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SUB-ALPINE PLANTS

BY THE SAME AUTHOR
Uniform in Size and Price with this Volume

ALPINE PLANTS OF EUROPE

WITH CULTURAL HINTS

WITH 64 FULL-PAGE COLOURED PLATES

A Few Press Opinions.

"The author combines botanical knowledge with an intimate acquaintance with the plants *in situ*; and this combination gives to his work an accuracy and precision which are lacking in many previous works on the subject."—*Journal of Botany*.

"There are many books which deal with the Flora of the Alps, and Mr. Thompson's volume ought to rank high among them. The author knows his subject at first hand."—*Gardeners' Chronicle*.

"The book ought to be a great help to amateur Alpine traveller-collectors, as it certainly will be to gardeners who have to do with Alpine plants."—*Field*.

"The short introductory chapters on the nature of Alpine plants, their culture, and collection for the herbarium are well done."

Spectator.
"Seldom is a botanical work more richly or more generously illustrated than this volume."—*New York Times*.

"Voici un beau et bon volume qui comble une lacune dans la littérature scientifique anglaise."—*Le Monde des Plantes*.

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Echo des Alpes.
"English botanists who go in for field work on the Alps or indeed who are in any way interested in the study of Alpine flora, will congratulate themselves on Mr. Harold Thompson's valuable work."

Scotsman.

GEORGE ROUTLEDGE & SONS, LIMITED

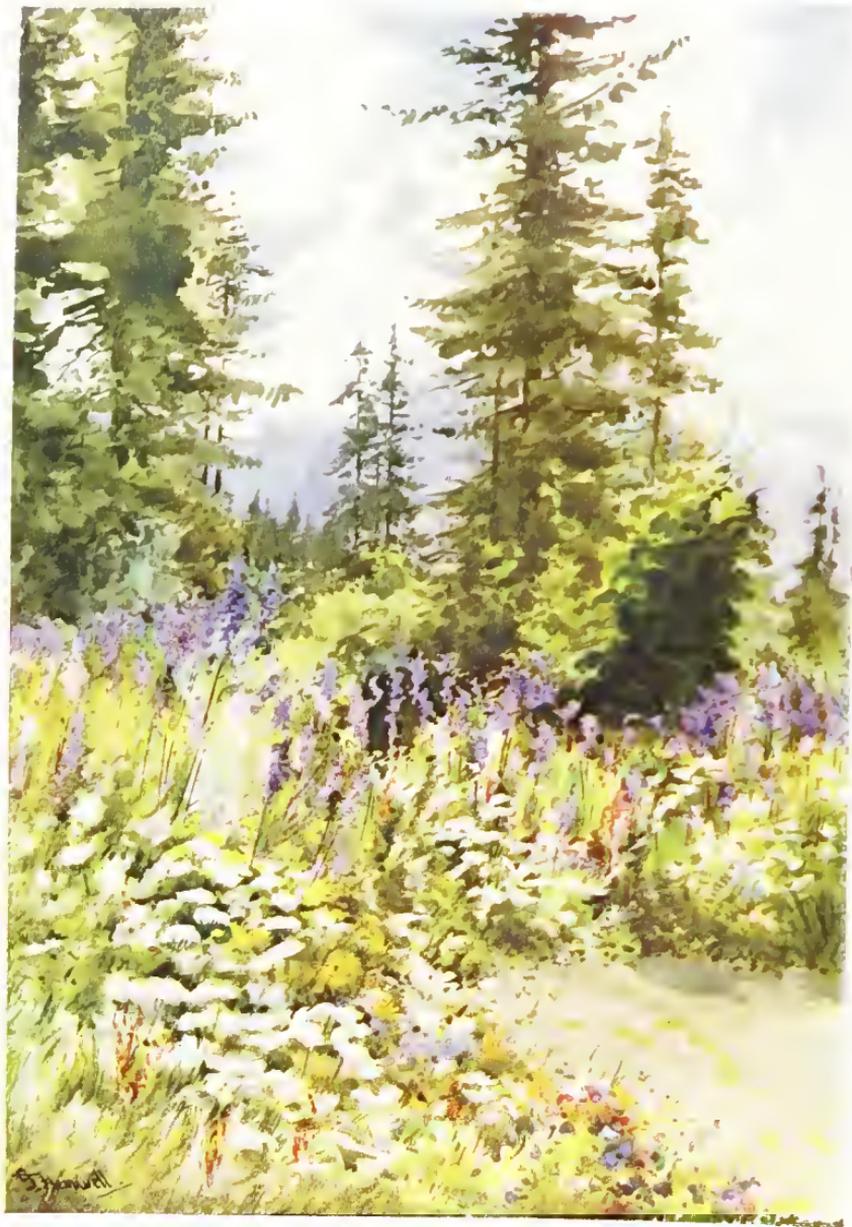


PLATE I.

MULGEDIUM ALPINUM, EPILOBIUM ANGUSTIFOLIUM, ETC. WHERE FOREST
AND MEADOW MEET, AT LE PLANET, ABOVE ARGENTIÈRE.

SUB-ALPINE PLANTS

OR

FLOWERS OF THE SWISS WOODS
AND MEADOWS

BY

H. STUART THOMPSON, F.L.S.

AUTHOR OF "ALPINE PLANTS OF EUROPE"

WITH 33 COLOURED PLATES (168 FIGURES)

BY GEORGE FLEMWELL

AUTHOR OF "ALPINE FLOWERS AND GARDENS," ETC.



LONDON

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NEW YORK: E. P. DUTTON & CO.

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HEPATICA

" MOST welcome, while the meagre East
Rebuffs the Spring, is thy brave face,
Dear nursling of the Alps, and least
Of all the windflower race.

" Ere crocus-blades defend their gold,
Or woods are with thy kinsfolk white,
Thou beckonest thy comrades bold,
Snowdrop and Aconite.

" Not Winter's tyranny can blanch
Thy cheek, or bruise thy buds of silk ;
Hast thou not heard the avalanche
And quaffed the glacier-milk ?

" So to his face thou dost profess
Thy faith in Spring, and dost outrun
Thy very leaves in eagerness
To hail the insurgent sun."

ALFRED HAYES in *The Cup of Quietness*.

GK
137
T47
1912

PREFACE

IT is quite natural that most of the books on Alpine plants have dealt chiefly with the higher zone of vegetation, and that consequently the flowers of the sub-alpine woods and meadows have been somewhat neglected. Therefore it is believed there is room for a book descriptive of the plants of the lower mountains.

In the first chapter it is explained that owing to overlapping, a large number of species characteristic of the sub-alpine regions are also found in the higher pastures; and that many others, of which not a few are British plants, descend to the plains. No book on the subject would be at all representative if both series were not included.

When not otherwise stated, every plant described is believed to be perennial. In the case of a few species short cultural notes are given; while there is a general chapter on the cultivation of Alpine plants.

The heights given in the text refer more especially to the Swiss Alps, though sometimes I have given the approximate altitudinal limits of certain species as observed by myself in other mountain ranges. Naturally in Britain, Scandinavia, etc., most of the Alpine plants common to those countries and Switzerland flourish at much lower elevations.

The terms "Eastern," "Central," and "Western" Alps need some slight explanation. These divisions are roughly those adopted both in the late John Ball's classic *Alpine Guide*, and in Mr. Coolidge's *The Alps in Nature and History* (1908). Those two authorities have defined the WESTERN ALPS as extending from the Col de Tenda to the Simplon Pass in southern Switzerland. The Col de Tenda separates the Maritime Alps from the Ligurian Mountains, and carries the high road from Nice to Cuneo and Turin. Thus the Western Alps

are chiefly in France and Italy, but they also comprise that part of Switzerland which is south of the Rhone.

The CENTRAL ALPS include the greater part of Switzerland, north and east of the Simplon; the small portion of Tyrol west of the Reschen Scheideck Pass and the bit of Alpine Lombardy to the north.

The EASTERN ALPS comprise the rest of the Alpine ranges to the east of the Reschen Scheideck and the Stelvio Passes. They are wholly Austrian and Italian, except for the limestone hills of Bavaria in the north.

Among the many books and pamphlets consulted in the preparation of this work I must especially mention the help derived from the *Flore de la Suisse* by Messrs. Schinz and Wilczek, Mons. Coste's *Flore de la France*, and Bentham's *Hand-book of the British Flora*, which has been especially useful in framing synopses of the characters of families and genera.

My best thanks are due to my friend Mr. George Flemwell, the author of *Alpine Flowers and Gardens*, etc., for painting a beautiful series of flowers, which he has done in the course of a busy and eventful year, not undisturbed by illness. These drawings, though reduced in size in the plates, are remarkable for their accuracy of form and colour and for their artistic merit. They were made in many cases from specimens growing in the neighbourhood of Le Planet, above Argentière in Haute-Savoie. The Swiss frontier is only a few miles distant.

I am indebted to Messrs. Methuen and Co. for permission to reprint the charming poem entitled *Hepatica*, written by my friend Mr. Alfred Hayes. Finally I must not omit to thank Professor Seward and Dr. C. E. Moss for their kindness in allowing me to freely consult the Library and Herbarium of the Cambridge Botany School.

H. STUART THOMPSON.

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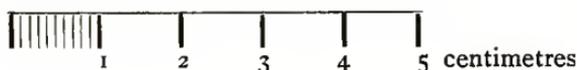
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Hoff. or Hoffm. = Hoffmann
 Hook. = Hooker
 Huds. = Hudson
 Jacq. = Jacquin
 Jord. = Jordan
 Juss. = Jussieu (A. L. de)
 K. = Koch
 Kalt. = Kaltenbach
 Kern. = Kerner
 Kit. = Kitaibel
 K. et S. = Koch et Sonder
 Krock. = Krockner
 Kütz. = Kützing
 L. or Linn. = Linnæus (Linné)
 Lach. = Lachenal
 Lagg. = Lagger
 Lam. or Lamk. = Lamarck
 Lamb. = Lambert
 Lapeyr. = Lapeyrouse
 Lej. = Lejeune
 Less. = Lessing
 Leyss. = Leysser
 L'Hérit. = L'Héritier
 Lightf. = Lightfoot
 Lindl. = Lindley
 Lk. = Link
 Loeffl. = Loeffling
 Lois. or Loisel. = Loiseleur
 M. B. or M. Bieb. = Marschall von
 Bieberstein
 Merc. = Mercier
 C. A. Mey. = Carl Anton Meyer
 E. Mey. = Ernst Meyer
 Michx. = Michaux
 Mich. = Micheli
 Mill. = Miller
 P. J. M. = P. J. Müller
 Mert. et K. = Mertens et Koch
 M. et K. = Mertens et Koch
 Murr. = Murray
 Neck. = De Necker
 Not. = Notaris (de)
 Nym. = Nyman
 Panz. = Panzer
 Parl. = Parlatore
 P. Br. = Patrick Browne
 P. B. or P. Beauv. = Palisot de
 Beauvois

Perr. et Song. = Perrier et Songer
 Pers. = Persoon
 Peterm. = Petermann
 Poir. = Poiret
 Poll. = Pollich
 Pourr. = Pourret
 R. Br. = Robert Brown
 Rchb. or Reichb. = Reichenbach
 Retz. = Retzius
 Reut. = Reuter
 Reyr. = Reynier
 Rich. = Richard
 Rottb. = Rottboell
 Rupp. = Ruppis
 R. et S. = Roemer et Schultes
 Salisb. = Salisbury
 Saut. = Sauter
 Schimp. = Schimper
 F. Schulz. = Friedr. Schultz
 Sch. Bip. = Schultz Bipontinus
 Schk. = Schkuhr
 Schleich. = Schleicher
 Schleid. = Schleider
 Schult. = Schultes
 Scop. = Scopoli
 Seb. et Maur. = Sebastiani et
 Mauri
 Ser. = Seringe
 Shuttle. = Shuttleworth
 Sibth. = Sibthorp
 Sieb. = Sieber
 Sm. = Smith
 Spr. or Spreng. = Sprengel
 Steph. = Stéphani
 Sternbg. = Sternberg
 Steud. = Steudel
 Sw. = Swartz
 Ten. = Tenore
 Thom. = Thomas
 Thuill. = Thuiller
 Thunbg. = Thunberg
 Tin. = Tineo
 Tiss. = Tissière
 Tourne. = Tournefort
 Trin. = Trinius
 Urv. = d'Urville
 Vail. = Vaillant
 Vauch. = Vaucher

Vig. = Viguier	Willd. = Willdenow
Vill. = Villars	W. et K., W. et Kit., Waldst. et
Vis. = Visiani	Kit. = Waldstein et Kitaibel
Viv. = Viviani	W. et N. = Weihe et Nees
Wahl. or Wahlen. = Wahlenberg	With. = Withering
Wallr. = Wallroth	Wulf. = Wulfen
Weigl. = Weigel	Zahl. = Zahlbruckner
Wettst. = de Wettstein	

SCALE OF MEASUREMENT



SOME USEFUL FIGURES

1	Metre	=	3.281	English feet
10	Centimetres	=	4	inches (almost)
30	"	=	1	foot
2.5	cm.	=	25	mm. = 1 inch

100	feet	=	30½	metres (about)
1,000	"	=	305	" "
2,000	"	=	610	" "
3,000	"	=	915	" "
4,000	"	=	1220	" "
5,000	"	=	1525	" "
6,000	"	=	1830	" "
7,000	"	=	2135	" "
8,000	"	=	2440	" "
9,000	"	=	2745	" "
10,000	"	=	3048	" "
11,000	"	=	3353	" "
12,000	"	=	3658	" "
13,000	"	=	3960	" "
14,000	"	=	4265	" "

Mont Blanc is 15,782 feet = 4810 metres

SUB-ALPINE PLANTS

PART I

CHAPTER I

SUB-ALPINE PLANTS—AND WHERE THEY GROW: A COMPARISON WITH THE FLORA OF BRITAIN

IN the author's *Alpine Plants of Europe*, which dealt chiefly with the plants of the higher Alpine region, it was pointed out that it is impossible to define zones of altitude at all rigidly, even in regard to a small country like Switzerland, and that different authorities had not always adopted the same standards of elevation in speaking of the vegetation of the mountains of Central Europe.

It was stated that it was impossible to give an exact definition of the term 'sub-alpine,' but it could be taken to be the zone from about 3000 feet, where the vine ceases to be cultivated, to about 5000 feet. But it should be clearly understood that any such limitation is purely arbitrary, and that the expressions Alpine and sub-alpine are often used in a very general sense. The vegetation of one valley of say 5000 feet above the sea may be far more Alpine in character than that of another of about the same height in a district not very remote.

Nor is it always possible to do as that great Alpinist and student of the Alpine flora, the late John Ball,¹ did. He called the Sub-Alpine Region the Region of Coniferous trees; and the lower Mountain Region the Region of Deciduous trees (whose upper limit often rises to 5000 feet on the southern slopes). But beech forests are also, in certain districts, a great feature of the sub-alpine zone. The very fact that the forest region, and especially the pine forest region, varies so much in different countries of Europe, and also in quite limited districts, prevents such a basis of calculation from being quite satisfactory, though otherwise it has much to commend it.

In Switzerland the Lowland region comprises the plains and the

¹ "Climate and Vegetation of the Alps," in the General Introduction to the *Alpine Guide*.

low hills in the north and west. The flora is very similar to that of temperate Northern and Western Europe, including most of France, Germany, Belgium, and the British Isles. But in addition one finds in the Swiss plains and warm valleys a distinct admixture of Southern plants of Mediterranean source. Among them may be mentioned *Astragalus Onobrychis*, *A. monspessulanus*, *Trigonella monspeliaca*, and *Centaurea crupina*. In the Rhone Valley about Sion, there is a remarkable mixture of Southern plants, such as *Buffonia macrosperma*, *Iris virescens*, *Tulipa australis*, and *Ephedra helvetica*, which have ascended the great river basin from the Mediterranean, together with sub-alpines which have descended the mountain-sides.

It is remarkable how few species are purely sub-alpine, in that they do not grow in the lowlands or in the Alpine region. The following might perhaps be chosen as typical sub-alpines, characteristic of that actual zone. *Actæa spicata*, *Dentaria digitata*, *Lunaria rediviva*, *Cytisus alpinus*, *Ononis rotundifolia*, *Saxifraga cuneifolia*, *Sambucus racemosa*, *Prenanthes purpurea*, *Centaurea montana*, *Veronica urticæfolia*, *Listera cordata*, *Streptopus amplexifolius*, and *Lilium Martagon*.

Among the 850 species described in this volume there are very few, if any, which do not grow in what is commonly understood as the sub-alpine region in Central Europe, if not in Switzerland. But there is so much overlapping that a very large number of these are also found in the Alpine zone, and a considerable number descend to the lowlands. A fair proportion of the Swiss sub-alpines are British plants. If these Alpine and lowland plants were omitted from a book descriptive of what may be called, with approximate accuracy, the more beautiful and interesting flowers of the Swiss woods and meadows, it would be altogether unrepresentative and misleading.

Many Alpine plants have a very great vertical range of altitude ; just as others may be confined to quite a narrow zone. Among those species which the writer has noticed growing in the Alps through the greatest vertical range—a range of at least 7000 feet in some cases—are the following: *Arabis alpina*, *Draba aizoides*, *Cerastium arvense*, *Lotus corniculatus* (up to 9000 feet several times), *Dryas octopetala*, *Potentilla Tormentilla* (this ubiquitous plant reaches 8200 feet on the Col du Galibier), *Saxifraga stellaris*, *S. aizoides*, *S. Aizoon*, *Sempervivum arachnoideum*, *Antennaria dioica*, *Leucanthemum vulgare*, *Campanula pusilla*, *Primula farinosa*, *P. viscosa* Vill., *Gentiana verna*, *G. ciliata*, *Calamintha alpina*, *Linaria alpina*, *Thymus Serpyllum* (up to 9000 feet), *Daphne Mezereum*, *Plantago alpina*, *Polygonum viviparum*, *P. aviculare*, *Euphorbia Cyparissias*, *Triglochin palustre* (found at sea-level in England, in the plains of Switzerland, and up to 8250 feet in Dauphiny), *Juncus bufonius*, *Scirpus compressus*, *S. cæspitosus*,

several species of *Carex*, such grasses as *Poa alpina*, *P. bulbosa*, *Agrostis alba*, *Phleum alpinum*, *Deschampsia cæspitosa*, *Festuca ovina* and *Nardus stricta*. He has also observed the following ferns with a range of from about 5800 to 6800 feet in the Alps, viz.: *Cystopteris fragilis* (up to 8500 feet), *Dryopteris Filix mas*, *D. spinulosa*, *Asplenium viride* (up to 8800 feet), *A. Trichomanes*, *Polypodium vulgare*, and *Botrychium Lunaria* (up to 8400 feet).

In comparing the flora of Switzerland with that of the British Isles, the most apparent difference is the absence of the maritime element from that of the former country. Even the Sea-thrift (*Armeria maritima*) which sometimes grows on hill-tops in England, Scotland, and Ireland, is absent from Switzerland, and its place is taken by the larger and more handsome *Armeria alpina*. But there are one or two maritime plants, such as the Yellow Horned Poppy (*Glaucium flavum*), which find a suitable home on the sandy shores of the Lake of Neuchâtel.

