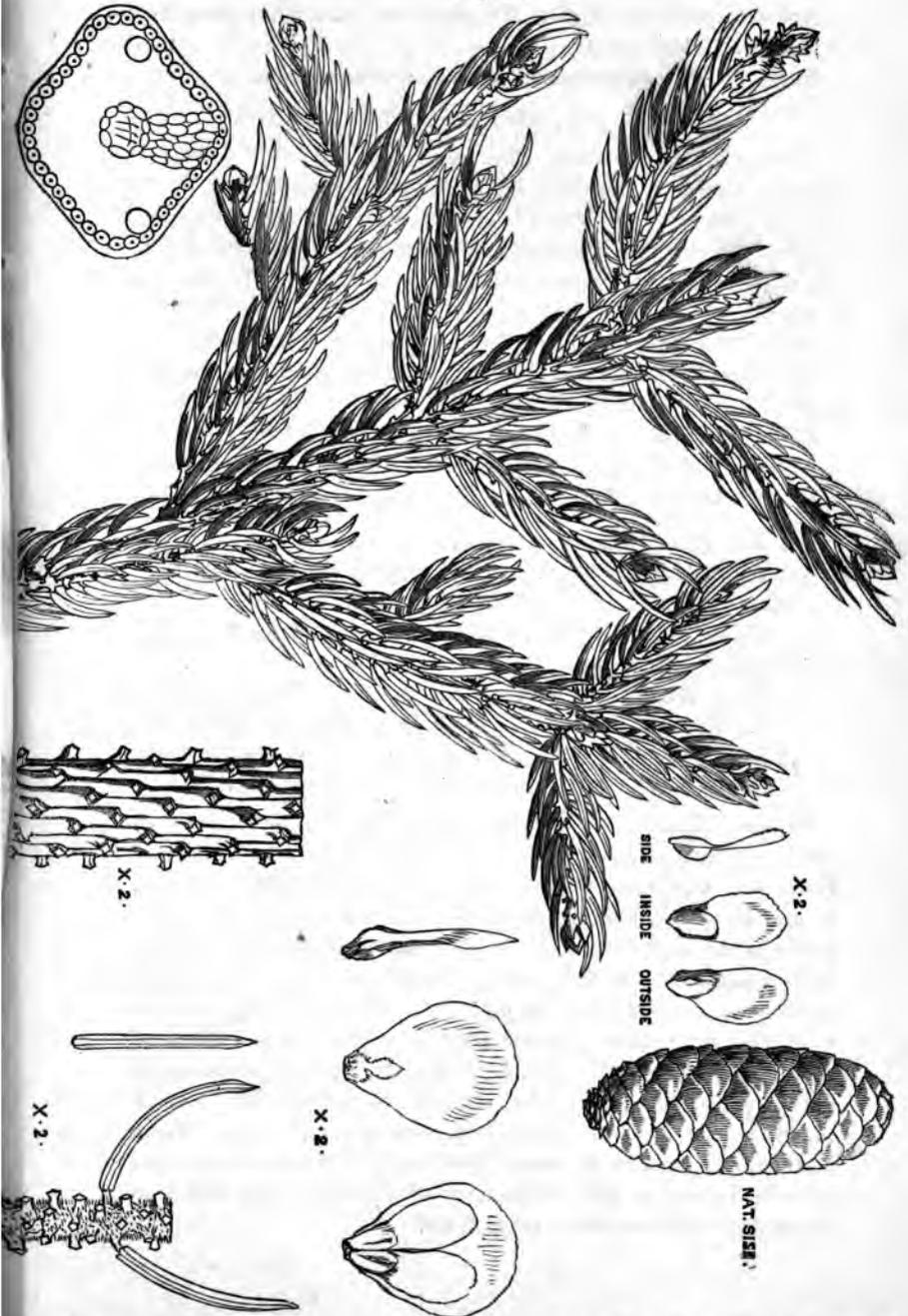
*Abies* araragi, *Loud.*

In Japoniæ borealis provinciis Matsu et Dewa, *Siebold; Veitch!*; *Maximowicz!*; *Savatier.*

Var.  $\beta$ . NANA, *Sieb. et Zucc. l. c.*

This is the Japanese representative of the Hemlock Spruce of the American continent and of the Himalayan *T. dumosa*.

Fig. 13.



*Picea Glehnii* (native specimen). Branch and cone, nat. size; shoot, detached leaves, scales, and magn. twice; transverse section of leaf, highly magnified.

## T. DIVERSIFOLIA.

*Abies diversifolia*, *Maxim. Mél. Biol.* vol. vi. p. 373; *Franchet et Savatier, Enum. Pl. Jap.*

In insulæ Nippon alpinis, in Kioussiou, *Maximowicz*.