To students of ecology, or plant associations, and to those occupied with the geographical distribution of plants, the absence of certain species from a given area is no less interesting than the presence of others. Let us therefore mention a few types (other than maritime) of plants found in the British Isles which do not occur at all in Switzerland. In the first place we have a few Highland species, such as *Saxifraga nivalis* and *Primula scotica*, which do not get so far south as the European Alps. In Ireland there are one or two North American plants, such as *Spiranthes Romanzoffiana* and *Sisyrinchium augustifolium*, which occur nowhere else in Europe.

Owing to the moisture of our climate and the mildness of our winters, we have various Lusitanian species, characteristic of Portugal and the south-west of Europe, which extend their range much further north in these islands, especially in Cornwall, Devon, Dorset, and the south-west of Ireland, than they do elsewhere. Among them are several Heaths, such as *Erica vagans* (it is found in very few places in Switzerland), *Erica ciliaris*, and the Connemara Heath (*Dabeocia cantabrica*). The common Bell Heather (*E. cinerea*) is not found at all in Switzerland, and in only one place in Germany, above Bonn; nor is *Erica tetralix* found in Switzerland. In fact, with the rare exception of *E. vagans*, *Erica carnea*, and *Calluna* (Ling) are the only Heaths in Switzerland.

Other western species found in England and Ireland, but not in Switzerland, are the little Butterwort (*Pinguicula lusitanica*), the tiny yellow *Cicendia filiformis*, *Cotyledon umbilicus* with its peltate, fleshy leaves, and *Iris fætidissima*, whose capsules, with bright orange-vermilion seeds adorn many of our Lias woods in autumn. We have also quite a number of bog or aquatic plants which do not occur in Switzerland. They include the Ivy-leaved Campanula, (*Wahlenbergia hederacea*), the Bog Pimpernel (*Anagallis tenella*),

the Marsh St. John's-wort (*Hypericum elodes*) and the Bog Myrtle (*Myrica gale*). The Bog Myrtle is distinctly an Arctic and Western European species, and so is the Bog Asphodel (*Narthecium ossifragum*). Neither of the two British Lobelias (*L. urens* and *L. Dortmanna*) is found in Switzerland. The former is purely Western European in its distribution, and the latter is more northern.

To sum up the chief differences between the Swiss lowland vegetation and that of great Britain or Ireland: in Switzerland there are no hills or commons covered with Bell Heather and *Erica tetralix*; no wet, sandy moors, such as those in Dorset, made picturesque with the same two heaths mingled with the beautiful *Erica ciliaris* and Bog Myrtle, the brilliant yellow spikes of Bog Asphodel turning coral-red in September, the little yellow *Cicendia*, the pale *Pinguicula lusitanica*, and the curious *Hypericum elodes*. In Switzerland the Gorse (*Ulex europæus*) and the Broom (*Sarothamnus scoparius*) are hardly even seen, the former being native only near San Bernardo in Tessin; on her banks and hillsides there are no Purple Foxgloves, but two less handsome yellow ones; and in her lowland woods and hedges the bright blue *Scilla bifolia* takes the place in spring of our wild Hyacinths.

Excluding sub-species and varieties, there are at least 2540 species of flowering plants and ferns in Switzerland; or perhaps six hundred more than in the British Isles, notwithstanding their long coastline and great variety of geological formation. And yet we have very much to be thankful for—we have Alpine and Arctic plants in the north, on some of the highest mountains further south, and in Ireland; we have, as already stated, quite a number of Lusitanian and Atlantic plants in the south-west of England and Ireland. Then there is a large Germanic element chiefly in the east of England; a most interesting maritime flora, with a few species from the Mediterranean; and many others which come under either the British, English, or Scottish type according to H. C. Watson's types of distribution. Indeed, there can be few countries in the world with so many interesting types of vegetation as the British Isles. Insular floras are almost without exception interesting, and that of our own Islands is of special interest, and furnishes some of the greatest surprises. One of the Continental botanists who took part last year in the Phytogeographical excursion in the British Isles wrote¹: "However much we have seen in different countries, we still found many peculiarities in the British vegetation which are not seen elsewhere, and many features which are as striking and interesting as any we have ever met with." Unlike most islands, however, and especially those of the Mediterranean, the British Isles can boast of extremely few endemic species.

The peculiarities of many high Alpine plants are not so noticeable

¹ *The New Phytologist*, January, 1912, p. 28.

in the sub-alpines. It will be remembered that most of the high pasture and rock plants are of small stature, often growing in tufts, mats, or cushions; with small leaves arranged in flat rosettes pressed against the ground. The roots are often very long, sometimes penetrating several feet into the ground so as to absorb all the moisture and nutriment possible, and also to prevent them from being blown away bodily by the high winds so frequent in the Alps. Many of them are prevented from being dried up through too rapid transpiration by developing a copious covering of hairs or woolly tomentum, as, e.g., in *Hieracium villosum* and in Edelweiss. Most conspicuous of all is the abundance of blossom and the brilliant colour of many of the Alpine flowers, particularly of the blues, reds, and purples.

Some of these characteristics are less noticeable in the plants of the mountain woods and meadows, for the simple reason that there is no great cause for their existence; for the climate is less severe and the winds less high. But, though it is supposed that the extreme brilliance of the light at high altitudes has a great effect upon the colouring of the flowers, yet in that particular, and especially in the abundance of blossom, many of the sub-alpines can well hold their own. The rapidity with which they blossom is another point in common. A large number of Alpine plants are specially constructed with a view to flowering at the earliest possible opportunity, just as are the Arctic species. The shortness of the summer is naturally the chief reason which has led to such peculiarities. After the flowering stage is more or less over, the seeds have to ripen. Time must then be allowed for their dispersal under suitable conditions, and finally for their getting a good start before they are embedded in the first snows of winter.

Most summer visitors to the Alps have noticed the snow melting from the highest pastures and exposing a sodden, brown sward. They have seen the Crocuses and Soldanellas flowering at the very edge of the melting snow, and sometimes pushing their blossoms through it; but they may not have kept an eye on those sodden patches of snow-freed pasture during the next week or two. Had they done so, they would have seen a veritable transformation, so rapidly does the grass get green and bespangled with flowers of every shade and colour.

It is the same with the meadows lower down; but to see this it is necessary to visit Switzerland in May. Towards the end of April the snow has usually disappeared from the Alpine meadows; and, though this is a peculiarly disagreeable season, with very little green grass to be seen, it is astonishing how soon the grass grows and the flowers appear. The meadow flowers are, for the most part, distinct from those which predominate in the upper pastures; and they are distinct from those of the woods.

The meadows usually occupy the more or less level portion of

Alpine valleys, and the pine forests descend on either side to meet them ; though in some valleys cliffs and steep rocky slopes take the place of the forests. The pastures, 'Alps,' or *Alpen*, are above the forest zone. In most communes the meadows are usually owned privately, but the pastures are held in common by the inhabitants of the villages, and each burgher has the right of grazing his cows on certain *alpen*. The meadows are very rich, for the soil contains much humus, or decayed organic matter, and fertilising deposits are also brought down by the numerous little rivulets which descend the slopes, and by the central glacier stream which usually flows through the valley. In addition to such natural irrigation, the peasants manure their land well, so that every season they get two crops of grass, while occasionally late in autumn men and women may be seen laboriously gathering in a third crop, though this is usually very scanty. The cattle are not often allowed on the meadows in spring, because the grass is more valuable when converted into hay. They are sent up to the lower pastures, and, as the summer advances, are gradually driven to the highest 'Alps.' If the higher pastures are ever mown, it is as autumn approaches.

When once the meadows have yielded their first crop of hay, which is usually at the end of June or the first week of July, or if by chance the cattle should have had access to them, their great glory has departed. For though some plants quickly spring up again—*Geranium sylvaticum* sometimes flowers within a week—their chief charm has gone. The second crop is never so tall, nor often so full of blossom, and many of the plants have a branched, stunted appearance.

Compared with an English meadow, the dense vegetation of these Swiss meadows consists not so much in true grasses as in other flowering plants. Probably the periodic manuring, and frequent cutting with the scythe tend to promote a dense growth of coarser plants at the expense of the finer grasses. Therefore we find great masses of pink Bistort (*Polygonum Bistorta*), of blue *Centaurea montana*, of mauve or purple *Geranium sylvaticum*, and many other handsome plants. We also find a number of marsh plants, for these meadows are often little more than peat marshes, and probably few of them have been drained with pipes, such as is the custom in England. Among the more important marsh plants frequent in the meadows are: *Ranunculus aconitifolius*, the Globe-flower ; (*Trollius europæus*), *Primula farinosa*, certain species of *Pedicularis*, *Orchis maculata*, *O. latifolia*, *Gymnadenia conopsea*, and *G. odoratissima*.

Many flowers of the Alpine meadows are ordinary British plants. In addition to those already mentioned and to the true grasses we often find such common species as the Buttercups (*Ranunculus acris* and *R. bulbosus*), the Ox-eye Daisy (*Chrysanthemum Leucan-*



47. NATURE SCENE

PLATE II.

MEADOW SCENE IN JUNE AT CHAMPEY, WITH DENT DU MIDI.

themum), Bladder Campion (*Silene inflata*), Ragged Robin (*Lychnis Flos cuculi*), and, in autumn, *Colchicum autumnale*.

Among Alpine meadow plants not, or in one or two cases very rarely, occurring in British meadows, there is a large number which especially tend to give such a wonderful colouring to the scene. The following are but a handful: *Campanula rhomboidalis* in sheets of azure blue; the Rampions (*Phyteuma orbiculare*, *P. betonicaefolium*, and *P. spicatum*); *Salvia pratensis* in every shade of mauve and purple; the goatsbeard or *Tragopogon*; Yellow-rattle (*Rhinanthus*) of several kinds; various large Hawkweeds, and particularly the pale yellow *Hypochaeris uniflora*; *Biscutella laevigata*, with its disc-shaped seed-vessels; pink, red, and yellow species of *Pedicularis*; and the beautiful *Astrantia major*. Among the most handsome of the Monocotyledons are various Orchids, St. Bruno's Lily (*Paradisica Liliastrum*), *Anthericum Liliago*, and the madder-red *Lilium Martagon*.

In the drier portions of many sub-alpine meadows are found *Cerastium larvense*, *Potentilla aurea*, *Saponaria ocymoides*, the mauve *Gentiana campestris*, the rich purple *Calamintha alpina*, and the magenta *Centaurea uniflora*, whose plumose involucre bracts form a curious feathery ball when in bud. *Gentiana verna* and *G. utriculosa* sometimes make sheets of blue in the damper parts of a field, but the large *Gentiana excisa* does not often grow in the meadows proper, but, like the *Anemone sulphurea*, prefers the lower pastures skirting the forest.

There is hardly a meadow without some huge boulders here and there. They may be partly screened by a growth of the lovely *Rosa alpina*; and the rocks themselves usually afford shelter to patches of *Sempervivum*, *Sedum*, or *Saxifrage*. If the great yellow Gentian (*G. lutea*) or *Veratrum album* with similar foliage grows in the meadows, these bitter or poisonous plants are always left by the mowers, just as they are avoided by the cows on the steep pastures where they are more abundant than in the meadows themselves.

It may seem quite unnecessary to specially mention any large stretches of fine Alpine meadows, for they are to be found almost everywhere in the Alps. But in Switzerland it would be difficult to come across a more magnificent expanse of meadow land refulgent with sub-alpine flowers of every kind and colour than in Val Ferret, above Orsières, in Valais. This paradise of flowers, backed by stupendous mountains, is within easy reach of Lac Champex, now one of the most popular Alpine resorts. On the steep descent from Champex to Val Ferret can be found many species which delight in sun-baked, shaly slopes, such as those which lead to the village of Pras-de-Fort.

The Jura mountains are much more wooded than the Swiss Alps. They also afford very excellent opportunities for collecting and

studying both the plants of the sub-alpine woods and meadows and many of the higher Alpines, which prefer limestone soil. The Jura has the double advantage of being a little nearer home and less crowded by visitors than the Bernese Oberland and the valleys south of the Rhone. The *Flore du Jura*, by C. H. Godet, published in 1853, gives an ample description, covering 870 pages, of all the flowering plants and ferns of this delightful mountain range. The sylvan flora of the calcareous Jura chain is particularly interesting.

We have already observed that the Alpine forest flora is, for the most part, quite different from that of the meadows or the pastures. We have also noticed that the Coniferous forests extend upward to a height which varies considerably according to local circumstances. As a general rule, in Switzerland the upper limit of the forests is from 6000 to 7300 feet, or some 2000 feet or more below the line of perpetual snow. The pine forest zone may be anything from 1000 to 2000 feet in vertical height, and the lower limit is frequently between 4000 and 5000 feet above the sea. At that height the Beech is replaced by the Spruce (*Picea excelsa*) and Larch (*Larix europæa*). At a somewhat higher level the Mountain Pine (*Pinus montana*) and, very locally, the Arolla Pine (*P. Cembra*) usually take the place of the Spruce Fir. But, of course, the Spruce and Larch are often found growing with the Beech, Birch, Sycamore, and other trees in the mixed woods of the lower mountain region. The Scots Pine (*P. sylvestris*) and the Silver Fir (*Abies pectinata*) are common in the lowlands and sub-Alps, but are rarely seen above 5000 feet.

The Coniferous forests in Switzerland are under very strict regulations in regard to the felling of the timber. But in times gone by immense damage was done in many districts by the wasteful and indiscriminate cutting of the trees.

Our artist has painted typical bits of Coniferous forest, skirting a flowery meadow at a height of some 4500 feet in a granite district above Argentière in Haute Savoie. This is close to the Swiss frontier and at the eastern end of the Mont Blanc group. The great granite boulders strewn among the Firs and Larches afford an ideal home for the Rhododendron, and for such handsome herbaceous plants as the great mauve *Mulgedium alpinum*, the showy Rose-bay Willow-herb (*Epilobium angustifolium*), and the rather scarce Umbellifer called *Laserpitium Panax*. The rocks themselves are sometimes partly hidden by dense mats of *Saxifraga cuneifolia*, which is like a miniature London Pride; but it sends out long runners with rosettes of leaves at every few inches. The leaves are often purplish beneath.

The Whortleberry and Cowberry (*Vaccinium Vitis-idaea*) form a thick undergrowth in many of these Alpine woods; and *Alnus viridis* is abundant in the more open parts, and forms an important

feature in the landscape. Among other characteristic plants the following may be mentioned, viz. : *Viola biflora*, *Saxifraga rotundifolia*, *Polygala chamæbuxus*, *Linnæa borealis*, very local, *Adenostyles glabra*, *A. albifrons*, *Gnaphalium sylvaticum*, *Homogyne alpina*, *Pyrola secunda*, *P. rotundifolia*, and more rarely, *P. uniflora*, *P. chlorantha* and *P. minor*; *Phyteuma spicata*, *Melampyrum sylvaticum*, *M. pratense*, *Veronica urticæfolia* and *Maianthemum Convallaria*. In the Beech woods, at a lower elevation, we find such plants as *Dentaria*, *Paris*, *Listera*, *Cephalanthera rubra*, *Neottia Nidus avis*, and various other orchids, of which several are semi-parasitic.

CHAPTER II

ALPINE FRUITS AND BERRIES

MANY of those who visit the Alps in late summer or in autumn miss the great wealth of flowers which form such a feature in the landscape earlier in the season. Many visitors arrive too late to see even the lingering blossoms of Rhododendron, the Alpen Rose or Rose des Alpes, of which the Swiss are so justly proud ; while the small deep blue Gentians are in August found only on the higher mountains, and never in the splendid luxuriance of June. Their place is taken in autumn by the pretty Fringed Gentian (*G. ciliata*), a biennial species with long hairs on the margin of the corolla-lobes—which loves shaly limestone slopes, both in the Alps and foot-hills, and by *Gentiana germanica* with its purple-red flowers which continue in bloom in the sub-Alps until mid-October. The handsome ultramarine spikes of the Willow Gentian (*Gentiana asclepiadea*) may also be seen adorning mountain thickets and shady slopes until the end of September, but the plant is rare in Western Switzerland and the Jura. The beautiful Marsh Gentian (*Gentiana Pneumonanthe*), which brightens some of the damp, sandy heaths in Dorset, Hants, and Yorkshire is another autumn flower which is perhaps as beautiful as any when its large blue bells streaked with green open to the sunlight, and stand erect sometimes singly on a stalk and sometimes in threes and fours on leafy stems a foot or eighteen inches high. The Marsh Gentian is more scattered in Switzerland than in England, but perhaps less abundant locally.

In late summer and in autumn, long after the meadows and the lower pastures have been mown a second time, and when the characteristic forest flora has also mostly disappeared, the numerous red and 'black' berries are continually attracting the eye of even the most casual of visitors to the mountains. Long before the end of such a hot and dry season as that of 1911, when many plants were withered up prematurely, berries and fruits of various kinds and many colours were particularly noticeable, and often they formed the chief means of table decoration in Swiss hotels, in addition to sounding the loudest note of colour in the woods and on the mountain-side.

But, exceptional as was the weather last summer, in any season towards the end of July, when the crowds are at their height, the Alpine berries begin to show themselves, and we realise that 'spring,' even in the Alpine sense, has gone. At best the Alpine summer is not a long one, and in the short space of about three months much has to be gone through—the face of Nature is continually and rapidly changing, and many plants have to develop, blossom, and ripen their seeds in quite a brief period of time.

It was thought that a short chapter on some of the Alpine berries and fruits might be of interest to some of the vast multitudes of late visitors to Switzerland, who may be attracted by the abundance of the crop, but who are not, perhaps, in every case familiar with earlier stages of the plants; or in other cases they may know the flowering stage well enough but fail to recognise the fruit which follows it.

The Bilberry or Whortleberry (*Vaccinium Myrtillus*), which often grows finer in the Alps, and particularly in the Chamonix valley, than at home, was losing its flavour by mid-September last year, when its leaves were turning a brilliant crimson so that mountain sides seemed ablaze with them. But wild Raspberries were even at that late date in the best of condition at about 6000 feet, and as delicately flavoured as any in gardens. The Wild Strawberry also lingered on until plants in some of the higher regions must have been embedded in the first September snows. That year in the Mont Blanc district the first cold spell came about 15th September, but by 1st October the weather was extremely cold and wet, and snow covered the mountains to within a thousand feet of Geneva.

But to return to the Bilberry, whose fruit begins to ripen in sub-alpine regions usually about mid-July, it is interesting to note that not infrequently on the older rocks—it is rarely seen on limestone—this common plant ascends to 9000 feet in the Maritime Alps, as, for example, on Monte Santa Maria, and it may sometimes be found as high in Savoy and in the Southern Swiss Alps. The Bog Whortleberry (*Vaccinium uliginosum*) ascends even higher in Alpine turbaries in Switzerland, where it has been recorded from 3000 metres, or nearly 10,000 feet. Its leaves are bluish green or glaucous on the under side, and always entire (not slightly toothed), and its berries resemble those of the Common Bilberry, but are insipid to the taste, and often rather smaller.

The Cowberry (*Vaccinium Vitis idæa*) is very beautiful in both flower and fruit. It is a low shrub, sometimes not six inches in height, with wax-like, flesh-coloured blossoms, evergreen leaves, often turning red in autumn, and brilliant scarlet berries which are very attractive. It grows abundantly in Alpine woods and on moors or on beds of mould about rocks from the plains up to 10,000 feet in Switzerland. The Cranberry, of still the same genus (*V. oxycoccus*), grows only in sphagnum bogs, as in Britain, but its

delicate drooping crimson flowers on long slender pedicels are fugitive and very difficult to find, being less conspicuous than the well-known yellowish red fruit. We have not seen the Cranberry at a higher elevation than 5000 feet, as, for example, in the marsh by the picturesque Lac Champex in Switzerland. The stems are very wiry, and the leaves quite small, rolled in at the margin, glossy green above and glaucous beneath.

Closely allied to the Vacciniums are the Bearberries (*Arctostaphylos alpina* and *A. Uva ursi*), both of which are distinctly Alpine in character and habitat, though the latter species descends to the plains in Switzerland. The Alpine Bearberry has black berries, which ripen the second year, and thin, netted veined annual leaves, finely toothed at the margin. The Red Bearberry (*Arctostaphylos Uva ursi*) has red berries and thick, leathery, evergreen leaves of a glossy green on the upper side, with sunken dots on the under side. It is chiefly found on limestone. Both species are found in Scotland, and the latter appears also in the north of England and north-west Ireland. Sometimes great mats are formed by these prostrate shrubs. The flowers resemble those of the *Arbutus* more than those of any other plant.

The Crowberry (*Empetrum nigrum*) is a low, wiry shrub, with heath-like leaves and small blue-black fruit, smaller than those of the Bilberry, which often ascends to a high altitude and sometimes covers enormous areas of moorland where little else will grow but lichen. It grows not only in the mountains of Europe, and in the British Isles, but penetrates the Arctic regions of Iceland, Greenland, Siberia and Labrador. It gives its name to the extremely small family of *Empetraceæ*, which comprises only four species in the whole world.

Among other low bushes bearing berries in the mountains is the Stone Bramble (*Rubus saxatilis*), which is frequent in Scotland and the north of England, as well as in some of the hills in South Wales and the West of England. In the Alps it is found in open woods and bushy places, and it is scattered over the mountain regions of Europe, Central Asia, and Siberia. The Stone Bramble is a very dwarf and distinct species, whose rootstock sends out a few creeping runners rooting at the nodes and ascending stems often only six or eight inches high, with a few small prickles, though sometimes quite unarmed. There are usually three pale green leaflets, rather thin in texture and resembling those of the Dewberry; and the petals are a dirty white or greenish colour and very narrow. The berries or drupes are a rich red, few in number, but large and tempting to the eye in their luscious transparency. However, they are disappointing when eaten, for they are strongly acid and each drupe consists chiefly of a large pip or seed. The Cloudberry (*Rubus Chamæmorus*), so well known in Norway, where its orange-red fruit is stewed and served at table under the name of Multebær,

does not appear to grow in the Alps, but its large, solitary, white blossoms, on stems only a few inches high, are often seen in turf swamps and wet heaths in Northern Europe, Asia, and America. This species of *Rubus* is one of the few British plants not found at all in Switzerland or France. The berries are first red, and they turn yellow on ripening. Of the ordinary kinds of Blackberry, or *Rubus*, many of which grow in the Swiss lowlands, very few appear to reach the mountain forests. Perhaps *Rubus tomentosus* is the most distinct of any which flourish in such places. It is a pretty Bramble, and easily known by the greyish tomentum or felt which covers its leaves and calyx, and by its small yellowish white flowers. It is abundant in the Eastern Pyrenees, and extends right across Central Europe and as far east as Persia. Probably in that very mountainous country it reaches a higher altitude than in Europe.

Among Roses there are several in addition to the beautiful *Rosa alpina* found in Alpine or sub-alpine regions. The true Alpine Rose, or Eglantine, whose deep rose blossoms adorn the open woods and broken, rocky pastures up to nearly 8000 feet in June and July, usually has long, narrow hips of the richest red. The hips of *Rosa pomifera*, which is widely spread throughout the Swiss Alps, though very rare in the Jura, are very large and round and generally, though not always, covered with bristly glands. In early autumn their rich orange colour, deepening to a beautiful crimson, makes them an attractive feature in the landscape. The pretty little Burnet or Scotch Rose (*Rosa pimpinellifolia*) is very rare in Switzerland, except on the borders of the Jura. Though this very prickly little rose grows close to the sandy seashore in parts of England and Wales, we once found its delicate cream-coloured blossoms at 7000 feet in the south of Savoy. To find even a few plants of this Rose on the stony southern slope of a mountain at that height intermingled with some truly Alpine species, was one of the surprises of an eventful season devoted to the exploration of the Western Alps and their supremely rich flora. The fruit of the Burnet Rose is nearly globular, and blackish red at maturity.

The poisonous scarlet berries of the Mezereon (*Daphne Mezereum*) are often seen in the woods of the plains and on stony pastures and slopes of débris up to about 7000 feet; but, as in England, this bush is more often seen singly or in pairs than in groups. The pink, scented flowers appear in March, before the leaves, or a month later in the higher elevations.

There are two or three Alpine species of Honeysuckle, or *Lonicera*, in Europe; the Blue-fruited Honeysuckle (*L. cærulea*) is a shrub three to six feet high and of stiff habit. The yellowish white flowers are scentless and in pairs, but their ovaries coalesce into one globular and bluish-black berry. It is spread over the Coniferous forest zone; on moors it descends lower, and occasionally, as at Saas Fee, it ascends the rocky slopes to a height of 8000 feet.

Lonicera alpigena is a bush of about three feet which has much larger leaves and a shining berry resembling a small, double cherry. It frequents woods and rocky places in the mountains. The Black Honeysuckle (*L. nigra*) is a sub-alpine shrub, a yard or two in height, with small flowers in pairs, which develop into a pair of black, rounded berries united at the base.

In many of the shady ravines and wooded gorges one sees an elegant Alpine Elder-tree (*Sambucus racemosa*), which in late summer and autumn is usually heavily laden with dense clusters of small round berries of a blood-red colour. It grows well among the granite boulders and tall ferns bordering the road which skirts the Tête Noir and overlooks the famous Trient Gorge between Martigny and Argentière. Indeed, most of the fruit-bearing shrubs and bushes mentioned in this chapter can be seen in a walk along that picturesque route. Here also can sometimes be found the fruits of two kinds of *Polygonatum*, or Solomon's Seal, as well as those of an allied plant called *Streptopus amplexifolius*, or Knot-foot. The globular, crimson fruits hang on delicate flower-stalks springing from the leaf-axils and always bent at right angles half-way down, so that this curious plant with very handsome 'berries' is unmistakable when once seen. It is, however, by no means common. It sometimes grows by the side of huge granite boulders, as near the main road crossing the Col des Montets, and occasionally it can be seen under the shade of a Mountain Ash, whose scarlet berries ripen at the end of August in the higher regions.

Autumn visitors to the Alps sometimes have their attention arrested by a spiny bush of stiff habit, with narrow, olive-green leaves and orange-yellow almost stemless berries, which are much more densely attached in axillary clusters to the main axis of the shrub than to its branches. This is the Sea Buckthorn (*Hippophae rhamnoides*). In other countries it grows on the sea coast, and in England and the north of France it is planted on sand-hills to mat the sand together; but in parts of the Alps it grows naturally in the sandy beds of rivers, both by glacier streams and large rivers such as the Rhone. At the foot of the Col de Balme we have often seen bushes of it situated as high as 5500 feet. It is a somewhat curious example of a littoral plant which ascends to considerable heights in the mountains, though where it does so it is always either in river beds or on steep, sandy screes. But even in such places on the mountains it very probably answers the same useful purpose and prevents the steep slopes of sand and débris from being washed away by torrents of surface water.

Wild Gooseberries (*Ribes Grossularia*) are frequent in many parts of Switzerland, particularly by roadsides and stony, bushy places in sub-alpine valleys. The berries are usually small and yellowish when ripe, generally glabrous in the mountains, but often covered with stiff glandular hairs in the lowlands.

One of the commonest and most picturesque of the bushes bearing berries is the Barberry (*Berberis vulgaris*). It is a glabrous shrub, six or eight feet in height, with yellow wood like others of its family. The branches are armed with three-lobed thorns at the base of the tufts of leaves. The yellow flowers, in elegant drooping racemes, appear in May or June. The berries are oblong and very acid, green at first, then golden and finally bright red. In a single walk such as that spoken of above, from Martigny over the Col de la Forclaz (nearly 5000 ft.) down the steep escarpment to Trient, round the Tête Noir and down to Chatelard on the French frontier the fruit of the Barberry can be seen early in August in every shade of green, yellow and red, according to the altitude. In the hot slopes above Martigny it will be already crimson, while nearer the Forclaz the young fruit is still in its tender green stage. Similar transformations can, of course, be seen in walking from the Rhone Valley up any of the beautiful valleys to the south leading into the heart of the Pennine Chain.

CHAPTER III

THE CULTIVATION OF ALPINE PLANTS

THE culture of Alpine and rock plants as a hobby is increasing by leaps and bounds. We remarked a year ago that nothing was more indicative of this increasing fashion than the number of books issued in recent years on the subject, and the amount of space devoted to it in horticultural journals. Since then several more books have appeared, including a practical and prettily illustrated little volume on *Rock Gardens and Alpine Plants* by Mr. E. H. Jenkins, who has had much experience in the making of rockeries and the management of Alpine and other hardy plants.

In Mr. Flemwell's last volume, *The Flower-fields of Alpine Switzerland*, the latter portion of that beautifully illustrated work was devoted to a plea for the formation of Alpine fields in England, and some very plausible arguments were advanced for the introduction of Swiss pasture and meadow plants into grassland as an adjunct to our rock-gardens. It was also proposed to decorate with Alpine flowers not only some of our parks and public places, but it was suggested that many a wayside field, copse, bank or railway-cutting might be improved 'by taking a leaf from Nature's Alpine book.'

Theoretically such an idea is excellent, and it is true that many of the handsome sub-alpine plants of the Swiss meadows and open woods would figure largely in any such scheme; and that some of these flowers of the lower mountains have been neglected by gardeners. Some horticulturists are ready to look kindly only upon anything that will grow on a rock, and to call it 'Alpine'; and certain small Alpine meadow and pasture plants frequently planted on dry rockeries in England languish and die because they are out of their natural habitat.

For the suggestion that a small field or enclosure adjacent to a rock-garden should be converted, with skill and taste, into an Alpine pasture, we have nothing but praise; and it has already been successfully done by several gentlemen. It is only fitting that a large rock-work should, where practicable, be completed or supplemented by an 'Alp' or small field where numerous meadow and woodland plants could be established and grown to advantage. But, we say—let it stop there, and chiefly for this reason. If many

foreign plants were introduced into out fields, copses, and railway-cuttings, and especially any Alpine species which do not already grow wild in England, it would soon upset the balance of distribution of our native flora, and the calculations of future generations of students in geographical botany. It must not be forgotten that the topographical distribution of the native plants even in these small islands is a subject abounding in interesting points, and the fact that it has been suggested of recent years that some of the commonest species such as the White Dead-Nettle (*Lamium album*), hitherto supposed to be indigenous, were introduced by the Romans or more recently, makes it all the more incumbent upon us not to 'make confusion worse confounded.' Therefore, however poor in floral wealth and colour some of our own fields and meadows may be in comparison with those of Alpine countries, let us be satisfied with our Primroses and Bluebells, our Buttercups and Daisies, and not sacrifice science to artistic effect, however tempting the experiment may be.

In regard to the making of rock-gardens, we do not propose to offer more than a few very general remarks, for, in addition to the fact that there are practical books already devoted to the subject, this is emphatically a case in which a little practice is worth much theory. Much can be learnt by observing Nature, and by noticing the way in which many plants grow upon the rocks at home, and how they adapt themselves to different local conditions. A single visit to the Alps will teach still more.

In making a rockery the chief thing to secure is thorough drainage of the subsoil, and this can usually be obtained by digging away a foot or two of the soil before any rocks are laid, and placing a layer of broken stones, etc. of various sizes before the soil is replaced. It must not be forgotten that in the Alps the plants grow, for the most part, in naturally drained places, where water does not stagnate. In the long Alpine winter they are kept dry and at a fairly even temperature by a deep coating of snow; and when spring arrives, the melting of the snow around the plants gives them a good start, while as the growing season advances the deeply penetrating roots are given a copious supply of water from the ever-melting snow above, which moisture sinks into the porous ground or trickles down the mountain slopes. Therefore, in our gardens, the first thing to guard against is excessive moisture in winter—we can well imagine the numbers of 'Alpines' which have been killed by the persistent rains of the present winter, 1911-12. The second precaution must be made in spring. In early spring there is a danger of some of the more delicate subjects being shrivelled up by cold east winds and brilliant sun, so that they should be watered carefully and only when there is no sign of frost. As early summer approaches most 'Alpines' should be well watered once or twice a day.

Much can be done in order to protect some plants from the effects of our damp and comparatively sunless winter. Sometimes if a piece of glass or slab of stone be placed in a horizontal position above delicate plants they will be protected from excessive rainfall or drip. The soil around the base of the stems or rosettes of leaves should not be allowed to become clogged and foul, or coated with green liverwort, moss, or other weeds. This can be easily prevented by carefully disturbing the top soil, removing the moss, etc., and top-dressing with grit, sandy loam, bits of limestone, sandstone, or sometimes a dressing of leaf-mould. This top-dressing is of the greatest importance, and when done judiciously it cannot fail to be of benefit. It applies even more to young plants in pots or boxes in greenhouses and frames, for it is in such places that the growth of liverwort, etc., is often most rapid.

We have found the simplest way to remove the green moss or *Marchantia* is with the flat, sharpened end of a thin piece of wood, such as an ordinary plant label. By holding the pot in one hand, and the flat wooden tool between the finger and thumb of the other, so that it does not deeply penetrate the soil, the coating of green slime or moss can very quickly be removed. A few small pieces of grit or a little dry sandy loam should then take its place.

Another thing to guard against is the 'coddling' of Alpines in warm or ill-ventilated greenhouses. They cannot have too much air, and most of them do far better in the open than under any glass. This somewhat artificial method of cultivating hardy plants may be necessary sometimes, but it frequently tends to produce a less robust race, with many individual specimens drawn out in quite an unnatural manner.

It is well known that one of the most characteristic features of nearly all the higher Alpine species is their dwarf habit, with stems frequently only a few inches in height, often with a rosette of leaves at the base, and very long fibrous roots which sometimes penetrate several feet into the soil. By this means they are prevented from being blown away by the furious blasts of wind so frequent in high mountains, and at the same time the long thick fibres absorb moisture and nourishment from the soil through which they pass.

Most Alpine plants can be grown from seed, and many are better obtained from this source than from established plants, because much of the material sent to England by collectors arrives with insufficient root. It is very difficult to get up the complete fibrous tap root of such things as *Anemone alpina*, *Campanula barbata*, *Gentiana asclepiadea*, etc. Again, many plants die in transit to a distant country. Moreover, when seed is collected, rather than roots, there is less chance of disfiguring the mountain side. Seed should be sown as soon as possible after its collection. In saying this we merely follow Nature; and it has been proved that many seeds refuse to germinate after a certain limited time.

Although many Alpines may be sown in a suitably prepared bed in a sheltered position out of doors, some of the rarest and best kinds should be sown in pots or boxes in the following manner. The pots should be well drained and filled either with a mixture of sifted loam and sand, or with sifted sandy heath soil. The best preventative against weeds is either to bake the soil or soak it in the prepared pots with absolutely boiling water, which will destroy the seeds and spores of weeds and kill all insects at the same time. After the boiling water is used the pots must be left for a day or two before sowing the seed. The seeds should be sown on a firm level surface and have a very light and shallow covering, and some of the very small ones might be lightly covered only with tritulated moss. The pots or boxes should then be gently watered with an extremely fine rose, placed in a frame or cool greenhouse, well shaded and kept at a uniform moisture. As soon as the seedlings appear they should be gradually hardened and exposed to the air, but not allowed to grow too lengthy, or nothing can be done with them. It is astonishing how rapidly some seedlings become too tall to be manageable in this delicate stage if proper care be not exercised. A few hours' sun might draw them up to such an extent that they cannot be watered without being beaten down like a field of mowing grass is after a heavy storm, which would make the subsequent operation of pricking out into larger pots or boxes one of great difficulty. This pricking out is a tedious business, The young seedlings are put in rows an inch or two apart, according to their size, kept again at a fairly uniform moisture, and more or less shaded from the hot sun, until large enough to be planted in the open. More usually, however, they are planted singly or a few together in pots, and placed in a frame and kept rather moist. In the winter they may be more freely exposed to the air and kept dry and clean. When the weather permits in spring, they can be transplanted into the open and treated like the old plants. It is important that every Alpine plant should be planted firmly, and the soil or stones should be pressed well round the plant.

Alpine plants are also propagated by cuttings, by division of the rootstock or by layers. This is best done in spring, before growth begins, or in the autumn after it is completed. Most rock, Alpine, and sub-alpine plants and nearly all the Saxifrages, *Semprevivums*, *Primulas*, and *Androsaces* can be easily increased by division.

Saxifrages are among the easiest of all Alpine plants to grow, and many will thrive under ordinary conditions in an English garden. Special care should be taken that all, except a few water-loving species, such as *Saxifraga Hirculus*, *S. aizoides*, and *S. stellaris* should be in rather dry, sunny places and not under trees where water drips. However, such species as *S. rotundifolia* and *S. cuneifolia* like to be in the shade of trees and especially among

big boulders. *S. cuneifolia* is particularly useful for quickly covering up rocks and ugly banks with its great tangled mass of pretty foliage.

Most of the 'encrusted' section will benefit by top-dressing with gritty loam in early autumn. Some should be wedged tightly between stones; and in dealing with small kinds, such as *cæsia*, *diapensoides*, *Burseriana*, etc., care should be taken that they do not get washed out of their place in winter. The small rosettes of encrusted Saxifrages may be transplanted at any time, and it strengthens the flowering shoot if the offshoots are removed. They may be planted in ordinary pots filled with sandy loam. *S. longifolia* may be placed between a couple of more or less upright rocks, so that water cannot collect in the large rosettes. It takes two or three years to come to maturity, and after flowering and seeding it dies. *S. florulenta* is another handsome species to be treated in the same way, but it prefers a vertical position, and has a still greater hatred of surface moisture. It should, however, have plenty of moisture *in the soil*.

Grit is beneficial to most of the Saxifrages because it checks the evaporation of moisture in summer, and prevents damp from stagnating round the collar of plants in winter. The reason why roots are often found in a network over the surface of a stone is because stones in the soil remain cool and moist, even in summer. It is therefore well to mix a quantity of stone chips with ordinary loam when making a rockery. They tend to keep the soil open and porous rather than sodden and water-logged. The air can penetrate further, and frost exercises its pulverising influence on a broken, gritty soil better than on a dense, compact one.

Saxifrages of the *oppositifolia* group die away in two or three years and should be taken up and pulled to pieces in fresh soil, and grit and leaf-mould may be worked into the shoots as a top-dressing.

Though in the wild state many Saxifrages grow almost solely on limestone, and a few seem to thrive only on granitic rocks, it has been found in cultivation that they are not so particular, and the great majority will live in an ordinary loamy soil, especially if it contains a fair proportion of lime.