*ABIES*, *Juss. pro parte; Link; Benth. et Hook.*

*A. FIRMA*, *Sieb. et Zucc. Flor. Jap.* ii. p. 15, t. 107 (1842)!; *Gordon; Carrière; Lindley; Veitch in Gard. Chron.* 1862, p. 309; *Murray* (excl. syn.); *Bertrand in Ann. Sc. Nat.* (1874), p. 95, quoad foliorum structuram!; *MacNab, in Proceed. Royal Irish Acad. sér. 2*, vol. ii. (1876), p. 686, quoad folia (synon. excludend.)!; *Masters in Gardeners' Chronicle*, vol. xii. pp. 198, 199 (1879).

*Abies Momi*, *Siebold, Koch, Dendrologie*, ii. p. 227 (1873).

*Pinus firma*, *Antoine, Conif.* p. 70, tab. 27 bis; *Endlicher, Synops.* p. 99 (1847); *Parlatore, in DC. Prod.* xvi. 2, p. 424, excl. syn.

*Picea firma*, *Gordon, Pinet.* p. 147, ed. 2, p. 204!, excl. syn.

*Abies holophylla*, *Maximowicz in Mél. Biol.* t. vi. p. 23 (1866)!

*Pinus holophylla*, *Parlatore in DC. Prod.* xvi. 2, p. 424 (1868).

. Var. (vel potius forma juvenilis) BIFIDA.

*Abies bifida*, *Sieb. et Zucc. Fl. Jap.* ii. p. 18, t. 109; *Carrière; Veitch in Gard. Chron.* 1862, p. 308.

*Pinus bifida*, *Antoine, Conif.* p. 79, t. 31. f. 2; *Endlicher, Conif.* p. 101.

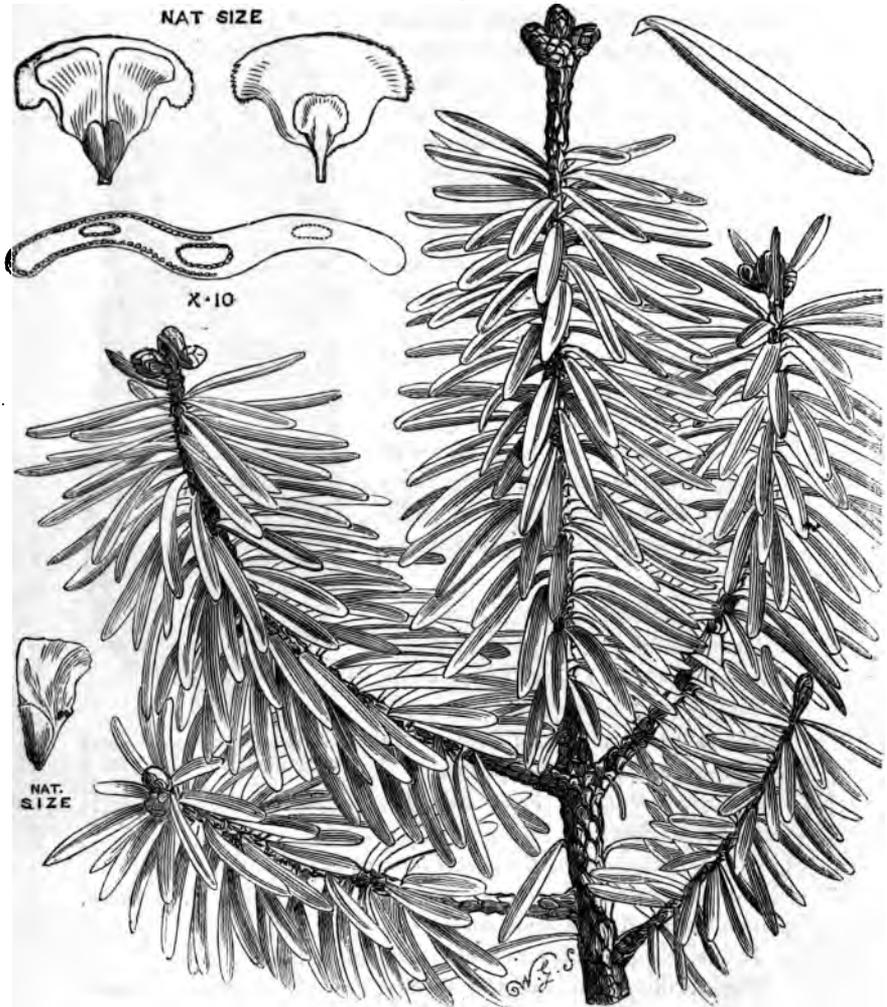
*Picea Webbiana*, *Gordon, Pinet.* p. 160 (1858), ex *Murray*.

In Japonia, *Kämpfer*!; in Japoniæ insulis a Kiusiu per Sikok, Nippon, Yesso et Karafto, nec non aliquas Kurilium diffusa; in Manchuria austro-orientali, *Maximowicz*!

In the 'Gardeners' Chronicle,' above cited, I have given in detail my reasons for following the lead of those who have combined the two reputed species of *firma* and *bifida*. Briefly, it may be stated that, although the external appearance of the leaves is very different, and the internal organization, as studied by *Bertrand*, by *MacNab*, and by myself, yet more so, it is impossible to consider them as belonging to two different species, when they are seen to be borne on different branches of the same tree. This was seen by *Mr. J. G. Veitch*; and his testimony is confirmed by the specimens brought home by *Mr. Maries*. *A. bifida* has, moreover, never been seen bearing cones. There is, then, every reason to assert that the *bifida* form is simply the juvenile immature and sterile form of the same tree, which in the mature state we know as *A. firma*.