In my former volume¹ I did not sufficiently emphasise the fact that in the Alps themselves certain plants avoid calcareous soil in some districts, while they tolerate it in others; and in a few cases I was tempted to generalise about them in a manner which further observations and reading have proved unwise. For example, one of my kindest critics points out that the common Ling (*Calluna vulgaris*) is not strictly speaking a lime hater, for it is fairly common on the hillsides of the Dolomites, where it grows mixed with *Erica carnea*, which almost always affects limestone soils. Then

¹ *Alpine Plants of Europe*, p. 5.

again *Rhododendron ferrugineum* does not invariably grow on primary rocks. I saw it last year on the limestone in Switzerland ; though possibly it was an apparent congener and growing there with the other species (*R. hirsutum*) because a sufficient thickness of peat separated it from the subsoil. Mr. Reginald Farrer has also pointed out in his last volume (*Among the Hills*) that "no reliance can be placed on rigid assignments of a plant to one stratum or another," and that this applies even to *Anemone alpina* and *A. sulphurea*. But generally speaking the chemical and physical nature of soil is a factor of far greater importance in the distribution of plants in relatively small areas than the physical configuration of the land.

Many of the *Primulas*, such as *P. Auricula*, *P. viscosa* Vill., and *P. latifolia*, which grow on rocks in the Alps, may be planted in deep crevices between rocks ; but there must be plenty of good compost made of a mixture of peat, sand, and loam, or leaf-mould instead of the peat. The roots should be tightly wedged between two stones. Mr. W. A. Clark recommends the use of clay instead of loam to wedge the plants in, because it will hold moisture longer.

The roots of *Primulas* should be well watered in spring and early summer. Some species such as *P. glutinosa* and *P. involucreta* do better in a northerly aspect, sheltered from the sun. *P. integrifolia* will cover damp, flat rocks if the soil is moist and yet well drained. It wants an abundance of water in spring, for it usually thrives best in the Alps just below the melting snow. The tiny *P. minima* hates lime, and likes sandy peat in a bare, open spot, though neither it nor the rare *P. Allioni* should be allowed to become very dry. *P. Allioni* is endemic in the Maritime Alps, and grows most luxuriantly in limestone grottos or small caves. Mr. W. A. Clark suggested the placing of a large stone to hang over this *Primula*, about a foot above the plant, sloping in towards the bank, so that rain may run off to the roots in a sort of little pit lined with clay and filled with loam and broken limestone.

To propagate Alpine plants by cuttings, a method particularly applicable to shrubs and certain hard-wooded plants, such as *Helianthemum*, *Cistus*, *Daphne*, *Rhamnus*, etc., half-ripe branches should be cut off in autumn and placed in a shallow pan or bed. The cuttings should not be more than three or four inches long ; the lower leaves should be trimmed off, and the shoots must be cut immediately below a joint, whence the roots will spring. There should be good drainage, and the compost of loam and sharp sand can be made more porous by adding pieces of charcoal. Each cutting should be firmly placed in little holes about an inch and a half deep, which are drilled with a stick or ordinary lead pencil, and a little silver sand can be dropped into each hole. After the earth has been firmly rammed down, the cuttings may be placed in a cool frame, or in some shady place covered with a bell-glass,

and allowed fresh air daily. They should be kept uniformly moist, but not too moist. When the young shoots have grown some size and become rooted they should be gradually accustomed to the open air until ready to be transplanted. Many of the *Helianthemums*, or Rock-roses, can be grown from cuttings in a properly prepared bed in a sheltered position in the open.

Lastly, those Alpine plants which have runners, such as *Linnæa borealis*, can be increased by merely detaching separate pieces and replanting them firmly in shaded beds or in pots. Some of the dwarf *Campanulas* with a creeping rootstock can be similarly treated. Some hard-wooded shrubs, such as *Azalea*, certain *Daphnes*, and *Rhododendrons*, which don't ripen their seeds in this country, and are difficult to strike from cuttings, can be increased by layering. A suitable branch near the ground is chosen, cut half through near a joint, and then pegged down firmly and covered with a compost of loam and sand an inch or two deep. If by the following spring roots have been formed, the layered portion can then be cut from the old stock.

The greater number of sub-alpine plants which grow in the woods and meadows, and many of the true Alpines, may, if desired, be treated like ordinary garden plants. Even forty years ago this was realised by Messrs. James Backhouse and Son, who said in issuing their Catalogue for 1871: 'A large proportion of the truly Alpine species, which find their natural home in the crevices of rocks at a great elevation, grow with perfect ease in an open border in ordinary loamy soil. And, strange to say, some that succeed with difficulty on artificial rockwork, flourish well under such circumstances, and thus bring within the range of every garden a large and varied amount of beauty.' Many could be planted in turf, and perhaps some of the woodland denizens might be tried under trees, where little else will grow, provided the foliage is not very dense. Some of the *Orchids*, *Butterworts*, *Parnassia*, *Primula farinosa*, and many others frequenting damp places, should have a peat or bog garden prepared for them at the foot of the rockery.

CHAPTER IV

SOME ALPINE GARDENS ¹

BOTANIC gardens are increasing in numbers in the Alps, just as rock gardens are becoming more and more numerous in the British Isles. The most recent of the Swiss Alpine gardens is that at Rigi Scheidegg, at about 5400 feet, which was opened by Professor Carl Schroeter, of Zürich, in July, 1909, and of which Dr. Bachman, of the Lucerne Gymnasium, is the Director. The German-Swiss have taken the lead from Monsieur H. Correvon and his Geneva friends in starting these interesting and useful mountain gardens.

Monsieur Correvon was the President of the Association for the Protection of Plants, founded in Geneva in 1883 to struggle against the destruction of the Alpine flora ; but in 1908 the Association was amalgamated with the Swiss League for the Protection of Natural Beauty, which corresponds in many respects to our Selborne Society.

It is wall-culture that the Swiss understand perhaps better than most people ; and Monsieur Correvon, at Chêne Bourg, near Geneva, has a low wall which is a perfect paradise of interesting and rare saxatile flowers in early summer. We have also seen the famous wall at Valleyres, at the foot of the Jura, in Canton Vaud, which Boissier made in 1856, and where he cultivated some of the best Saxifrages and rock Primulas, including a very fine patch of *Saxifraga Kotschyi* from Asia Minor. They are still thriving, for his son-in-law, Monsieur William Barbey, has taken the same interest in the plants, and does all he can to cherish and extend the work started by his illustrious relative.

The town of Geneva has planted many wall-plants on what remains of the old fortifications, and these are doing well. Some of the mountain railway companies have also decorated the walls bordering their railways with rock-plants, which tend greatly to brighten the scene in spring and early summer.

The oldest of the gardens in the Swiss Alps is the LINNÆA, on a hillock which dominates the quaint village of Bourg St. Pierre, the last village on the road to the great St. Bernard Hospice. It was founded in 1889, with Professor Chodat of Geneva as President

¹ Some of these notes are based upon articles by the author already published (sometimes anonymously) in the *Gardeners' Chronicle*.

of the International Committee, and with Monsieur Correvon as Director. Lord Avebury, the President of the Selborne Society, the late Professor Romanes, Miss Willmott, and other well-known English scientists have always taken a keen interest in the garden, and it was with their help that the ground was bought in 1888.

The garden now comprises about three thousand kinds of plants, of which the majority seem well established. It is on granite, and over two hundred of the granite-loving plants growing naturally in the district have been left to their own devices on the rocky prominence which overlooks the picturesque but dirty village of St. Pierre at a height of about 5500 feet.

Bourg St. Pierre is about fifteen miles on the great St. Bernard route from Martigny in the Rhone Valley to the beautiful city of Aosta in Piedmont, a total distance of forty-five miles. Visitors to the famous Hospice (8100 ft.) who are interested in flowers should spend an hour at the Linnæa garden *en route*; and if they have the time they will do well to stay the night at the little Hôtel du Combin just beyond the garden, which modest hostelry will be found clean though primitive. The village of St. Pierre contains relics of more important days, like Lanslebourg, at the foot of the Mont Cenis, with which the history of the famous Pass is bound up. The church is very ancient, and in the churchyard wall is a Roman milestone of the younger Constantine. As early as the ninth century the original Hospice was here. In May, 1800, Napoleon's visit to the village with 30,000 men on his way across the Great St. Bernard is commemorated by the name of the older inn, "Au Déjeûner de Napoleon," the room which he occupied being worthy of a visit.

The flora is interesting all the way from Martigny to the top of the grand St. Bernard Pass, and in the lower part of Val d'Entremont, above Sembrancher, where the picturesque Val de Bagnes joins the main valley on the east, the botanist will find various plants usually characteristic of a warmer climate together with Alpine species which have descended from the neighbouring mountains. Thus the yellow *Ononis Natrix* and bright pink *O. rotundifolia*, the very handsome purple *Vicia onobrychioides* (common in the Pyrenees), *Caucalis grandiflora*, the deep yellow *Euphrasia lutea* and *Campanula bononiensis* (of chestnut groves in the Maritime Alps) may be found side by side with *Scutellaria alpina*, *Sempervivum montanum* and *S. arachnoideum*, *Poa alpina*, *Juniperus Sabina*, etc. At Sembrancher the celebrated botanist, L. J. Murith,¹ was born in 1742. He was a Canon of the St. Bernard Hospice, and a correspondent of de Saussure. He was the first to ascend Mont Vêlan, that ice-clad peak which forms such a beautiful object from the Jardin de la Linnæa or from the lovely Valsorey just beyond. Murith's name is commemorated in *Saxifraga Murithiana*, a form

¹ In 1810 Murith published a *Guide du Botaniste qui voyage dans le Valais*.

of *S. oppositifolia* which grows in the Western Alps and Pyrenees. The Botanical Society of the Valais also bears his name.

On entering the Linnæa garden from the road on the north side, several shady, winding paths lead up the steep hillside which is clothed with the tall mauve spikes of *Mulgedium alpinum*, the rosy heads of *Adenostyles*, with leaves like Coltsfoot, the nodding blossoms of *Cortusa Mathioli*, and those of the lemon-yellow *Primula Sikkimensis*. The red-brown Gentian (*G. purpurea*), and its speckled yellow relative, *G. punctata*, grow naturally on this slope, and so do the handsome purple madder *Lilium Martagon*, the steel-blue *Eryngium alpinum* and the great white *Achillea macrophylla* with deeply cut leaves. Then on the bit of natural cliff above are such plants as *Saxifraga Cotyledon*, whose great panicles of white blossom, eighteen inches in length, festoon the black, weather-worn cliffs on the Italian side of the Simplon, just above the village of Iselle.

Before reaching the summit of the garden we pass rockeries devoted to Saxifrages, Sempervivums, Pinks, and Primulas, and others which are devoted to the plants of special countries or mountainous regions. Besides the European Alps and the Jura, the Pyrenees, Caucasus, Himalaya, Atlas, North America, and the Arctic regions are all represented by separate rockeries. In the Balkan rockery, built by King Ferdinand of Bulgaria, is a fine selection of Balkan plants sent by his Majesty from Sofia. Self-sown poppies (*P. nudicaule*) of Siberia and other Arctic regions, in yellow, white, and orange, give a blaze of colour to the scene, and the smaller, more delicate Alpine Poppy thrives there equally well, and sometimes hybridises with the other.

On our first visit to this garden at the end of June, 1908, among the Arctic plants noticed were *Epilobium latifolium* from Labrador, with blossoms two inches across, *Chrysosplenium glaciale*, from Lapland, and *Polemonium campanulatum* in abundance. We saw the beautiful pink *Androsace Chumbyi* and *Primula Cashmeriana* from the Himalaya, and *Lindelfia spectabilis* with its drooping flowers in purplish blue.

The collections of *Primula* and *Saxifraga* are particularly good. *Saxifraga cochlearis*, endemic in the Ligurian and Maritime Alps, grows well at this altitude, notwithstanding the colder climate, and *S. Aizoon rosea*, with red stem and calyx, forms a striking variety of this common but very beautiful and variable species. The Pyrenees are well represented by such species as *Saxifraga capitata*, *S. longifolia*, *Erinus hirsutus*, *Reseda glauca*, *Geum pyrenaicum*, *Eryngium Bourgatii*, and the tiny *Dianthus brachyanthus*, only two inches in height. *Saxifraga Camposii*, with its large, pure white flowers, was represented from the Spanish Sierras.

Among the orange-red Composites, so conspicuous by their brilliant colouring, were *Senecio.tiroliensis*, *S. aurantiacus*, and the

bright red *Hieracium aurantiacum*. These plants afford good examples of the deepening in colour at high altitudes of plants of two genera, the species of which are almost always characterised by yellow flowers in the plains. *Primula* is another genus in which a pale yellow colour predominates in the lowlands, but which is represented chiefly by red or purple flowers in the high mountains. Again, in the great Saxifrage genus there are several in the high Alps with red flowers, such as *S. oppositifolia*, *S. biflora*, and *S. retusa*, though we do not know a single red-flowered Saxifrage indigenous in the plains of Central Europe.

The THOMASIA garden at Pont de Nant above Bex, in Canton de Vaud, is smaller though quite as beautiful, and it is one of those which are laid out on strictly scientific lines. This garden is called Thomasia, after an early botanist at Bex, who belonged to a family who made collections of dried plants and minerals for sale. Some of the Thomas family were among the earliest visitors to Zermatt in the middle of the eighteenth century in search of rare plants. The garden is on limestone formation, and is situated at the foot of the precipitous sides of the Grand Muveran, at about 3800 feet above the sea. Started originally by a society in Bex, it was afterwards taken over by the Canton de Vaud and affiliated to the University of Lausanne, and it is under the management of Professor Wilczek.

The RAMBERTIA is also a limestone garden. It is romantically situated at the summit of the Rochers de Naye, above Montreux, and is one of the very highest gardens in Europe, being at an elevation of 6900 feet. For the most part it is laid out on the southern face of a more or less precipitous cliff, from which in fine weather a magnificent panorama of mountains can be enjoyed. Here again Monsieur Corveon has made the most of striking surroundings, and the result is an attractive display of Alpine flowers growing in unique circumstances, while everywhere the Iceland Poppy seems to have found a home for itself.

Let us now pass to Geneva, the Mecca of botanical science, and say a few words about its new Botanic garden, for of all the gardens we have ever visited the Geneva Alpine garden is arranged in the most thorough geographical order. Landscape gardening, as practised in England, seems hardly to be understood on the Continent, especially in France and Germany; so that for neatness combined with artistic effect we have seen nothing abroad to equal some of the English rock-gardens. Too often the stones are dumped down anyhow, as they still are in many suburban gardens in London and elsewhere. But at Geneva it is different; and great skill has been shown not only in the conception of the garden, but in the arrangement and disposition of the rocks, and it is obvious that geological knowledge was shown in the execution of the whole thing. In all probability the distinguished botanist, Dr. John,

Briquet, who acts as Director of the Conservatoire Botanique and the Gardens, was himself largely responsible for their design.

The Botanical Gardens occupy 75,000 square metres, or about sixteen acres of land overlooking the beautiful Lake Lemán, with Mt. Blanc fifty miles beyond ; and they are separated by the railway from the Ariana Park. They comprise a systematic garden with the plants arranged according to Engler and Prantl, a young arboretum, greenhouses, etc., and the fine Alpine garden under discussion. The culminating rocks are those of the Swiss Alps, three groups comprising the flora of calcareous regions, and two granite masses represent the crystalline rocks. In early spring large clumps of *Erica carnea* give colour to these rocks. Close at hand are several rockeries for plants of the Western Alps (Savoy, Dauphiny, and Piedmont) ; then comes one for those of the Maritime Alps, and a large mass for the Pyrenees, with various endemic species. Near them come the Spanish Peninsula and the Atlas Mountains. To the north-east are the following groups, viz. the Eastern Alps, Carpathians and Balkans, the Caucasus, the Orient, the Himalaya, Altai and Siberia, Thibet and China and Japan. Among less important groups are the Central Plateau of France, the Vosges, Cevennes, Jura, with a splendid collection of its interesting plants, the Apennines and Sicily, Corsica and Sardinia. Towards the lower end are the isolated masses of the New Zealand Alps, with their shrubby Veronicas, etc., the Andes, and lastly North America with a very rich collection. From a grotto in the highest rocks of the Swiss Alps a stream of water emerges, and descending in a sinuous course across the Alpine garden, forms a small lake where various aquatic plants are grown.

Probably the first botanic garden at Geneva was the one laid out many years ago on the natural system of classification by Pyrame de Candolle, who was Professor of Botany at Montpellier University in the south of France and Director of the ancient botanic garden there. It was he who began the famous *Prodromus*, which was continued by his son Alphonse, the great authority on geographical botany, and finally finished by his grandson, Monsieur Casimir de Candolle, the present head of the family.

Geneva has given birth to many distinguished men, and the town and district have been the chosen abode of many others ; but her botanists alone were enough to make the place celebrated. In addition to the de Candolles, Edmond Boissier, the author of the *Flora Orientalis*, lived and died in the vicinity ; and of the distinguished living botanists it would ill become me to speak, except to say that they are carrying on the work which has helped to make their beautiful city famous. There are at Geneva no less than four important Botanical Institutions, including the private establishment of Messrs. de Candolle, with its fine herbarium and unique library, and l'Herbier Boissier at Chambésy, with its library

and unrivalled collection of plants from the Orient. Then there is the Botanical department of the University under the control of the distinguished and energetic rector (Professor Chodat), and the Conservatoire Botanique, opposite the Botanic garden, which now contains as fine and complete an herbarium of European plants as any to be seen in Paris, Berlin, Vienna, or London.

In a word, thanks to the kindness of individuals and to the public spirit of the town, it would be difficult for students desirous of studying European plants, both living and dead, and of investigating their geographical distribution, to find a more suitable or congenial place than Geneva in which to prosecute their labours. There is also at Geneva an excellent school of horticulture.

Having spoken thus of Geneva, it is only natural to make a brief allusion to another important Swiss centre of botanical research, viz. Zürich. Indeed, for young students the facilities offered there are remarkable, for in addition to the University and a small but useful botanic garden, under the able directorship of Dr. Schinz, the Professor of Botany, there is the famous State Polytechnicum, perhaps the best of its kind in Europe. Its botany school is under Professor Carl Schroeter, who is so well known for his extensive work on the Alpine flora. Alpine vegetation in all its branches is very thoroughly studied at Zürich, and that place is the headquarters in Switzerland of the modern science of Vegetable Ecology or the study of Plant Associations. Those who wish to hear more on the subject should read the very useful pamphlet by T. W. Woodhead,¹ reprinted from *The Naturalist*, May and June, 1908.

Travellers in the Dauphiny Mountains will find a small but interesting Alpine garden, containing good specimens of rare plants, at the Col du Lautaret (6800 feet) and adjacent to the hotel. It is in the keeping of the Faculty of Science of Grenoble University. The surrounding scenery is very grand, and the district renowned for the variety of its flora.² Acting on the assumption that monopolies are, generally speaking, not good, and from actual experience of both places, we have no hesitation in suggesting that La Grave, with its two comfortable hotels, will be found in some respects a more convenient and satisfactory place at which to make a stay in that delightful district.

¹ T. W. Woodhead, *Plant Geography and Ecology in Switzerland*.

² So long ago as 1843, when J. D. Forbes wrote his *Travels through the Alps*, he alluded to the Col du Lautaret and the neighbouring mountains being "clothed to a great height with pasturages of the utmost luxuriance, filled with a greater and more gorgeous variety of flowers than I recollect to have seen in any other part of the Alps."

CHAPTER V

ON COLLECTING AND PRESERVING PLANTS

SOME hints on how to collect plants and dry and mount them for an herbarium may be useful to some readers, particularly as the subject is discussed either very briefly or not at all in most botanical books.

Plants can be collected and preserved in Switzerland, or any other extra-tropical country, much in the same way as in the British Isles. Specimens are usually put into a japanned or painted tin, commonly called a vasculum ; while an ordinary large sponge-bag would in the Alps be found a useful adjunct or alternative, for it can easily be carried in the rüch-sack when on mountain expeditions, and is more convenient than a tin. Sponge-bags are light and fairly waterproof, and for many small fleshy plants, such as Saxifrages and Sempervivums, they are both convenient and handy. Some botanists, however, prefer to take into the field a light portfolio, furnished with leather straps and sheets of drying-paper, so that the plants, and particularly the more delicate ones, and those, like Veronicas, whose blossoms drop easily, can be put straight into paper, and sorted and rearranged in a proper press on returning to the house. We do not, however, much recommend the use of such a portable press, especially as it wastes time and is quite useless in wet or windy weather.

Many of the tins carried by young botanists are bought ready-made, and are too short. For ordinary purposes the tin should be about fifteen inches long, seven or eight inches wide, and about two and a half or three inches deep. It should have rounded edges, and the opening, which is on the broad side, should be large enough to admit average specimens without difficulty or needless doubling. The cover to the opening is attached by a couple of hinges, and it fastens at the side by a sliding wire bolt. If this should work loose and there be danger of the lid falling open when carried, the bolt can be bent the least bit out of the straight and it will then hold firmly. The plant-tin is most conveniently carried from the shoulders by a leather strap ; but sometimes it has a thick wire handle at the top, which is convenient on occasion. On hot days the vasculum should be kept as much as possible out of the sun, for the metal gets very hot if exposed to brilliant sunshine. To

combat this difficulty, or rather to prevent its consequences, the writer often lays the first delicate specimens in a bed of fresh green leaves placed in the tin. If necessary these can be removed as the tin gets too full.

When a sponge-bag is not carried, it is often an advantage to have a smaller tin, such as is sometimes called a sandwich-tin, which will go within the coat-pocket. Small and delicate specimens can thus be carried, or it can be used for wet or dirty roots which might damage delicate flowers in the larger box.

A perfect specimen should have root, stem, leaves, flowers, and fruit—both young and mature if possible. If, as is often the case, the fruit cannot be obtained on the same plant with the flowers, it should be gathered separately from another. It is most important to get the fruit, and in a more or less developed state, for in some families, such as *Cruciferae*, *Leguminosae*, and *Umbelliferae*, it is at times impossible without it to determine a plant correctly. Good typical specimens should be selected, not necessarily the largest, but the most perfect and convenient in size. When possible a root-leaf or two should be collected as well as stem-leaves, but, of course, in many small plants most of the leaves will be root-leaves.

The sheets of paper upon which the specimens are finally mounted should not be less than about 15×10 inches, which is the size most cartridge paper cuts into, but $16\frac{1}{2} \times 10$ is still better, and this is about the size adopted in the Kew Herbarium, and quite large enough for ordinary purposes, though exceeded in several of the other great public herbaria.

When plants are not more than about fifteen inches tall it is better to put them into the tin and the press whole—not cut or doubled. When, however, a tall plant or shrub is dealt with, a good flowering branch should be cut off with several of the lower stem leaves, and the root leaves, if any, should be added separately, so as to give the complete habit as much as possible.

A notebook should always be taken into the field, in which the names, when known, of all the rarer and more interesting plants should be entered, together with date, habitat, locality, and anything of special interest worth recording. These notebooks form the basis of both the temporary and permanent labels referred to later. When in a foreign country it is sometimes desirable for botanists to enter the names of all the interesting species they come across in their walks, whether they keep dry specimens or not, for such notes are sometimes useful long afterwards, and it is astonishing how quickly such things are forgotten if not noted down.

A press is very simply made from two stout boards, about $16\frac{1}{2} \times 10\frac{1}{2}$ inches, and of sufficient thickness not to warp. The boards are best clamped together by cross-pieces at the ends, in the manner that drawing-boards are made; and they are either furnished with strong leather straps—screws are not advisable—

or the pressure can be obtained by placing glazed bricks, boxes of pebbles, or heavy iron weights on top. Such automatic pressure is best, for it adjusts itself to the diminishing thickness of the contents of the press as the specimens dry. A press of this kind, or a pair of them, can be taken to the Continent without much trouble; but if a few plants only are to be collected, it would suffice to take a couple of pieces of thick millboard with either leather straps or thinner straps made of a kind of braid, or of the cloth that saddlers use, with buckles attached. Elastic bands are not recommended, for they break easily and cannot be adjusted like straps.

To separate half-dried specimens from fresh ones, and to keep the whole mass fairly level, and generally to hasten the process of drying, we have found a few thin wooden 'ventilators' or frames the size of the press, made of cross-pieces of wood half an inch wide and one-eighth inch thick, very useful. Sometimes strong wirework frames or lattices can be bought, which answer the same purpose, or they could be used instead of the wooden boards to form an actual drying-press.

Common blotting-paper should never be used for drying plants in; it is too tender, it does not last, costs too much, and the plants often stick to it. Any coarse, stout, and unsized paper will do, and even old newspapers may be used as a last resort. It is not necessary to buy the specially made grey, absorbent paper, though as it lasts a lifetime it is not expensive in the end. Such drying-paper is supplied in four sizes by Messrs. West, Newman, and Co., of 54, Hatton Garden, London, at 1s. 1d. per quire or 15s. a ream for the smallest size, which measures 16×10 inches when folded. Suitable paper cannot always be bought in Swiss resorts, and if the stock has run short it is better to ask the stationer for some of his ordinary rough wrapping-paper. In Italy and France the tough, yellow or grey paper frequently used in grocers' shops will form quite a good drying-paper.

Before the specimens are placed in the press they should be examined, and any superfluous branches, leaves, or buds removed, if a fairly flat object cannot be otherwise attained. Roots should have soil or sand shaken from them, and they should be washed if necessary, and dried in a duster. The plant is then laid out as naturally as possible on a sheet of drying-paper, and others are placed by it until the sheet is fairly covered. Several sheets of paper should be placed between this lot and the next, according to the nature of the plants and the thickness of the paper; but the great idea in pressing plants is to dry them *quickly*, and thus preserve the colour as naturally as possible. The more paper used and the oftener it is changed and dried the better. At first the papers should be dried every day, in the sun or by the fire; afterwards less often. If the paper is hot, all the better, and a hot iron is often a useful adjunct. The pressure should be light at first, and increased after

the first day, but the flowers and delicate leaves of some plants will shrivel if the pressure is not even and adequate. However, many a youthful collector is apt to forget that *drying* is the chief thing, and that the pressure can be easily overdone. At the first changing of papers the specimens can be rearranged while pliable, and super-abundant parts removed with scissors. Any stems with broken or ragged ends should also be cut clean. When quite fresh many specimens do not so easily yield to necessary treatment as now.

Generally it is better to leave plants in the tin, rather than put them in water, if it is inconvenient to press them within one or two days, while many small kinds would remain fresh a week in the tin if in a cool place, though both leaves and flowers might lose some colour during that time. Most of the very thick or fleshy portions of plants, such as the head of a thistle, the bulb of a Daffodil, or the stem of an Orobanche, should be cut in two before being dried. In fact, the whole of a thick Orobanche or of a plant like *Campanula thyrsoidea* had better be split in two from top to bottom. Usually both halves are worth preserving. Woody stems also are better split in two, or at any rate thinned.

In order to aid the drying of any such thick or fleshy plants or portions of plants, it is well to make pads of cotton-wool and place them both above and below the specimens. Cotton-wool can be bought in long sheets and easily cut with scissors the size of the drying-paper. It is better that the plants should not touch the cotton-wool itself; but useful and more or less permanent pads can very quickly be made by loosely stitching together with a needle and thread a pair of folded sheets of drying-paper with the wool inside.

Many succulent plants such as Orchids, Lilies, Sedums, and Sempervivums can be dried with the help of these pads, but it is best first to dip them in *boiling* water up to the base of the flowers. This kills the plant at once, and enables it to be dried more quickly, and with much less loss of colour. Thick Orchids should always be killed in this way, and their tubers and stems might first be pricked with the point of a knife to hasten the process of scalding, for the final result, particularly in regard to the green colour of the leaves, makes it well worth the trouble. Dipping in boiling water is also recommended in the case of Heaths, which shed their leaves while being dried.

With the help of the notebook or diary already referred to, it is well to write on a rough, temporary label the name of the plant, if known, the place where it came from, date, and approximate altitude. It is interesting sometimes to add the kind of soil or geological formation. These labels should be placed with the specimens they refer to, and afterwards copied when the plants are mounted. If a series of one species or variety, especially when belonging to a critical genus, be collected, every example should

have a little label or ticket with the same number, while one label only need have the full particulars.

When the specimens are quite dry and stiff they can be packed close together, with only a single sheet of paper between each layer, and this paper need not be absorbent, but if it is unglazed the specimens will keep in position better when travelling, and not slip about so readily if the parcel is not quite tight.

In hot countries it is desirable to poison collections of dried plants by painting them over with a solution of mercuric chloride or corrosive sublimate, to protect them against insects. This is done at Kew Herbarium, and also by a few amateur Botanists in this country ; but in England it is not really necessary, if camphor or naphthaline be freely used, as is the case in the National Herbarium at South Kensington. In addition to spoiling some specimens, and to the subsequent peculiar blackening of the mounting paper in many cases, and to the offensive fumes which in hot weather sometimes rise from specimens treated with corrosive sublimate, the solution is, of course, a most deadly poison, and must be handled with great care.

The preservative solution used at Kew is as follows :

$\frac{1}{2}$ oz. corrosive sublimate,
 $\frac{1}{2}$ oz. carbolic acid,
1 pint methylated spirit.

It is better that the specimens should be quite dry before they are poisoned. It is usually done with a large camel-hair brush, but there should be no metal mountings about it, and all steel instruments such as knives, scissors, or forceps must be kept away from the solution or it will quickly corrode them. If the solution contains too much chloride of mercury a white crystalline deposit will be left on the specimens. But we say again emphatically that in this country 'the game is not worth the candle.' If further proof be needed it may be mentioned that the writer has in his own herbarium many hundreds of perfect specimens collected eighty or more years ago which were never 'poisoned,' but which have suffered nothing from the attacks of insects, and are to-day as complete and in as good condition as ever.

It has been customary in this country to mount dried plants on paper by means of paste, good gum, or liquid glue. When frequently handled this may have its advantages, and especially if little envelopes containing loose portions of the flower and fruit are attached for careful examination or dissection ; but many amateur botanists attach their specimens to the paper with narrow strips of gummed paper, so that they can be examined on both sides, and altogether removed if desired. The little rolls of transparent adhesive paper sold by stationers for repairing torn music, books, etc., cannot be improved upon for this purpose. Another method

sometimes adopted on the Continent is to attach the thin portions of stem, etc., to the paper by means of ordinary pins, of course placed horizontally. If gum be used it is best made of a mixture of gum Acacia (gum Arabic) and gum Tragacanth, it being both clean to use and very adhesive. In rare instances collections of plants are not mounted at all, but simply left loose in folded sheets of paper. However, they are better more or less mounted, and the paper should be a thick, white cartridge or some similar paper, which will remain rigid and flat when one end is held in the hand.

After the plants are mounted they should be labelled. The labels should be about $3\frac{1}{2} \times 2$ inches in size, of rather thin but good white paper so that they can easily be gummed or pasted in a corner of the mount. In British collections it is usual to have the name of the owner neatly printed at the head of the label after the contracted word 'Herb.' (before which 'Ex.' can be written when specimens are exchanged or given away). A broad space is then left for the name of the plant, and usually there are lines for the habitat and locality, and half-lines for the Vice-County, collector's name, date and number in the last edition of the *London Catalogue of British Plants*. But for European herbaria a simpler label is usually adopted, with the same simple line border, and either with the heading 'Herbarium Europæum, A.B.C.—' or 'Flora of Switzerland,' 'Plants of Norway,' or something of that sort. It saves time when many specimens have been collected by the same person to have the collector's name, preceded by 'Coll.' or 'Legit,' printed in small type at the base of the label.

It should have been mentioned that in mounting many specimens which do not fill a sheet, it is important not to place them always in the centre, but rather at one side if narrow, or in one corner if very small. This will not only tend to keep the bundles of sheets fairly level, but allow several examples of the same species from other districts or from other countries to be added later. The label should, of course, be placed near the plant, and it is sometimes well to rule off with a pencil line one specimen from another from a different district. In this way it is quite easy to have four or five gatherings of the smaller Alpine plants with different labels mounted on the same sheet. In starting a continental collection young botanists are tempted to economise in paper and space by mounting different species on the same sheet. This is greatly to be discouraged, for, apart from the want of systematic order, the space may be needed on future occasions for plants of the same species or variety.

As previously suggested, it is an excellent plan to have a series of very small envelopes, which can be home-made, in which to keep seeds, fruits, and sometimes individual specimens of the flowers or even some leaves, so that they can be easily examined either

with an ordinary pocket-lens or under the microscope. Such envelopes should be gummed at the back to the sheet of mounting-paper, preferably with the name of the plant and its collection number, if any. These field numbers are quoted, and save much trouble and needless explanation in the event of any subsequent correspondence on the specimens they refer to. In collecting obscure forms and little known varieties and all plants such as Hawkweeds, Willows, Roses, Sedges, etc., in any quantity, all of one gathering should bear the same numeral. This is particularly the custom with collectors of sets of rare plants in new or little-known countries, and these numbers are referred to and quoted afterwards in books written on the flora of those countries. In working at any special genus or at the plants of one country, whether it be at Petersburg, Vienna, London, or New York, it is a great help to find a collector's specimens all uniformly numbered thus.

The arrangement of the specimens in genus covers, and of the herbarium generally in a cabinet, must depend upon the individual taste of the botanist and upon the size of his collection. But except in very small collections when several genera can be placed together in one cover, with its name and that of the various genera neatly written outside, it is better to place all the species of one genus only in a cover. These genus covers should be made of stout brown paper folded to a slightly larger size than the mounting paper. The name of the genus should be written on the end of the cover so that it can be readily found when packed in the cabinet. As the collection grows it may be necessary to have more than one cover for many of the larger genera.

Cabinets should be made of well-seasoned wood—what is called American whitewood is a very good and inexpensive material. The usual form is a tall, upright cupboard, divided perpendicularly into two equal parts, and with two closely fitting doors opening in the middle (two doors are very much better than one). The shelves should be made very carefully of thin wood which will not warp, and they should slide easily in shallow grooves cut in the framework of the cupboard. They are better supported in this way than on narrow strips of wood nailed to the sides, for such strips interfere with the papers when the shelves are very full.

CHAPTER VI

A GLOSSARY OF BOTANICAL TERMS

- ACHENE**, a dry, indehiscent 1-seeded fruit, such as the single 'seed' of a *Ranunculus*.
- ACICULAR**, applied to linear leaves which are stiff and needle-like, such as those of Pine.
- ACUMINATE**, suddenly narrowed at the top and then prolonged into a point.
- ACUTE**, tapering to a point.
- ADHESION**, the union of dissimilar parts of a flower, such as the petals and sepals; cf. Cohesion.
- ADVENTITIOUS ROOTS**, those which appear as outgrowths from the stem or leaves.
- ÆSTIVATION**, the arrangement of the petals in the unexpanded bud.
- ALTERNATE**, applied to leaves which are not arranged opposite to one another on the stem.
- AMPLEXICAUL**, when a leaf, bract, or stipule more or less embraces the stem.
- ANDRŒCIUM**, the male organs or stamens, considered as a whole.
- ANGIOSPERM**, a Flowering Plant whose ovules are enclosed in ovaries; cf. Gymnosperm.
- ANNUAL**, applied to plants which pass through their life-history in one year and then die.
- ANTHER**, the upper portion of a stamen containing pollen.
- APETALOUS**, without petals, or with very small rudimentary ones.
- AQUATIC**, growing actually in water.
- ARILLUS**, a fleshy covering of some seeds.
- ARISTATE**, when the point of a leaf is fine like a hair.
- ARTICULATE**, jointed, applied to organs which can be separated (without tearing) into several similar parts, e.g. an articulated capsule.
- ASCENDING**, applied to stems which are first prostrate and then rise more or less vertically.
- ASEXUAL**, applied to the reproduction by organs other than the stamens and carpels.
- ASSOCIATION**, a colony or community of plants living together.
- AWN**, a thread-like extension of a seed or other organ, such as in Barley or in *Anemone alpina*.

- AXIL, the angle formed, for example, at the attachment of a leaf to a stem.
- AXILLARY, growing in an axil.
- AXIS, usually applied to the stem.
- BEAK, sometimes applied to the curved and pointed extremity of a fruit ; or the hooded portion of a corolla, such as *Pedicularis*.
- BIENNIAL, requiring two years to complete its life-history, after which the plant dies.
- BIFID, 2-cleft.
- BIPINNATE, twice-pinnate ; e.g. the leaflets of *Osmunda*.
- BIPINNATIFID, applied to pinnate leaves whose segments are doubly cut or lobed ; e.g. *Matricaria*.
- BRACT, a small leaf at the base of a flower-stalk ; or the divisions of an involucre.
- BUD, the unopened leaf or flower.
- BULB, a modified stem, usually subterranean, consisting of a series of succulent leaves, containing reserve material, such as an onion.
- BULBIL, a bud which falls from certain flowers or leaves and is capable of reproducing the plant, as in some *Alliums* and *Lilies*.
- CÆSPITOSE, tufted, when stems are very short, close, and many together.
- CALCICOLE, applied to plants which thrive best on calcareous, or limestone, soils.
- CALCIFUGE, applied to plants which avoid calcareous soils.
- CALYX, the sepals considered as a whole.
- CAMPANULATE, in the form of a bell.
- CAPILLARY, hair-like ; very fine, but hollow.
- CAPITULUM or HEAD, an inflorescence in which the flowers are stemless, and arranged on a terminal expansion of the axis ; e.g. many *Compositæ*.
- CAPSULE, a dry seed-vessel containing many seeds and composed of two or more carpels.
- CARPEL, the divisions of the ovary or capsule.
- CARPOPHORE, a small support to the capsules of certain plants, as in many *Silenes*.
- CARTILAGINOUS, of the consistence and colour of cartilage ; e.g. the border of many *Saxifrage* leaves.
- CATKIN, a dense spike of unisexual apetalous flowers, which are shed as a whole.
- CELLS, the units of which plant or animal tissue is built up.
- CELLULAR, composed of cells.
- CHLOROPHYLL, the green colouring-matter of plants.
- CILIATED, fringed with longish hairs or cilia.

CIRCINATE, curled up.

CLAW, the narrowed part at the base of a petal.

CLEISTOGAMOUS flowers are those which never open and are self-fertilised ; very rare among Alpine plants.

CLUB-SHAPED, cylindrical, but becoming larger towards the apex.