Fig. 15.



Foliage and structural details of *Abies brachyphylla* (native specimen).

*Abies nephrolepis*, *Maximowicz, Mém. Biol.* vi. p. 22 (1866)!

*A. sibirica*, var. *nephrolepis*, *Trautvetter ex Maximowicz, Primit. Flor. Amurens.* p. 260 (1859)!

*Pinus selenolepis*, *Parlatore in DC. Prod.* xvi. 2, p. 427 (1868).

*Pinus Veitchii*, *MacNab, Proc. R. Irish Acad.* p. 686 (1876)  
(foliorum anatomia).

In ins. Nippon, Fusi Yama, 6000–7000 ped., *Veitch* !, *Oldham* 818 !, *Maxies* Hakodate (cult), *Maximowicz* !; Manchuria austro-orient., *Maximowicz* !; ? in ins. Sachalin, *Schmidt*.

A. SACHALINENSIS, *Mast. in Gard. Chron.* Nov. 8, 1879, p. 588, c. ic. (See fig. 16 *infra*.)

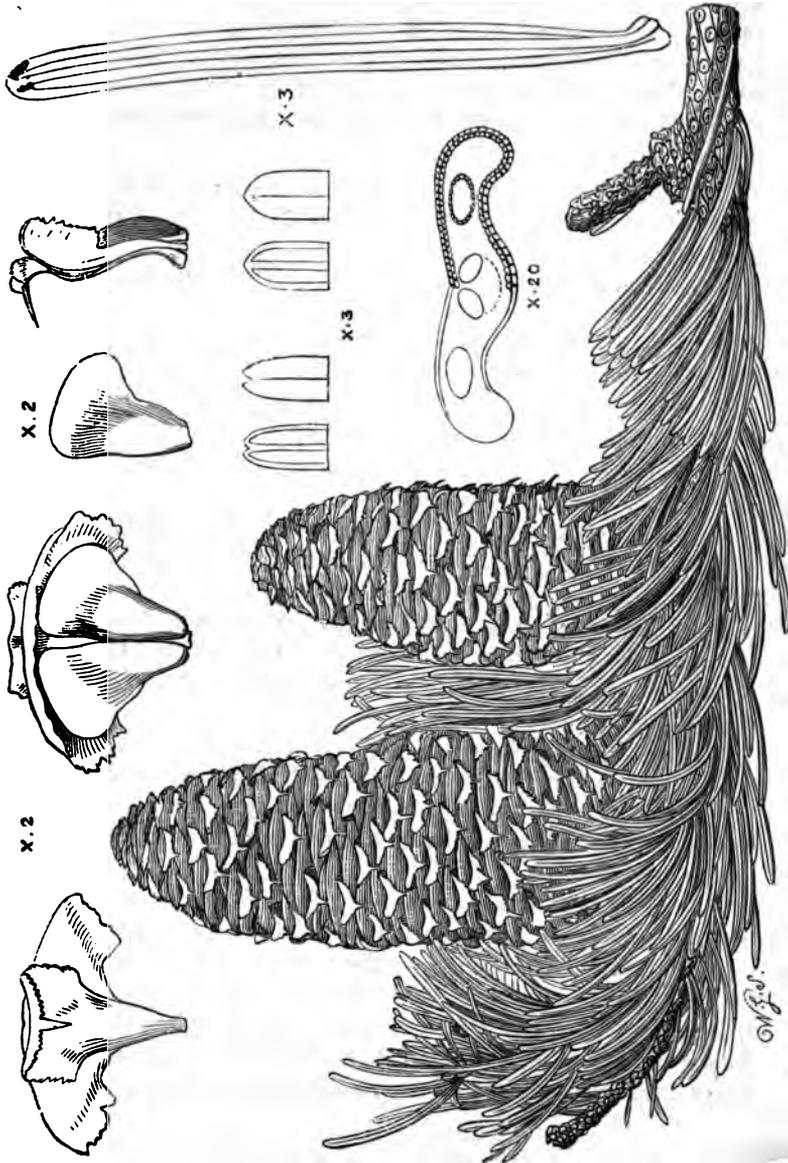


Fig. 16. *Abies sachalinensis*. Foliage and cones (native specimens), of natural size; structural details, magnified

*A. Veitchii*, var. *sachalinensis*, *Fr. Schmidt, Mém. Acad. Imp. Sc. Pétersb.* 7 sér. tom. xii. n. 2, p. 176, tab. 4. figs. 13-17.

In ins. Sachalin, *Schmidt* ! ; in ins. Yesso, *Maries*, nn. 70, 71, 73, pro parte !