COHESION, the union of similar parts of a flower ; cf. Adhesion.

CONE, the scaly fruit of the *Coniferæ* or Pine family.

CONICAL, cone-shaped.

CONIFEROUS, applied to the Pine and Fir family, which bear cones.

CONVOLUTE, rolled together.

CORDATE, heart-shaped.

CORIACEOUS, firm and tough like leather.

CORM, a bulb-shaped, modified and swollen underground stem, in which reserve material is stored ; e.g. a Crocus corm.

COROLLA, the petals of a flower considered as a whole.

CORONA, a circular rim within the corolla or perianth, such as the 'trumpet' of a Daffodil.

COTYLEDONS, the first pair of seed-leaves.

CRENATE, applied to leaves with obtuse, rounded teeth, such as those of Violet and Ground Ivy.

CRYPTOGAMIC, plants reproduced by spores, like Ferns and Mosses, in which the stamens and pistils are wanting.

CUNEATE or CUNEIFORM, wedge-shaped ; i.e. broadest above the middle and tapering towards the base.

CUSPIDATE, imperceptibly lengthened into a sharp point.

CUTICLE, the outer skin of an animal or plant.

CYME, an inflorescence in which the flowers are produced in successive, lateral axes ; e.g. *Myosotis*, *Lychnis*.

DECIDUOUS, applied to plants, and especially trees, whose leaves are shed each autumn.

DECURRENT, applied to leaves which run down the stem.

DEHISCENT, applied to fruits which open at one or more points to allow the seed to escape.

DICHOTAMOUS, applied to a stem, branch, panicle, or cyme which is forked again and again.

DICOTYLEDON, a plant having two seed-leaves ; cf. Monocotyledon.

DIGITATE leaves are those whose lobes are disposed like the fingers of the hand, but from one centre, as in Lupine.

DICEIOUS plants are those having stamens and pistils in separate flowers on different plants.

DISC, the central part of a capitulum of *Compositæ* ; also the glandular space above the receptacle of some flowers.

DRUPE, a fleshy, indehiscent fruit containing a stone in which the seed is enclosed ; e.g. a cherry.

EBRACTEATE, without bracts.

- ECOLOGY**, the study of plants in relation to their environment.
ELLIPTICAL, in the form of an oval with both ends tapering alike.
EMARGINATE, notched ; usually applied to petals.
ENDEMIC, peculiar to a district or country.
ENDOSPERM, the store of food outside the embryo in certain seeds, and absorbed by it in germination.
ENTIRE, applied to leaves which are not cut or toothed.
EPICALYX, the outer portion of a double calyx ; e.g. in *Dryas* and *Potentilla*.
EPIPETALOUS, applied to stamens borne upon petals.
EPIPHYTE, a plant which grows upon another, but not as a parasite. Lichens and many Orchids are epiphytes.
EVERGREEN, applied to plants with green foliage all the year, and to leaves which last more than one season.
EXALBUMINOUS seeds have no endosperm, and the embryo occupies the whole cavity.
EXSTIPULATE, having no stipules.
FALCATE, sickle-shaped.
FAMILY = Natural Order ; a group of genera of greater or less affinity.
FASCICLED, in bundles or tufts.
FILAMENT, the slender stalk of a stamen.
FILIFORM, long and slender or thread-like.
FISTULAR, cylindrical and hollow, like many umbelliferous stems.
FLACCID, limp or flabby.
FLEXUOSE, bent more or less in a zigzag.
FOLLICLE, a carpel or seed capsule dehiscing longitudinally at the inner suture ; e.g. *Helleborus*, *Aconitum*.
FREE, not united.
FRUIT, the seed or group of seeds with its whole covering.
FUSIFORM, spindle-shaped.

GALL, a growth caused by an insect or fungus ; e.g. an ' Oak apple.'
GAMOPETALOUS flowers have the petals all united, as opposed to polypetalous.
GENUS (plural genera), a group of species of greater or less affinity.
GIBBOUS, swollen at the base.
GLABROUS, without hairs.
GLAND, an organ of secretion.
GLANDULAR HAIRS are those with enlarged apices containing a secretion, as in *Drosera* or *Arnica montana*.
GLAUCOUS, covered with a pale bluish green bloom.
GLOBOSE, spherical.
GLUME, the bract which encloses the spikelet in Grasses and Sedges.
GLUMELLA or **GLUMULE**, the bract which forms the exterior covering of each flower of a spikelet in Grasses.

GYMNOSPERM, a flowering plant whose ovules are not enclosed in carpels. The *Coniferæ* are the chief Gymnosperms.

GYNÆCIUM, the carpels or female organs of a flower considered as a whole.

HABIT, the outward form, shape, or build of a plant.

HABITAT, the kind of locality in which a plant grows. Not the locality itself, which may be called a station.

HASTATE, halbert-shaped.

HERBACEOUS, not woody.

HERMAPHRODITE, or bisexual flowers, have both stamens and pistils present.

HISPID, bristly, thickly covered with stiff hairs.

HONEY, the nectar secreted by many flowers to attract insects.

HUMUS, organic matter in the soil, more or less decomposed.

HYBRID, a cross between two species.

HYPOGYNOUS flowers have the calyx and corolla borne on the receptacle, and the ovary is superior.

IMBRICATED, overlapping like the tiles of a roof, such as the leaves of *Gentiana imbricata*.

INDEHISCENT fruits are those which do not open to allow the seed to escape.

INDIGENOUS, native, not introduced.

INFERIOR, applied to the ovaries of flowers whose calyx-tube encloses the ovary; cf. Superior.

INFLORESCENCE, the manner in which flowers are arranged on the main stem or on lateral branches.

INSECTORIOUS plants are those which absorb nutriment from flies and other insects.

INTERNODE, the portion of a stem between the attachment of two alternate leaves.

INVOLUCEL, the involucre of a partial umbel.

INVOLUCRE, the whorl of bracts below an inflorescence or below a single flower.

IRREGULAR, unequally divided.

KEEL, the two lower united petals of Leguminous flowers; keeled is also applied as an adjective to certain leaves.

LABELLUM, the lower lip of Orchids, Labiates, etc.

LACINIATE, when leaf-lobes are narrow and very irregular.

LAMINA, the blade or broad part of a leaf.

LANCEOLATE, tapering at both ends, but more so at the upper end; a somewhat comprehensive term applied to leaves, etc., which are about three or more times as long as broad.

LIGULATE, strap-shaped,

LIGULE, a small membranous bract embracing the stem of grasses and forming part of the sheath.

LIB, the broader part of a petal or leaf.

LINEAR, very narrow and with parallel edges.

LOBES, the divisions of a leaf, calyx, or corolla in a broad sense.

LYRATE, applied to a pinnatifid leaf with a rounded terminal lobe and smaller divisions towards the base, as in *Geum montanum*.

MEMBRANOUS, thin and transparent like a membrane.

MIDRIB, the principal vein of a leaf.

MONOCOTYLEDON, a plant having only one seed-leaf. Grasses, Sedges, Lilies, and many bulbous and tuberous plants are Monocotyledons.

MONŒCIOUS plants are those which have the stamens and pistil in separate flowers, but on the same plant.

MUCRONATE, suddenly terminated by a short and stiff point or needle, called a *mucro*. In leaves it is the prolongation of the midrib.

NATURALISED, of foreign origin, but established and growing naturally in a country.

NECTARY, an organ secreting nectar or honey.

NITROGENOUS, containing nitrogen.

NODE, the point of insertion of a leaf on a stem.

NUT, a dry fruit with a hard, woody shell or pericarp.

OBCORDATE, inversely heart-shaped.

OBOVATE, inversely egg-shaped.

OBTUSE, more or less rounded at the top.

OFFSET, the bud at the end of a runner or stolon.

OPPOSITE, applied to leaves which are in pairs at the same level on the stem; cf. Alternate.

ORBICULAR, round, spherical.

OVARY, a carpel enclosing one or more ovules.

OVULE, the embryo seed enclosed in the ovary.

PALEACEOUS, chaffy.

PALEÆ, or **CHAFF**, the inner bracts or scales in *Compositæ*, *Gramineæ*, etc.

PALMATE, divided like a hand into several lobes.

PANICLE, a branched raceme.

PAPPUS, a feathery appendage of the seed of many *Compositæ*.

PARASITE, a plant living on or in another (the host) from which it derives part of its food; e.g. *Orobanche*. Semi-parasites include *Pedicularis*, *Rhinanthus*, *Euphrasia*, etc.

PATENT, spreading open.

PECTINATE, finely divided like the teeth of a comb.

- PEDICEL, the stalk of a flower in a compound inflorescence.
- PEDUNCLE, the stalk of an inflorescence, or of a solitary flower.
- PELTATE, applied to leaves which are more or less round, with the stalk in the middle (*Hydrocotyle*).
- PERFOLIATE, when the stem passes through a pair of leaves, as in *Chlora perfoliata*.
- PERIANTH, the floral envelope replacing the calyx and corolla in the Monochlamydeæ and Monocotyledons; e.g. the flower of a Crocus.
- PERICARP, the wall of the developed ovary as seen in the fruit.
- PERENNIAL, lasting more than two years.
- PERSISTENT, not falling off.
- PETAL, a unit of the corolla.
- PETALOID, in the colour or form of a petal.
- PETIOLATE, having a leaf-stalk.
- PETIOLE, a leaf-stalk.
- PHANEROGAM, a flowering plant.
- PILOSE, sparsely covered with rather long hairs.
- PINNATE, when several segments succeed each other on each side of a petiole, compared to the branches of a feather.
- PINNATIFID, lobed in a pinnate manner.
- PISTIL, the portion of the flower comprising the ovary, style, and stigma.
- PLACENTA, the portion of the ovary to which the ovules are attached.
- POLLEN, fertilising powder contained in the anthers.
- POLLINATION, the act of dusting the stigma with pollen.
- POLLINIUM, the pollen-mass of an Orchid.
- POLYGAMOUS, bearing hermaphrodite and unisexual flowers at the same time.
- POLYMORPHIC, variable in shape or form.
- POLYPETALOUS flowers having the petals free from one another.
- PREMORSE, bitten off.
- PRICKLE, a sharply pointed excrescence on a branch or leaf, etc.
- PTERIDOPHYTES, Fern plants.
- PUBERULENT, feebly pubescent.
- PUBESCENT, downy, furnished with fine, soft, short hairs.
- RACEME, an inflorescence in which stalked flowers are borne on a central stem, the lowest flowers opening first.
- RACHIS, the stalk of a compound leaf; the primary axis of certain kinds of inflorescence.
- RADICAL, springing from the root.
- RADICLE, the embryo root.
- RAY FLORETS, the outer flowers of the *Compositæ*; cf. Disc Florets.
- RECEPTACLE, the top portion of the axis of a flower which bears the floral envelope and the male and female organs; also the axis bearing the florets in *Compositæ*.

- REFLEXED, bent back.
- REGULAR, divided equally.
- RENIFORM, kidney-shaped or bean-shaped.
- RETICULATED, like a network.
- RETUSE, very obtuse or truncate and slightly indented.
- RHIZOME, a creeping, prostrate underground stem, bearing erect or sometimes prostrate shoots.
- RINGENT, strongly 2-lipped and gaping.
- ROOTSTOCK, the rhizome ; or the crown of the root.
- ROSETTE, a somewhat circular group of leaves arranged in a close and spreading manner, often flat on the ground ; e.g. *Ramondia*.
- ROSTRATE, beaked.
- RUGOSE, wrinkled.
- RUNCINATE, pinnatifid, with the lobes pointing backwards ; e.g. a Dandelion leaf.
- RUNNER, a slender, prostrate, and generally rooting stem-branch.
- SAGITTATE, arrow-shaped.
- SCABROUS, rough to the touch.
- SCALE, a thin, disc-like growth on the exposed surface of some leaves and stems.
- SCAPE, a naked flower-stem springing direct from the root and bearing a single flower.
- SCARIOUS, thin and more or less transparent and not green ; scaly.
- SEED, a fertilised ovule.
- SEPAL, one of the calyx-leaves.
- SERRATE, edged like a saw.
- SESSILE, stemless.
- SETACEOUS, like a bristle.
- SHRUB, a woody perennial plant without a main trunk.
- SILICULE, a short seed-pod in Cruciferous plants, such as *Draba* ; adj. Siliculose.
- SILIQUEA, a linear seed-pod in Cruciferous plants, such as Wall-flower ; adj. Siliquose.
- SINUOUS or SINUATE, wavy ; when teeth on the margin of a leaf are broad and irregular.
- SPADIX, a fleshy spike, as in *Arum maculatum*.
- SPATHE, a sheath-like leaf enveloping a flower, as in *Arum*.
- SPATHULATE, broadened in the short upper half and narrowly contracted below.
- SPECIES, a unit of a genus of greater or less affinity.
- SPERMATOPHYTES, seed-plants.
- SPIKE, a simple inflorescence of sessile flowers attached to a simple axis.
- SPORES, the powdery grains of Mosses, Ferns, etc., which correspond to the ' seeds ' in flowering plants.

- SPUR, a prolonged portion of a flower, usually somewhat tubular.
- STAMEN, the male organ of a flower considered as a whole.
- STANDARD, the large upper petal of a Leguminous flower.
- STELLATE, star-shaped ; often applied to certain hairs.
- STERILE, having stamens, but no pistils ; barren.
- STIGMA, the receptive upper portion of a pistil, where the pollen is dusted. The adj. stigmatic means sticky.
- STIPULATE, possessing stipules.
- STIPULES, leaf-like appendages, often in pairs and winged at the junction of leaves with the stem.
- STOLON, a horizontal runner or stem-branch.
- STOMATA, the minute pores in the epidermis of a leaf, especially on the under side ; sing. STOMA.
- STRIATE, marked with parallel longitudinal lines.
- STYLE, the central portion of the pistil which bears the stigma.
- SUBULATE, awl-shaped.
- SUPERIOR, applied to an ovary which is free from and not enclosed by the floral envelope.
- TAP-ROOT, the main descending root.
- TEETH, small pointed lobes on the margins of leaves, etc.
- TENDRIL, a thread-like organ used for climbing.
- TERETE, long and cylindrical.
- TERNATE, in threes.
- TESTA, the outer coat of seeds.
- THALAMUS, the receptacle.
- THALLUS, a vegetative body not differentiated into stem and leaf.
- THORN, a sharply pointed extremity of a branch or stalk having a woody centre ; a spine.
- THROAT, the upper part of a corolla-tube.
- THYRSOID, applied to a narrow, pyramidal panicle, such as the inflorescence of *Campanula thyrsoides*.
- TOMENTOSE, covered with tomentum or dense, white hair.
- TOMENTUM, a thick coating of short, cottony hairs, usually whitish or grey ; e.g. Edelweiss.
- TRANSPIRATION, the act of giving off water from the leaves of a plant, through the stomata.
- TRIFID, 3-cleft.
- TRUNCATE, ending abruptly, as if cut off square.
- TUBER, a short, thick underground stem containing food material, such as an Artichoke.
- TUBERCULATE, covered with small obtuse, wart-like excrescences.
- UMBEL, an inflorescence in which the flower-stalks radiate from a common point and are nearly of the same length ; e.g. Carrot.
- UNCINATE, hooked.
- UNILATERAL, one-sided.

UNISEXUAL FLOWERS are those which contain either male or female organs, but not both.

URCEOLATE, pitcher-shaped, or urn-shaped.

VASCULAR, built up of vessels.

VERMICULAR or VERMIFORM, worm-like.

VERNATION, the state of leaves in bud.

VERRUCOSE, warty.

VERSATILE anthers are those which are balanced on the filament.

VERTICILLATE, whorled.

VESICLE, a bladder.

VILLOUS, shaggy.

VISCOUS, sticky, clammy.

VIVIPAROUS, applied to the production of young plants (not seeds) attached to the parent plant.

WHORL, three or more leaves or flowers arranged around the stem on the same level; e.g. *Galium*, *Gentiana lutea*.

WING, a prolongation of a fruit or seed or of a stem; the side petal of a Leguminous flower.

WOOLLY, when the hairs are long and loose, like wool.

The best *Glossary of Botanic Terms* is that by Dr. B. Daydon Jackson; 2nd Ed. 1905. The author regrets he had not it before him when compiling the above.

Distribution.—Carpathians; Eastern, Central and Western Alps; rare in Switzerland (Grisons, Bernese Oberland, etc.); Transylvania, Northern Russia, Lapland, Northern Asia, and North America.

Clematis Vitalba L. Traveller's Joy, Old Man's Beard.

A taller climber than the last, its woody stems being sometimes as thick as the wrist and several yards in length, whilst the young shoots spread greatly over shrubs and trees, to which they cling by their twisted petioles. Leaves pinnate, usually with 5-stalked segments. Flowers greenish white, in loose panicles at the ends of short branches. Carpels with long, feathery awns, which give the plant the name of Old Man's Beard.

Hedges, thickets and open woods, especially on limestone. Occasionally ascending to the sub-alpine zone in Switzerland. July and August.

Distribution.—Central and Southern Europe; France, England, Caucasus.

In France the long stems are used in basket-work, the leaves given to beasts as fodder, and the young shoots are occasionally eaten by the peasants.

THALICTRUM L

Herbs with a short perennial rootstock and much-divided leaf-stalks, bearing distinct segments or leaflets. Sepals 4 or 5, small, coloured and petal-like, but no real petals. Stamens numerous, with long anthers projecting beyond the calyx. Carpels several, 1-seeded, furrowed. Flowers sometimes polygamous. A genus of about 70 species diffused over the northern hemisphere; variable and difficult to characterise.

Thalictrum aquilegifolium L. (Plate III.)

Stem sometimes a yard high, robust, glabrous, finely furrowed. Leaves roundly triangular, 2-4 times pinnate, with membranous stipellæ at the branches of the leaf-stalk, light green above, bluish green below; auricles of leaf-sheaths blunt; leaflets roundish, obovate or wedge-shaped, often oblique or cordate at the base, obtuse, crenate, 3-lobed or undivided. Flowers erect, in dense terminal cymes. Stamens erect. Carpels 3-edged, winged, stalked, pendent. Sepals and stamens in various shades of lilac, and sometimes nearly white; anthers yellowish.

Rich upland meadows of the lower Alps, descending far into the plains, in meadows or margins of woods, etc.; often in stony places and ravines with *Rhododendron*, and ascending to 6000 feet. May to August.

Distribution.—Carpathians; Eastern, Central and Western Alps;

Black Forest, Vosges, Jura, Pyrenees, and almost all mountainous Europe, including Southern Scandinavia ; Northern Asia.

Thalictrum minus L.

A most variable species ; in dry limestone soils usually only about a foot high, of a glaucous colour or slightly downy ; in moist situations it is larger and greener, with stems often 3 feet high, flexuous, furrowed, glaucous, glabrous or pubescent-glandular. Leaves large, with leaflets glaucous below and rather large. Flowers yellow, pendent, in branched leafy panicles, flower-stalks slender. Carpels oval, with longitudinal ribs.

Rocky places in the hills, chestnut groves and fields, especially in the sub-alpine district. June and July. Well worth cultivating for its beautiful foliage, resembling robust and wiry Maidenhair fern.

Distribution.—Europe, Russian Asia, Africa, Alaska (British).

Thalictrum alpinum L. Alpine Meadow-rue.