Possibly only a variety of *Veitchii*; but differing in the habit, greater length of leaf, larger cones, and longer bracts (usually quite concealed in *Veitchii*). *Maries*' specimens, however, show that there is considerable variation as to these points. According to Mr. *Maries*, the present species or variety occurs in the lowlands and near the sea-coast in Yesso, while *A. Veitchii* is always a mountain tree in Japan proper.

*A. HOMOLEPIS*, *Siebold et Zuccarini, Flor. Jap.* ii. p. 17, t. 108! ; *Lindl. et Gord.* ; *Carrière*, ed. 2, p. 290; *Mast. in Gard. Chron.* Dec. 27, 1879, p. 828, c. ic.

*Pinus homolepis*, *Antoine, Conif.* p. 78, t. 31. f. 1 (1846); *Endlicher*.

*Abies firma*, *Murray, Pines and Firs of Japan*, p. 53, figs. 109, 113, 114, *haud Sieb. et Zucc.*

*Picea firma*, *Parlatore in DC. Prod.* xvi. 2, p. 424.

*Picea firma*, *Gordon, Pinet.* ed. 2, p. 204.

*Abies Tschonoskiana*, *Regel in Ind. Sem. Hort. Petrop.* 1865, *ex Parlatore in DC. Prod. l. c.* p. 431.

*P. Finnhonoskiana*, *Neum. Cat. ex Parlatore, l. c.* p. 431.

*Pinus Harryana*, *MacNab in Proc. Royal Irish Acad.* p. 689, t. 47. fig. 16! (quoad foliorum anatomiam).

*Abies Momi*, *Koch, Dendrol.* ii. p. 227 (1873), *haud Siebold*.

Nomina hortensia delenda *Abies* seu *Picea Veitchii* (*haud Lindl.*), *Tschonoskiana*, *firma* (*haud Sieb. et Zucc.*), *sibirica affinis*, et *brachyphylla* (*haud Maximowicz*).

In montibus ins. Nippon, *Siebold* ! vidi viv. cult.

This species, imperfectly described by *Siebold* and *Zuccarini*, has been held to be a form of *A. firma*; but it is amply different in the pulvini of the stem, the form of the leaves, and the arrangement of the resin-canals.

Only a very imperfect specimen exists in the herbarium at Kew; but there are good examples of what I believe to be this plant in cultivation, and specimens from these were obligingly compared for me by Professor *Suringar* with the type in the *Leyden herbarium*. Mr. *Syme*, now Superintendent of the Botanic Garden, Jamaica, considers this a form of *A. brachyphylla*, *Max.*; but the leaves differ in size, form, colour, and arrangement of the resin-

canals. In *A. homolepis* the leaves on the upper surface of the branches are much shorter than those on the lower; while in *A. brachyphylla* they are almost all of the same length; the leaves of the former, moreover, are much more acute than in the latter species. It is quite possible, however, that Mr. Syme's opinion is correct; but in the absence of cones of *A. homolepis* the balance of evidence seems to me to be decidedly in favour of the distinctness of the present species.

A. MARIESII, *Mast. in Gard. Chron.* Dec. 20, 1879, p. 788, c. ic. (Figs. 17, 18.)

In Japonia septentrionali prope Awomori, et in Monte Nikko alt. 3000-7000 ped. *Maries* n. 73, pro parte. V. v. sic. et cult.

This closely resembles *A. brachyphylla*—too closely, perhaps; but it has the young shoots hairy, the pulvini scarcely at all prominent, more deeply sulcate leaves, with the resin-canals subepidermal, not free; larger, broader, and more barrel-shaped cones, the scales of which are entire, not denticulate; and the bracts are denticulate and acuminate. From *A. firma* and the form of that species known as *holophylla*, the present species differs in the more prominent pulvini, the different form of the leaves, the position of the resin-canals, the nearly entire cone-scales, &c.

A. SIBIRICA, *Turcz. Cat. Baik. ex Parlatore in DC. Prod.* xvi. 2, p. 425 (1868); *Regel, Fl. Ussur.* 1862, p. 149; *Ledebour; Carrière; Antoine.*

*Pinus Picea, Pall. Fl. Ross.* i. p. 7, excl. syn.

*Pinus Pichta, Fisch. ex Loddiges' Cat.* 1836, p. 50; *Endlicher, Conifer.* p. 225.

*Picea Pichta, Loudon, Arboret.* iv. p. 2338; *Gordon, Pinetum,* p. 156, ed. 2, p. 221.

*Abies Pichta, Pinet. Woburnens.* t. 39; *Henk. et Hochst.*

In Rossia boreali et media orientali, in Sibiria et Davuria montibus, in Kantschatka et in Mongolia ad fl. Amur.