Root slender, creeping. Stem 2-4 inches high, almost naked, simple. Leaves radical, glabrous ; leaflets oboval, 3-cleft, crenate, greyish green. Flowers in a simple terminal raceme, greenish yellow, pendent ; flower-stalks recurved. The smallest of the genus.

Moist Alpine and sub-alpine pastures, rare ; 3300-8000 feet. June to August.

Distribution.—Eastern, Central and Western Alps ; in Switzerland only in Grisons ; Eastern and Central Pyrenees, Caucasus, Northern Europe and Asia (British).

In Norway it reaches about 3400 feet.

Thalictrum foetidum L.

Rhizome short. Stem 4-12 inches high, flexuous, feebly striated, glandular pubescent, and foetid like the whole plant. Leaves as broad as long, somewhat triangular ; leaflets small, toothed, usually densely pubescent, rarely glabrous ; foliage like Maidenhair fern except in colour. Flowers yellow, pendent, in a much-branched panicle. Carpels rounded at the base, oval-orbicular with prominent ribs. Another polymorphic species found in rocky places among the mountains up to 8000 feet. June to August. It is very common about Zinal.

Distribution.—Alps of Central Europe, Eastern Pyrenees, Central and Northern Asia.

Thalictrum tuberosum L.

Roots tuberous, spindle-shaped. Plant distinguished from all other species of *Thalictrum* by its flowers having 4 or rarely 5 large yellowish white sepals.

Dry, rocky places up to 4000 feet in the Pyrenees, Corbières and Spain.

The European species of *Thalictrum* are easily naturalised in

Britain in almost any soil, and readily increased from seed or by division in early spring. *T. aquilegifolium* is particularly ornamental in gardens, and likes shade and a light soil.

ANEMONE L.

Rootstock perennial. Leaves radical. Involucral bracts compound and often leaf-like. Flowers usually solitary. No petals. Sepals 5 or more, coloured and petal-like, longer than the stamens, which are numerous. Carpels numerous, 1-seeded, often ending in a long feathery awn.

A large genus of some 85 species, found in most of the temperate regions of the world, and chiefly characterised by the three 'leaves' placed in a whorl from half-way up the stem to very near the flowers, according to the species.

Anemone Hepatica L. (Plate IV.)

Root short, fibrous. Stem naked, velvety. Leaves leathery, heart-shaped at the base with 3 equal lobes, often purple below, persistent and with long petioles. Flowers blue, rose, or white, solitary. Involucre of 3 oval, entire leaflets, resembling a calyx. Sepals 6-9, glabrous. Carpels covered with tomentum, with short, glabrous beak.

The blue form is the commonest, and it is abundant in shady places and woods among the hills, especially on jurassic limestone. In the Eastern Pyrenees it flourishes from about 2500-4500 feet. March to June, according to situation.

Distribution.—Nearly all Europe; Siberia, North America.

In Mr. Flemwell's *Alpine Flowers and Gardens*, where is a most delicate picture of *Hepatica* in the woods at Bex, in the Rhone Valley, he says: 'As the snow recedes, the brown bed of the pine forests is decked with myriads of *Hepatica*; their thick clusters of mauve-blue blossoms, relieved here and there by the rarer forms of white and rose, glint gaily among the sombre tree-trunks, creating a veritable laughing fairyland where, usually, all is sedate, if not actually gloomy.' In gardens it likes a deep, light soil, with some leaf-mould, and should be disturbed as little as possible.

Anemone narcissiflora L.

Rootstock oblique, premorse, with branching fibres. Stem erect, 4-12 inches high, simple, with several leaves at the base, villous like the leaves, and bearing a terminal 3-6 flowered umbel. Root-leaves stalked, palmate, 3-5 partite, sparsely villous or glabrous on the upper side; the segments usually doubly 3-cleft. Bracts 3-4, sessile, smaller and less divided than the root-leaves and often only 2-3 cleft. Sepals usually 5, glabrous on both sides. Flowers white, often tinted with pale rose, $\frac{3}{4}$ to $1\frac{1}{2}$ inch in diameter; seed-vessel erect. Carpels not bearded, very shortly beaked.

Alpine pastures and steep, partially wooded banks and hillsides ; but nearly always on calcareous soil, from 3000 to 6800 feet, and often covering large tracts. End of May to August, according to situation.

Distribution.—Eastern, Central and Western Alps ; Erzgebirge, Vosges, Jura, Pyrenees, Transylvania, Balkans, Caucasus, Western and Central Asia ; Steppes of Russia and Siberia ; North America.

This beautiful *Anemone* likes rich, loamy soil, with plenty of leaf-mould mixed with lime. Care should be taken to get up the whole root of this and other members of the genus if success is to be expected from collected specimens.

Anemone apennina L.

Root tuberous, blackish. Stem 6–10 inches high, slender, glabrescent. Leaves resembling those of the common Wood Anemone ; bracts of the involucre petioled, having the appearance of leaves. Peduncle erect. Flowers pale blue, solitary. Sepals 10–15, almost linear. Carpels shortly pubescent, elliptic, with glabrous beak.

Woods and rocky places. April.

Distribution.—Southern Europe ; Italy, Corsica, Dalmatia, Herzegovina, Montenegro, Corfu. Occasionally it is found in plantations and woods in England, but is certainly not native.

It looks best in large clumps, and is a very ornamental plant for open shrubberies and glades, and for establishing round the base of some tree which will allow the sun to open its flowers in spring, but protect it from the fiercer heat of summer. A top-dressing of leaf-mould and peat is beneficial.

Anemone nemorosa L. Wood Anemone.

Rhizome horizontal, nearly black, sending up 2 or 3 leaves at the extremity and a single flower-stalk, either glabrous or slightly downy. Leafstalks long, with 3 ovate or lanceolate leaflets, toothed or lobed. Peduncle 3 to 8 inches high, with involucre leaves at about two-thirds of its height, smaller, and on shorter stalks than the real leaves. Sepals 6, white, often bluish or pinkish outside, glabrous. Carpels downy, longly pointed, but not feathery.

Woods of the sub-alps and plains, damp meadows and broad hedges. March to May.

Sometimes seen growing in Switzerland up to 6000 feet, as e.g. on the Simplon Pass, where in June, 1908, we found it accompanied by the Sulphur Anemone. The colour of the sub-alpine forms is generally deeper than that of the plains.

Distribution.—Nearly all Europe ; North-west Asia, North America. Abundant in Britain.

Anemone ranunculoides L.

Rhizome horizontal. Stem and whole plant about the size of the



PLATE IV.

4/7 NATURAL SIZE.

- | | |
|-----------------------------|---------------------------|
| 1. PHYTEUMA BETONICIFOLIUM. | 2. GNAPHALIUM SYLVATICUM. |
| 3. PHYTEUMA SPICATUM. | 4. ANEMONE HEPATICA. |
| 5. PHYTEUMA ORBICULARE. | |

Wood Anemone, which it much resembles in habit as well as in habitat. Leaves spring far from the stem, with 3-5 shortly petioled segments; leaflets of the involucre shortly petioled and resembling true leaves. Flowers bright yellow, usually solitary, but sometimes in twos or threes. Sepals 5-8 oval. Carpels pubescent, with long glabrous beak.

Woods and meadows, and damp, shady places, and by streams, especially on a limestone soil. March to May.

Distribution.—Throughout France, including the mountains above the Riviera, though rare elsewhere in the South, and fairly spread through Europe, though rare in Switzerland except in the Jura; Western Asia.

Occasionally found in England and the south of Scotland, but is probably not indigenous. It is a useful plant to naturalise in shrubberies, but in this country it is rarely seen so fine as on the Continent, as, for example, in Savoy, in the neighbourhood of Aix-les-Bains, etc.

Anemone sylvestris L.

Root short with matted fibres. Stem 10-20 inches high or more, slender, downy. Leaves downy, cut into 5 rhomboidal segments, bi-trifid, toothed irregularly. Leaflets of the involucre stalked, resembling true leaves; peduncle always erect. Flowers white, large, solitary. Sepals 5-8, oval, silky outside. Carpels woolly, numerous, forming a tight oblong head.

Woody places and stony hills; rare. May, June.

Distribution.—North of France, Alsace-Lorraine, Central Europe, Southern Sweden, Caucasus, Russia, Western Asia. In Switzerland only in Canton Bâle.

A very ornamental plant for the borders of shrubberies and shady places in gardens; and it looks particularly well with large ferns in a rockery.

Anemone trifolia L.

Radical leaves usually wanting at time of flowering. Involucral bracts 3, petioled, with simple, broadly lanceolate and regularly serrated segments. Flowers solitary. Sepals usually 6, oblong, glabrous beneath, white, but very rarely blue (var. *cærulescens* Haussm.).

Bushy places and woods up to about 5500 feet. June, July.

Distribution.—Southern Tyrol to Carinthia, where it is often abundant. Woods, pastures, and chestnut-groves in Liguria, at about 2000 feet. According to Moggridge it replaces *A. nemorosa* along the coast from San Remo to Genoa, while the Wood Anemone usually grows higher among the mountains (*Flora of Mentone, etc.*).

Anemone alpina L.

Rootstock thick, and extending into a long, fibrous tap-root. Stem 6-18 inches high. Root-leaves ternate, bipinnatifid, with

deeply cut segments. Involucral bracts ternate, shortly stalked, and resembling the root-leaves. Flowers solitary, white, often tinged with blue below, large, but variable in size, and blossoming before the leaves are fully developed. Sepals usually 6. Carpels, as well as the very long awn or beard, villous. The heads of feathery seeds of this and *A. sulphurea* form conspicuous objects in late summer. The seeds are at first reddish brown, and arranged spirally, and they all turn upwards stiffly; then they gradually bend horizontal and downwards, and the colour becomes a dull mauve.

Pastures and rough ground on steep slopes in the Alps and sub-Alps, especially on calcareous soil. May to July, remaining till August in the higher situations.

Distribution.—Carpathians, Eastern, Central and Western Alps, Vosges, Jura, Auvergne, Erzgebirge, Pyrenees, Corsica, Caucasus, North America.

Anemone sulphurea L. (Plate V.)

Probably only a variety of *A. alpina*, but usually growing on the older siliceous and granite rocks. The flowers are a pale, clear yellow colour and often larger than those of the white one.

The habitat and distribution, except as to geological formation, are fairly similar to the last. The seeds, collected in August usually, are difficult to germinate, but sometimes come up the second year when sown in the autumn in good, peaty soil, watered with a fine spray, and screened from the sun in a greenhouse or cold frame.

As suggested in the *Gardeners' Chronicle* in 1910, and in *Alpine Plants of Europe*, we again recommend that this *Anemone* be tried in flower beds, and also in turf and rough pastures in parks, etc., for clumps of these beautiful flowers would look remarkably well. But the plant dislikes lime, and probably for that reason it does not appear to be found in the Jura mountains. Specimens with double flowers were recorded many years ago from between Saas and Monte Moro, having been found by the Rev. T. Butler near the Mattmark See.

Anemone vernalis L.

Stem 3–5 inches high, silky. Leaves pinnate, shaggy; leaflets broadly wedge-shaped, in 2–3 pairs, 3-cleft, the divisions ovate, entire, or 2–3 toothed. Involucre of 3 sessile, multipinnate bracts, villous, with yellowish red hairs. Flowers large, nearly erect. Sepals connivent, white within, reddish, and finally bluish on the outside, villous, with yellowish red hairs. Carpels oblong, villous, with long plumose beak. It opens its flowers immediately after the snow has melted, but when fertilised they are usually closed again.

Dry Alpine and sub-alpine pastures, 3500–9000 feet. April to July. Rather local and preferring siliceous soil.



PLATE V.

4/7 NATURAL SIZE.

- 1 LINARIA ALPINA. 2 LINARIA PETRÆA. 3. ERIOPHORUM VAGINATUM.
4. POLYGALA CHAMÆEUXUS. 5. DIANTHUS SUPERBUS.
6. ANEMONE PULSATILLA. 7. ANEMONE SULPHUREA.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Riesengebirge, Alsace-Lorraine, North Germany, Carpathians, Scandinavia, Siberia. In Norway it reaches the limit of eternal snow.

Anemone Halleri All.

Stem taller than the last. Plant villous, with white, shining glandular hairs. Leaves pinnate, with segments in 2-3 pairs, pinnatifid, the lobes 2-3 cleft; ultimate segments entire or 3-cleft. Bracts of involucre sessile, linear-lanceolate, very hairy. Flowers usually pale violet, rarely white or rose-coloured, large, erect, solitary. Sepals 6, elliptic, silky outside. Carpels with long plumose beard.

Southern slopes and dry pastures at about 5000 feet, though occasionally descending lower. It usually blooms in May and June.

Distribution.—Carpathians; Eastern Alps, Switzerland (only in Valais), Savoy, Dauphiny, Provence, Italian Alps, Poland, Southern Bohemia.

Anemone Pulsatilla L. Pasque-flower. (Plate V.)

A smaller plant than the last. Leaves deeply cut into linear segments, and the whole plant very hairy. Flowers large, solitary, erect or finally drooping, purple. Carpels with a long plumose beard. A very acrid plant with medicinal properties.

Dry, stony, sunny places, especially on chalk and limestone. It frequents the lower hills rather than the mountains. March to May.

Distribution.—Almost all Europe; Siberia. In Britain confined to a few chalk hills in the south and east of England. Local in Switzerland.

Anemone montana Hoppe.

Plant 6-12 inches high, covered at first with silky hairs, later almost glabrous. Leaves with linear segments. Petiole broadened into a sheath at the base. Flowers solitary, dark violet, drooping, very silky outside; bell-shaped at first, star-shaped later, darker in colour and smaller than those of *A. Pulsatilla*. Rarely the flowers are blue, rose or whitish.

Sunny, stony places on the hills and lower Alps up to about 6500 feet—local. March and April. Autumn flowering specimens were found by the author near Sierre in the Rhone valley in 1911.

Distribution.—Switzerland, Dauphiny, Auvergne, S. Tyrol and Transylvania.

ADONIS L. Pheasant's Eye.

Characters those of *Ranunculus*, except that the petals have no nectary, though often deeply coloured at the base, and the seed is suspended and not erect, in the carpel. Leaves with very narrow segments.

A small genus, chiefly confined to Southern Europe and Western Asia.

Adonis vernalis L.

Stem about a foot high, almost glabrous; lower leaves reduced to scales, the others herbaceous, multifid, with linear segments. Flowers pale yellow, large, petals 10-15, lanceolate or oblong. Carpels oval, rounded, pubescent, with short recurved beak. Sepals pubescent.

Dry pastures, stony or wooded. April, May.

Distribution.—In several places in the Valais; Cevennes, Alsace, Spain, Central and South-Eastern Europe.

Both the late A. W. Bennett, in his *Flora of the Alps*, and F. E. Hulme, in *Familiar Swiss Flowers*, were in error in stating that this is a weed in cultivated ground in Switzerland. If on cultivated land it has been planted for sale in the market.

Adonis pyrenaica DC.

Stem about a foot high, slightly hairy; leaves all herbaceous, the lower ones large and longly petioled, 3-4 pinnate with linear segments. Flowers bright yellow; petals 10-15 oboval. Carpels angular, pubescent, with long, tapering, recurved beak.

Rock and cliffs; rare, 5000 to 6500 feet in the Eastern Pyrenees. June, July.

Distribution.—French and Spanish Pyrenees; and in one or two places in the Maritime Alps.

Adonis autumnalis L., with deep red petals, often with a black spot, and *A. æstivalis* L., with red and sometimes yellow flowers and glabrous sepals are annuals sometimes found among crops and in waste places in the mountains; but they cannot be considered sub-alpine. We have specimens of *A. æstivalis* from Mont Cenis, at about 6300 feet above the sea.

RANUNCULUS L. Buttercup.

Annual or perennial herbs, sometimes entirely aquatic. Leaves entire or more or less divided. Flowers usually yellow or white. Sepals 5, very rarely 3. Petals 5 or more, each with a thickened hollow spot at the base, often covered by a minute scale. Stamens numerous. Carpels numerous, without awns, in a globular or oblong head, each with a single ovule attached near its base. A large genus, spread widely over the temperate regions of the globe, and even found in the tropics.

Ranunculus aconitifolius L. (Plate VI.)

Rootstock short, premorse, tufted with thick fibres. Stem erect, 1-3 feet, leafy, branched above, 3-many-flowered, flexuous, glabrous like the leaves or with a few scattered hairs. Root-leaves and lower

stem-leaves stalked, developing before the flowers, palmate, 3-7 cleft; segments 2-3 cleft, or undivided, unequally serrate, acute; stem-leaves more shortly stalked or sessile, less divided, less serrate. Flowers forming a terminal cyme. Petals white, obovate, obtuse. Carpels veined and furrowed, large, glabrous, with a short curved beak. The sepals, which envelop the buds before opening (when they fall) are a beautiful purplish colour. Very variable, both in the height of stem and in the numbers of leaves and flowers. The leaves are thin and dark green.

The variety *platanifolius* L., commoner in the Eastern Alps, has a tough, not zigzag stem and glabrous peduncles. In Norway it is found up to the birch limit.

Wet meadows, borders of streams, and shady, stony places, in clefts of rocks and by springs in the mountains; and often brought down to a low elevation by mountain torrents. June to August. 2000-8000 feet.

In cultivation it does best in cool, damp, rocky places under trees, and can be associated with such vigorous plants as *Adenostyles*, *Achillea macrophylla*, *Mulgedium alpinum*, etc.

Distribution.—Eastern, Central and Western Alps; Carpathians; Sudetic Mountains; Black Forest; Vosges; Jura; Cevennes; Corbières and Pyrenees; Corsica.

Ranunculus crenatus W. et Kit.

Stem erect, 3-6 inches high, usually 1-leaved and 1-flowered, glabrous. Leaves roundish cordate or reniform, undivided or slightly 3-cleft near the apex, crenate; stem-leaves linear. Flower-stalk furrowed. Calyx glabrous. Flowers white. Petals obovate, with wavy margin, crenate. Achenes smooth without any membranous margin, glabrous, globular, drawn out into a striated hooked beak. August.

Distribution.—Meadows on primitive rocks, 3500-6800 feet, rare; Carpathians, Styria, and Eastern Alps.

Ranunculus alpestris L.

Rootstock cylindrical, oblique or vertical, tufted, covered with thick fibres. Stem erect, 2-4 inches high, leafless or 1-2 leaved, simple, usually 1-flowered, glabrous like the entire plant. Root-leaves stalked, cordate-rounded or reniform, undivided or digitate, or cleft and coarsely crenate, appearing before the flowers. Stem-leaves smaller, linear or wedge-shaped, entire, obtuse, sessile, the base broader and membranous at the margin. leaves somewhat rugose, shining on the upper side. Flowers snow-white. Petals usually 5, obcordate, often 3-lobed. Achenes smooth, glabrous, with a long-hooked beak.

Locally abundant (especially on calcareous soil) in pastures and damp, stony places on the Alps from 4000-8500 feet. June, July.

Below the famous Joch Pass, leading from Engelberg to Meiringen, the damp rocks and stony pastures at about 7000 feet are in July purple and white with myriads of blossoms of *Primula integrifolia* and *R. alpestris*. But directly one gets west of Switzerland this buttercup becomes rare.