A. FORTUNEI, *Murray, Pines and Firs of Japan,* p. 49, c. ic. xylogr.

*Abies jezoensis, Lindl. in Paxt. Fl. Gard.* 1850, p. 43, et in *Gard. Chron.* 1850, p. 311, c. ic. xylogr.; *Van Houtte, Fl. des Serres,* vol. vii. p. 223, vol. xi. p. 7; *Carrière, Traité Général,* p. 255, ed. 1; *Gordon, Pinetum,* ed. 1, p. 17, ed. 2, p. 27; *haud Siebold.*

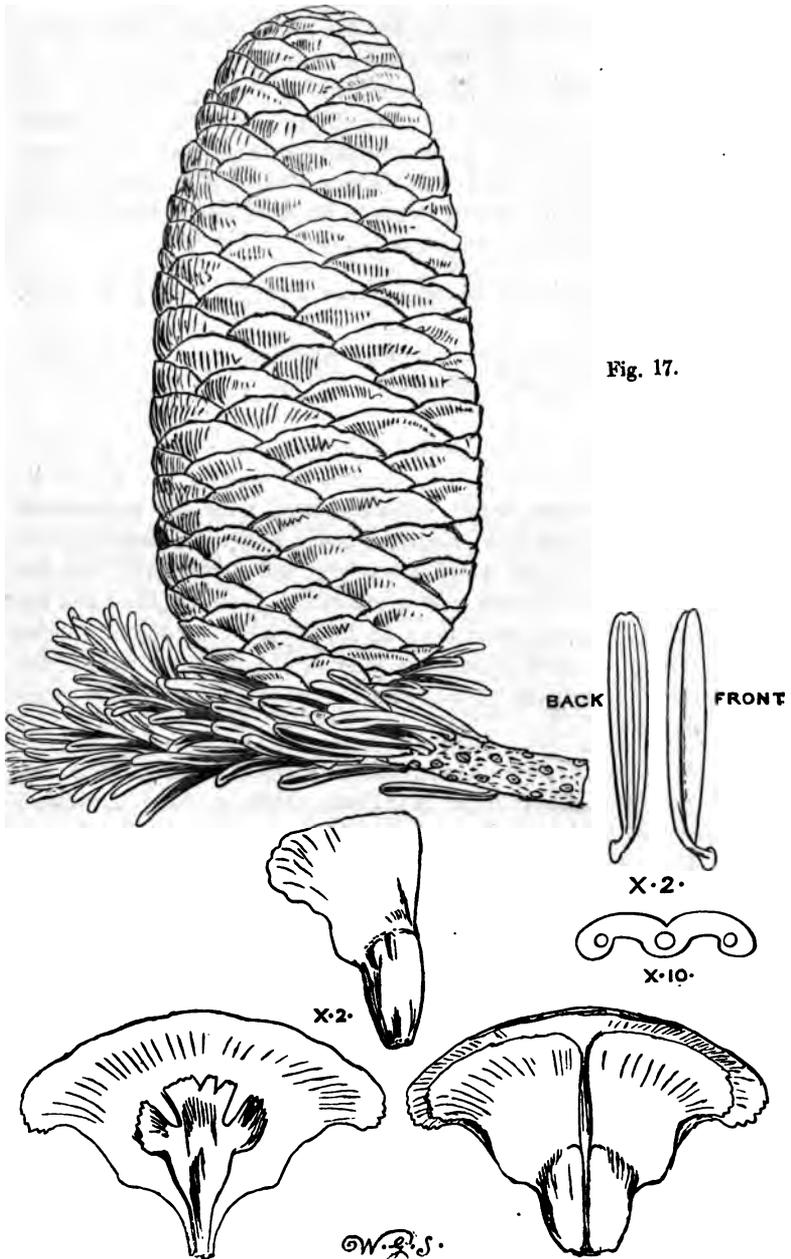
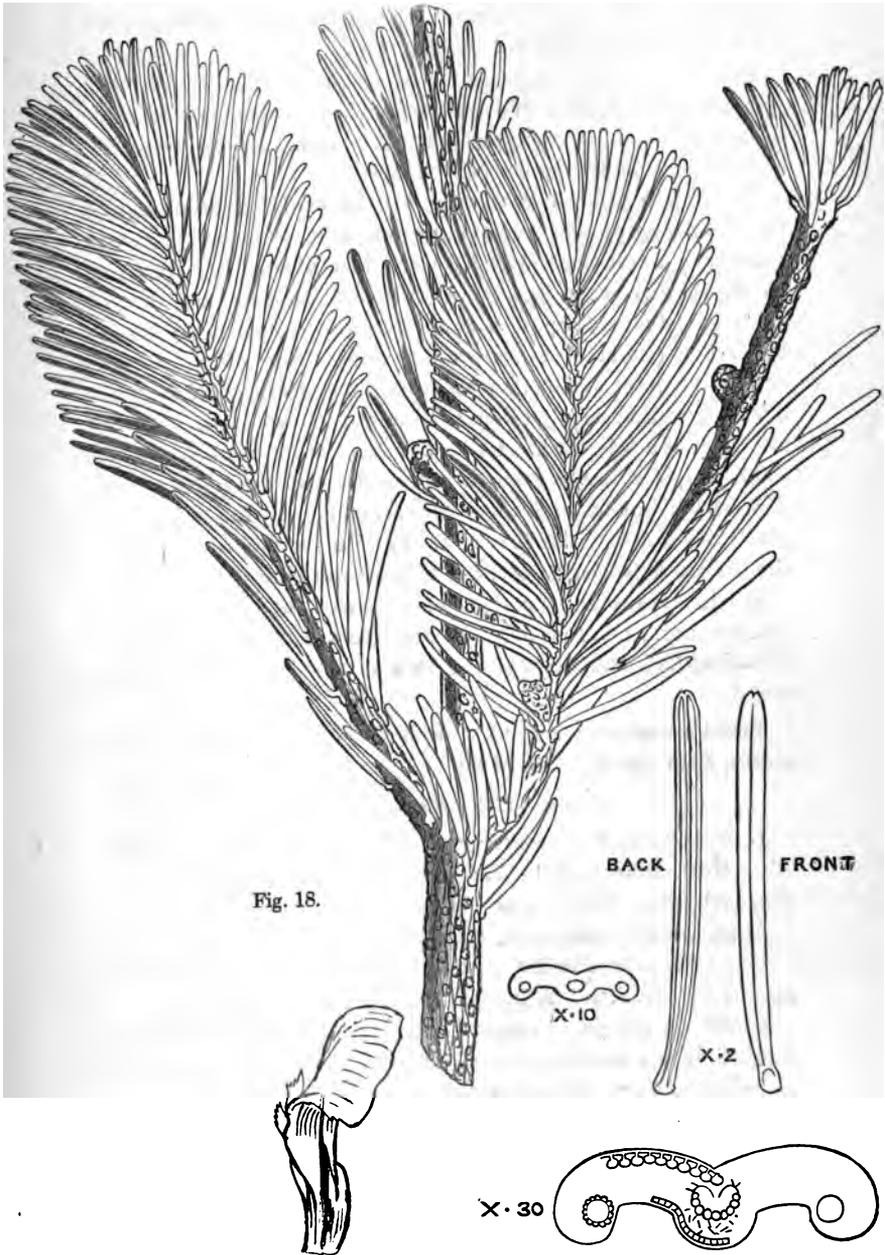


Fig. 17.

*Abies Mariesii*. Cone, leaves, plan of leaf-section, bract, scales, and seeds (native specimen).



*Abies Mariesii*. Foliage, plan of leaf-section and seed-scale from the side (native specimen).  
LINN. JOURN.—BOTANY, VOL. XVIII. 2 q

*Keteleeria Fortunei*, *Carrière, Revue Horticole*, 1866, p. 449, c. ic. ; *et in Traité Général*, ed. 2, p. 260.

In China ad templum prope Foo-chow-foo, *Fortune* n. 50, 52 !

A transverse section of a leaf shows a continuous layer of hypoderm cells and parenchymatous resin-canals, one on each side, and not surrounded by strengthening-cells.

To the late Andrew Murray is due the credit of disentangling the synonymy of this remarkable species. It is, however, not quite clear whether he intended to rank it among the Spruces or among the Silvers ; in fact, he placed it in both sections. But, on the whole, it would appear as if he preferred to place it among the Silver Firs (*Abies* of Continental writers, *Picea* of English gardens). *Carrière* well points out that the appearance of the plant differs from that of any other Conifer yet known—that its cones are those of a Silver Fir (*Abies*), but its scales are persistent, not caducous. On these grounds he established for it the genus *Keteleeria* ; but Mr. Bentham (Benth. et Hook. Gen. Pl. vol. iii. 1880) refers it to *Abies* (Juss., Link), with the remark “est verisimiliter *Abietis* species, strobili squamis diu persistentibus.”

*Fortune* is the only botanist who has met with the plant in its native country ; and he only saw one tree in a temple-garden near Foo-choo-foo, and conjectures that it may have been introduced.

Fossil remains referred to *Abies* have been met with in various strata, from the Miocene to the Oolite.

LARIX, *Mill.* ; *Benth. et Hook.*

*L. DAVURICA*, *Turczaninow, Cat. Pl. Baic. in Bull. Soc. Imp. Nat. Mosc.* 1838, p. 101 ; *Trautvetter* ; *Carrière*, excl. syn ; *Gordon*, excl. syn. ; *Henk. et Hochst.*

*Abies Gmelini, Ruprecht, Fl. Samoj.* p. 56, *ex Parlatores.*

*Pinus davurica, Fischer, ex Turcz. Cat. Baik. n. 1072, ex Parlatore in DC. Prod.* xvi. 2, p. 410.

In Sibiria arctica et orientali, in Davuria, Ajan, Amur, ins. Cadjak, in ins. Sachalin teste *Schmidt* ! in China boreali, *Bretschneider* ! ; Amur, *Maximowicz* !

*L. LEPTOLEPIS, Endlicher, Conif.* p. 130 ; *Gordon* ; *Murray.*

*Pinus Larix, Thunberg, Fl. Jap.* p. 275, excl. syn.

*Pinus leptolepis, Parlatore in DC. Prod.* xvi. 2, p. 410.

*Abies leptolepis, Sieb. et Zucc. Fl. Jap.* p. 12, t. 103 ; *J. G. Veitch in Gard. Chron.* 1862, p. 308 ; *Gordon.*

*Larix japonica*, *Carrière, Conif.* p. 272, ed. 2, p. 353; *Henk. et Hochst.*

In mont. ins. Nippon, *Veitch!*; *Maximowicz!*; in ins. Yesso, *Maries!*

*L. SIBIRICA*, *Ledeb. Flor. Altaic.* iv. p. 204; *Link*; *Trautvetter*; *Carrière.*

*Larix Ledebourii*, *Ruprecht, ex Parlatore*; *Gordon in DC. Prod.* xvi. 2. p. 410.

*Larix europæa sibirica*, *Loudon, Encycl. of Trees*, p. 1054.

*Pinus intermedia*, *Lodd. Cat., ex Parlatore, l. c.*

*Larix intermedia et Archangelica*, *Laws., ex Loudon, Arboret.* p. 1055.

*Larix decidua*  $\beta$ . *rossica*, *Henk. et Hochst., ex Parlatore l. c.*

*Pinus Ledebourii*, *Endlicher*; *Parlature in DC. Prod.* xvi. 2, p. 410.

In *Rossia arctica et septentrionali*, et in *Sibiria omni*, in *Manchuria austro-orientali*, *Maximowicz!*

#### § *Pseudo-Larix.*

*L. KÆMPFERI*, *Gordon, Pinet.* p. 292; *Murray*; *Henk. et Hochst.*; *Carrière.*

*Pinus Kæmpferi*, *Lamb. Pinus*, ed. 3, p. vii, *ex Parlature in DC. Prod.* xvi. 2. p. 412 (1868).

*Abies Kæmpferi*, *Lindl. in Gard. Chron.* p. 255, 1854, *c. ic.*; *Carrière.*

*Larix Kæmpferi*, *Carrière in Flore des Serres*, xi. p. 97.

*Pseudo-Larix Kæmpferi*, *Gordon, Pinetum*, ed. 2, p. 360 (1875).

In *montibus Chinæ boreali-orientalis*, *Fortune!*

Var.  $\beta$ . *NANA*, *colitur.*

A transverse section of a leaf shows the midrib prominent on the lower surface, the upper surface being convex. There is a central vascular bundle surrounded by a bundle-sheath and enclosed between palissade cells above and spongy parenchyma below. There are few, if any, hypoderm cells, and no resin-canals. Bertrand, however, detected small ones near the edge of the leaf; so that their presence is variable.

*L. PENDULA*, *Salisbury in Linn. Trans.* viii. p. 313; *Forbes, Pinet. Woburn.* p. 137, t. 46; *Carrière.*

*Pinus pendula*, *Solander in Aiton, Hort. Kew.* ed. 1, vol. iii. p. 369, *ex Parlature in DC. Prod.* xvi. 2. p. 409; *Endlicher*; *Willdenow*; *Lambert.*

*P. laricina et intermedia*, *Duroi, ex Parlature l. c.*

*Larix microcarpa*, *Pinet. Woburn*, p. 139, t. 47; *Hook. Fl. Bor.-Am.* ii. p. 164; *Link*; *Carrière*; *Gordon*; *Henk. et Hochst.*

*Larix americana*, *Michaux, Arb. forest. Amér. sept.* iii. p. 37, t. 4.

*L. intermedia*, *Link in Linnæa*, xv. p. 535; *Pinet. Woburn.* p. 141.

*Pinus microcarpa*, *Lamb. Pin.* ed. 2, p. 56, t. 37, et ed. 2, p. 87, t. 53; *Meyen, Pl. Labrad.* p. 30; *Antoine*; *Endlicher.*

*Abies pendula et microcarpa*, *Lindl. et Gord. in Journ. Hort. Soc.* v. p. 213.

*Larix decidua*  $\gamma$ . *americana*, *Henk. et Hochst. Nadelhölz*, p. 133.

*Larix Fraseri*, *Curtis, ex Parlatores l. c.*

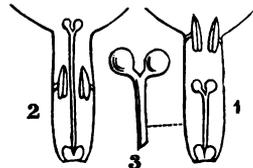
In America arctica, boreali et orientali usque ad montes Virginiae.

LARICITES is found in Miocene deposits.

On *Arnebia* and *Macrotomia*.  
By C. B. CLARKE, M.A., F.L.S.

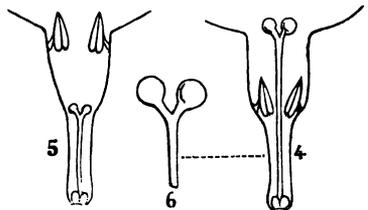
[Read March 3, 1881.]

*ARNEBIA* is stated by Kuhn (in 'Botanische Zeitung,' 1867, p. 67) to be dimorphic. I find this to be so in every species. *A. hispidissima*, DC. (figs. 1, 2, 3) is dimorphic in a very common way. Some plants are all long-styled; others are all short-styled: the style may be slightly less divided in the long-styled than in the short-styled. These figures might do for any species of *Arnebia*.



*Arnebia hispidissima*, DC.  
Fig. 1. Short-styled form.  
2. Long-styled form.  
3. Stigma of short-styled form.

*Macrotomia* is dimorphic in a similar manner. In the type species of the genus, *M. Benthami* (figs. 4, 5, 6), both the long and short styles are bifid, and are exactly the same as in *Arnebia*. In *Macrotomia perennis* (figs. 7, 8, 9, 10) the long style is subdivided; the short style manifestly bifid. In some other species of *Macrotomia*, similarly dimorphic, the style, whether long or short, is obscurely bifid.

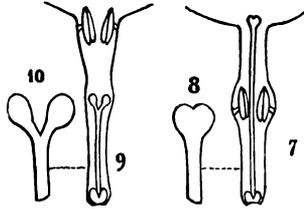


*Macrotomia Benthami*, DC.  
Fig. 4. Long-styled form.  
5. Short-styled form.  
6. Stigma of long-styled form.

Dimorphism has now been noticed in very many genera. The present case is noticeable for two reasons:—

1st. In the 'Genera Plantarum,' ii. p. 837, Bentham and Hooker, not noticing the dimorphism of these two genera, have separated *Arnebia*, as having a bifid style, from *Macrotomia*, having an entire style, and have removed (Gen. Pl. ii. p. 862) *Macrotomia perennis*, Boiss., to *Arnebia*. The limits of these two genera, if two are to be maintained, will have to be reconsidered.

2nd. One of the earliest good notices of dimorphism relates to *Macrotomia*. Fischer & Meyer, 'Enum. Pl. Schrenk.' p. 34 (published in 1841), write of *Macrotomia perennis*, Boiss. (under the synonym *Stenoselenium perenne*):—"Flores polygami? Inveniuntur enim specimina *brevistyla*, quorum flores staminibus instructi sunt ad faucem corollæ insertis et stylo tubo corollæ duplo breviori: adsunt alia specimina *longistyla* staminibus in media parte tubi corollæ insertis, stylo tubum superante."



*Macrotomia perennis*, Boiss.

Fig. 7. Long-styled form.

8. Stigma thereof.

9. Short-styled form.

10. Stigma thereof.







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# LINNEAN SOCIETY.

## NOTICE.

The **LIBRARY** and **READING-ROOM** will be closed for Cleaning and other purposes from Monday, August 1st, till Saturday, September 3rd, inclusive.

Borrowers who have Books on loan will favour by returning these, if convenient, not later than July 30th.

It is here also notified that the Council have granted to the **INTERNATIONAL MEDICAL CONGRESS** the use of certain of the Society's Rooms during their sittings in August, as specified below. The attention of Fellows of the Society is hereby directed to the circumstance that, unless they are among the Registered Members of the Congress, and present their tickets on entrance, they will not have the privilege of attending the Meetings of the Congress.

### INTERNATIONAL MEDICAL CONGRESS.

SEVENTH SESSION. LONDON, 2ND TO 6TH AUGUST, 1881.

**Section I. ANATOMY.**—To meet in the Council Room, Linnean Society.

Professor FLOWER, LL.D., F.R.S., *President*.

Professors MACALISTER and TURNER, *Vice-Presidents*.

Professors CURNOW and THAMM, *Secretaries*.

This Section will receive communications relating to any of the following subjects:—(1) Human Anatomy, descriptive, microscopic, and topographical; (2) Embryology and Teratology; (3) Anatomical Anthropology and Anthropometry; (4) Comparative Anatomy, in so far as it illustrates structural arrangements in Man; (5) Improved Methods of Instruction in Anatomy, and of preparing and preserving anatomical specimens.

**Section XI. DISEASES OF THE SKIN.**—To meet in Secretary's Room, Linnean Society.

ERASMUS WILSON, F.R.S., *President*.

Dr. CHREABLE and Dr. R. LEVINSOHN, *Vice-Presidents*.

Dr. CAVAFY and Dr. TRIN, *Secretaries*.

Subjects for discussion:—(1) On the Relation between Constitutional Disorder and Cutaneous Disease; (2) On the Nature and Treatment of Lupus erythematosus; (3) On the Influence of Climate, Race, and Social Habits on the Development and Character of Cutaneous Disease.

**Section XII. DISEASES OF THE TEETH.**—In Linnean Society's Meeting Room.

EDWIN SAENIERS, *President*.

JUDY TOMES and C. SPENCER BATES, *Vice-Presidents*.

C. S. TOMES, *Secretary*.

Subjects for discussion:—(1) Replantation and Transplantation of Teeth; (2) Premature Wasting of the Alveoli, and its amenability to treatment; (3) The Share taken by Septic Agencies in causing Diseases of the Dental Pulp and Periosteum; (4) Mercurial and Syphilitic Teeth, and the Causes of Irregularities of Position of the Teeth; (5) New Dental Instruments and Methods of Operating.

Sectional Meetings from 10 A.M. to 1 P.M., and 2 to 3.30 P.M.