Distribution.—Carpathians, Eastern and Central Alps; rarely in Savoy and Dauphiny; Jura, Eastern and Central Pyrenees.

R. alpestris can be planted in a mixture of peat, loam, and leaf-mould, with a little grit added, but the place must be well drained and with a little shade. Snails must be kept off in the early spring, as they are fond of eating the crowns when just appearing.

Ranunculus Traunfellneri Hoppe.

Stem 1-3 inches high; leaves not shining, where it differs chiefly from *A. alpestris*, which it resembles, and of which it is sometimes considered a variety. Leaves veined; root-leaves 3-partite, reniform in outline, the central lobe 3-cleft, the divisions lanceolate. Stem 1-flowered, usually with one leaf; stem-leaf linear, undivided. Flower-stalk furrowed. Calyx glabrous. Petals obcordate or 3-lobed, white.

Dry places on limestone, at about 5000 feet; rare. June, July.

Distribution.—Eastern Alps; Tyrol to Carniola.

Ranunculus montanus Willd.

Stem 4-12 inches high, erect. Root-leaves palmate; divisions obovate, 3-cleft, obtusely toothed. Lowermost stem-leaf 5-cleft; divisions linear, palmately diverging; upper stem-leaf 3-cleft. Flowers 1-3, yellow. Sepals spreading, pubescent. Carpels marginate, convex on both sides; beak somewhat curved, very short. Receptacle bristly.

Alpine and sub-alpine woods and pastures; 3500-8200 feet. Common. June to August. Very variable, and with several named varieties, of which *R. Villarsii* DC. is a very striking dwarf form.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Black Forest, Corbières, Pyrenees, Western Asia and W. Africa.

Ranunculus lanuginosus L.

A tall Buttercup, the size of *R. acris*. Stems hollow branched, densely woolly. Leaves hairy beneath, lower ones 5-partite with broadly obovate lobes, irregularly toothed, the upper leaves tripartite with lanceolate lobes; peduncles not furrowed. Flowers bright yellow. Sepals spreading, hairy; receptacle glabrous. Carpels glabrous, with hooked beak nearly half the length of the carpel.

Mountain woods, especially in the Conifer zone. June to August.

Distribution.—Alps, Jura, Dept. of the Var, Corsica ; Central and Southern Europe from Denmark to Italy, Greece and the Caucasus.

Ranunculus bulbosus, *R. acris*, and *R. repens* are often found in the sub-alpine meadows ; *R. acris* especially ascending some distance into the mountains. *R. auricomus* does not get higher than the woods of the Swiss foot-hills.

Ranunculus Thora L.

Rootstock with spindle-shaped roots in bundles. Stem 4–12 inches high, 1–5 flowered, simple, glabrous like the whole plant. Lower stem-leaves sessile or shortly petioled, roundly kidney-shaped, toothed or crenate-toothed, the next leaves with 3–5 lobes, and the others lanceolate entire. Flowers small, yellow. Petals 5. Sepals glabrous. Carpels almost globular, with a short beak.

Steep, stony places in the Alps, in the Pine region and above, up to 7000 feet. June, July ; not common.

Distribution.—Carpathians, Eastern Alps, Switzerland, Jura, Savoy, and Dauphiny ; Italian Alps and Central Pyrenees.

Ranunculus scutatus Schott.

This species closely resembles the last, of which it is considered a variety by some botanists. It is taller and stouter, with more branched stem and larger flowers.

Its habitat is similar, but it is not found quite so high in the Alps. June, July.

Distribution.—Eastern Alps (Styria).

CALTHA L.

Flowers regular. Sepals usually 5, large and yellow, petaloid, no real petals. Stamens numerous. Carpels 5–10 compressed, each with several seeds.

A very small genus, inhabiting the temperate and cold regions of both northern and southern hemispheres.

Caltha palustris L. Marsh Marigold.

Stems about a foot long, often rooting at the lower nodes. Leaves mostly radical, on long stalks, orbicular or kidney-shaped with cordate base and crenate margin, very glossy. Flowers large and handsome, bright yellow.

Marshy places, by streams, and damp mountain slopes from the plains up to 8000 feet, and very abundant in the lower Alps from 3000 to 5000 feet. In Norway to 4300 feet, or above the birch limit. March to July.

Distribution.—Europe, Temperate Asia, N. America (British).

TROLLIUS L.

Perennial herbs with divided leaves and yellow or orange flowers. Sepals 5 to 15, large and petaloid. Real petals small, linear, and flat. Stamens numerous. Carpels several, each with several seeds.

There are a few species from N. Asia and N. America, besides the European species.

Trollius europæus L. Globe-flower (Plate X.)

Stem erect, $1\frac{1}{2}$ – $2\frac{1}{2}$ feet, simple and 1-flowered or branched and 2–3 flowered, glabrous like the whole plant. Leaves palmately 5-cleft, lower ones stalked, upper leaves sessile; divisions rhomboidal, 3-cleft, unequally cut. Sepals yellow, almost closed into a ball. Follicles glabrous, linear, obliquely wrinkled, turning black when ripe, seeds black.

Damp Alpine and sub-alpine meadows and mountain declivities, often in great masses, sometimes extending to 8000 feet in altitude. In Great Britain it is almost confined to sub-alpine districts in the north and west; but it actually descends, or did fifteen years ago, the valley of the Taff to within a mile or two of the town of Cardiff. May to July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Black Forest, Vosges, Jura, Auvergne, Cevennes; Corbières and Pyrenees; Europe, especially northern and central, as far as the Caucasus.

It grows freely in almost any soil, and thrives in a stiff loam with a moist subsoil. Globe-flowers rarely vegetate until the spring following the year in which the seeds are sown, but they do not attain full development until about the fourth year.

HELLEBORUS L. Hellebore.

Perennial herbs with palmately or pedately divided leaves. Sepals 5, large, often greenish, remaining till the fruit is nearly ripe. Real petals 8–10, very small, tubular. Stamens numerous. Carpels several, large, with several seeds.

Helleborus niger L. Christmas Rose.

Rootstock thick, oblique, knobbed, with black fibres. Stem erect, simple, glabrous like the whole plant, 3–6 inches high, usually 1, rarely 2-flowered, leafless, having 2 or 3 elliptical or ovate bracts in the upper part. Leaves radical, large, coriaceous, stalked, pedate, 7–9 cleft; divisions undivided or 2–3 cleft, linear-lanceolate or wedge-shaped, acute, toothed. Flowers nodding, handsome, 2–3 inches in diameter, white or rose-tinted, ultimately green. Petals and stamens yellow. Sepals petaloid, elliptical. Follicle (capsule) elongate, obliquely veined, with a long beak.

The leaves spring up after the flowers, but remain through the

following winter. The rootstock contains a narcotic poison of a very fatal character. It is officinal.

Calcareous sub-alpine woods and rocky, wooded slopes, as high as the zone of *Pinus montanus*. January to April.

Distribution.—In Switzerland only in Canton Tessin. It is frequent in woods above Lago Lugano; Carpathians and Central Europe from Tessin to Roumania.

If deep cultivation is given on planting, *Helleborus niger* seems indifferent to subsequent treatment, provided it is not much disturbed. Lifting and dividing should be done in July, when the plant is strongest. Though garden specimens are often protected by a hand frame before and during flowering, the Christmas Rose sometimes suffers when removed from under glass, for though very hardy the protection of a glass tends to bring on the young foliage before its time.

Helleborus viridis L. Green Hellebore.

Plant 10–20 inches high. Radical leaves large, on long stalks, divided into 7–11 oblong, acute, toothed segments, 3–4 inches long, the central ones free, the lateral ones connected together at the base. Flowers 2–4, large, drooping, yellowish green.

Woods and hedges, especially on limestone, and about old buildings in the plains and hills. March, April.

Distribution.—Western and Central Europe (British).

Helleborus fœtidus L. Fœtid Hellebore.

About 2 feet high, robust, with perennial leafy stems. Lower leaves not all radical, but forming a larger and thicker tuft than in *H. viridis*. Segments narrower, less toothed, and more shining. Flower-stem about a foot high, with a large close panicle of drooping flowers, of a pale green tinged with purple.

Common in stony pastures, chiefly in limestone districts, and sometimes in great masses on mountain slopes, such as those of the Jura. February to May.

Distribution.—Western and Central Europe as far as Styria. Spread through France, but rare in England.

Helleborus lividus Ait. (*H. corsicus* Willd.).

This handsome species has prickly leaves divided into 3 lanceolate segments, and white or rose-coloured flowers with spreading sepals.

Distribution.—Mountain region of Corsica, Sardinia, and the Balearic Isles. November to April.

ERANTHIS Salisb.

A genus of only 5 species inhabiting the mountains of Europe and Asia. Flowers regular. Sepals petaloid, deciduous. Petals small, 2-lipped.

Eranthis hiemalis Salisb. Winter Aconite.

Yellow petals and sepals. Flowers solitary and sessile in an involucre of green 'leaves.' Leaves glabrous, shining, appearing after the flowers, orbicular, but deeply cut into segments. Sepals petaloid, 5-8. Follicles 5-8, free, divergent, with a beak half their length.

Damp, wooded places, sometimes extending up to 5000 feet in the Alps, though very local. February and March. Frequently naturalised in shrubberies, etc., in Switzerland and Normandy, and well known in English gardens. Even in 1633 Gerard wrote, "We have great quantities of it in our London gardens."

Distribution.—Vosges, Jura, Alps of Dauphiny and Provence; Central Europe as far as Servia. In Switzerland it is rare, and only naturalised in orchards, vineyards, etc.

AQUILEGIA L. Columbine.

Perennial herbs with the leaves mostly radical, ternately divided, with distinct stalked segments or leaflets. Sepals 5, coloured. Petals 5, each prolonged below into a horn-shaped spur. Stamens numerous. Carpels 5, each with several seeds.

A small genus, spread over the temperate regions of the northern hemisphere, especially in hilly districts.

Aquilegia alpina L. Alpine Columbine.

Stem 1-2 feet high, 1-3 flowered. Leaves doubly ternate; leaflets deeply incised and 3-cleft, crenate. Flowers very large, the petaloid sepals broadly ovate, deep blue, the spur of the nectary somewhat curved. Petals 5, broad, paler blue, rather longer than the stamens. Follicles 5, densely hairy.

One of the most handsome plants of the Alps. Mr. Reginald Farrer says of it in *My Rock Garden*, page 46: "The flowers, dancing high on airy stems, are of enormous size, most exquisitely, daintily balanced, and of a soft, melting blue quite impossible to describe—a colour deep yet gentle, brilliant yet modest, perfectly clear and yet not flaunting." The same writer, in speaking of the cultivation of Columbines, tells us: "The essential is to give them perfect, quick drainage, and then a soil both rich and light. They dislike, too, being battered by winds and weather when they are coming up. The best that we can do is to remember how they lodge and dodge behind bushes on their native hills when they can, and give them some such similar protection in the garden."

Rocky, bushy places and escarpments in the Alps; 4500–6500 feet. July, August. Scattered and generally rare.

Distribution.—Switzerland, where it attains its eastern limit in the Engadine; Alps of Savoy, Dauphiny, and Provence; Mont Ventoux and Northern Italy.

Aquilegia Einseleana F. Schulz (*A. pyrenaica* Koch, not DC.).

Stem 6–12 inches high, tender, more or less covered with viscid, glandular hairs, especially above. Leaves glabrous, once or twice ternate, leaflets obovate-spathulate, 2–3 lobed, with rounded entire or slightly indented lobes. Flowers about 1 inch broad, purple. Spur of corolla nearly straight at the apex or curved, but not rolled up. Receptacle rounded, as long as or longer than the stamens.

Rocky places in the lower Alps up to 5000 feet. June, July.

Distribution.—Upper Bavaria, Tyrol (Salzburg), Carinthia, etc.

Aquilegia pyrenaica DC., not Koch.

Stem about a foot high, very slender, almost naked, with 1–3 flowers. Leaves small, 2- or 3-ternate, with entire or divided leaflets. Flowers blue, rather large, but smaller than those of *A. alpina*. Petals with rounded lip. Spur slender, straight, slightly longer than the lip. Follicles rather small (12–15 mill.).

Rocks and débris-strewn slopes in the Alpine and sub-alpine region. July, August.

Distribution.—French and Spanish Pyrenees.

Aquilegia Reuteri Boiss.

Stem 1½–2 feet high, simple or slightly branched, often rather viscid, as several of the *Aquilegias* are, leafy, with 1–5 flowers. Radical leaves biternate, with deeply incised lobes; stem-leaves with several linear lobes or entire. Flowers clear blue, in a narrow panicle, shortly peduncled. Petals with lip rounded or sub-truncate. Spur curved back into a hook, equalling the lip in length. Stamens as long as the lip. Follicles small.

Woods and rocky places in the Western Alps. June, July.

Distribution.—Western Alps only, as Hautes-Alpes, Basses-Alpes, Maritime Alps, Var, Liguria, and Piedmont; abundant in some of the Ligurian and Maritime Alps, at from 2400 to 5500 feet, where it takes the place of *A. alpina*.

Aquilegia vulgaris L. Common Columbine.

Stem 2–3 feet high, pubescent, branched above. Lower leaves longly petioled, usually biternate, with broad incised segments; upper leaves sessile, with lobes often entire. Flowers purple, rarely white or rose, large, longly peduncled.

Woody places and rough hilly pastures, especially on limestone, from the plains up to 5000 feet. May to July.

Distribution.—Nearly all Europe; Siberia, Himalaya. Indigenous in parts of the British Isles, but often introduced.

Aquilegia atrata Koch.

This is probably a variety of the Common Columbine, with violet-black flowers about an inch in diameter, which occasionally grows at about 5000 feet in the Italian Maritime Alps and the Jura, and flowers in June and July. The stamens are longer than in the common *Aquilegia*.

Hoffmann speaks of its being "widely, and in some places abundantly, distributed over the Alps and sub-Alps, and regarded by many botanists as an Alpine form of the Common Columbine"; but he and some other botanists include in this category the ordinary mountain plants with "purple-brown" flowers, which are so common and so decorative in many Alpine pastures, as e.g. those about Engelberg.

The Alpine species of *Aquilegia* are rather more difficult to cultivate than the common one; and they are best sown from seed in spring obtained direct from the Alps, pricked out into pans or a cold frame, and planted in early autumn in deep, well-drained loam with some grit in it. On rockeries they do well in half-shady but well-drained positions, but *A. alpina* likes rather more sun.

DELPHINIUM L. Larkspur.

Mostly annual herbs having much divided leaves with narrow segments. Sepals 5, coloured and spurred. Petals lengthened into a spur. Carpels 1-5 each with several seeds.

A considerable genus, widely spread over the northern hemisphere without the tropics.

The two following sub-alpine species are perennials and deserve to be more cultivated in gardens.

Delphinium fissum Waldst. and Kit.

Glabrous or hairy, sometimes a yard high, robust. Leaves cut into 5-7 linear lobes, trifid, incised-dentate. Petioles dilated into a sheath at the base. Flower-stalks erect, pubescent, with two linear bracts near the centre. Flowers bright blue, at first often tinged with green; in long spikes. Spur long and pointed. Petals bifid, the 2 inferior downy at the base. Follicles 3-5, glabrous or hairy. Seeds numerous, with imbricated scales.

Rocky and shrubby places in the south. June to August.

Distribution.—Hautes-Alpes, Basses-Alpes, Maritime Alps (at about 2000 feet in the chestnut zone), Var, Bouches-du-Rhone, Gard, Southern Europe as far as the Caucasus; Western Asia.

Delphinium elatum L. Alpine Larkspur.

Stem 1-2 yards high, robust. Leaves palmately divided into 5-7 divisions, similar to those of *E. fissum*, but the lobes less linear,

and there is no sheath at the base of the petiole. Flowers bright blue, in long spikes. Petals downy.

Very local, in fresh, stony places in the mountains between 4800 and 6500 feet. June to August.

Distribution.—Central Europe (not in the Jura), but including Carpathians, Silesia, Bohemia and as far as the Caucasus, Provence, Eastern Pyrenees ; Siberia, India.

Delphinium Consolida L.

Annual. Almost glabrous. Stem slender, 8-18 inches, with spreading branches ; leaves multifid, with linear segments ; bracts simple and entire, linear, spike short, few-flowered. Flowers deep blue, with long spur. Carpels glabrous, solitary. Seeds black.

Among crops on calcareous soil. June to August.

In the sub-Alps this beautiful blue weed is occasionally seen up to about 4000 feet, as e.g. in a small arable field in the Val d'Anniviers (Valais), where we saw it again in 1911 after a lapse of eight years, and in cornfields below Lanslebourg in Savoy.

Distribution.—Nearly all Europe ; Western Asia.

ACONITUM L.

Perennial herbs with much-divided leaves, the segments palmate. Sepals 5, coloured, the upper one helmet-shaped, the two lateral broader than the two lower. Petals 2-5, concealed within the calyx. Stamens numerous. Carpels 3-5, each with several seeds.

A rather small genus inhabiting the mountainous parts of Europe, Asia, and North America ; though a number of new species have recently been determined from the Himalaya.

Aconitum Anthora L.

Rootstock with 1-3 globular tubers covered with fibres. Stem erect, 1-2 feet high, glabrous below, downy above, like the flower-stalks and calyx. Leaves pedately or palmately 5-9 cleft, usually glabrous, except the root-leaves ; divisions palmately multisect, with narrowly linear segments. Flowers in a simple or branched terminal raceme, yellow. Calyx persistent after withering. Hood hemispherical and helmet-shaped. Follicle hispid or ultimately glabrous.

Stony places and pastures in the Alps. July to September.

Distribution.—Carpathians ; Jura, Switzerland (Tessin), Eastern Alps, Corbières and Pyrenees ; Western Asia.

Aconitum Lycoctonum L.

Stem attaining a yard in height, pubescent, branched. Leaves deeply palmately cut, with 5-7 broad segments, incised-dentate. Flowers pale yellow, in oval, elongated spikes. Sepals pubescent, soon falling. Hood cylindrical-conical, much longer (higher) than

broad. Follicles 3, glabrous or glabrescent, with seeds striated on every side.

Woods, gorges, and damp, shady places in the mountains. The writer has seen this as high as 7750 feet in Dauphiny. Somewhat polymorphic ; poison. June to August.

Distribution.—Almost all Europe ; Western Asia, India, Morocco.

Aconitum Napellus L. Monkshood.

Tubers 1-3, turnip-like, covered with fibres. Stem erect, 2-5 feet high, lower part glabrous like the leaves, upper part downy like the flower-stalks and calyx, rarely quite glabrous, leafless below, densely leafy above. Leaves shiny, palmate, 5-7 cleft. Segments lozenge-shaped in outline, once or several times divided with linear or lanceolate acute teeth. Flowers dark violet, very rarely purple, light blue, or white, in a terminal, elongated, crowded, simple, cylindrical raceme, rarely branched at the base into a panicle. Calyx deciduous. Hood obliquely hemispherical ; claw of the two upper petals nearly semicircular, bent forwards, with horizontal or deflected cap. Spur capitate, somewhat bent. Follicles glabrous, less often downy, at first spreading, afterwards parallel.

Woods and damp meadows and pastures in the Alps and sub-Alps, especially by the herdmen's huts, descending streams into the plains ; 3000-8200 feet. June to August. Polymorphic, poisonous, and medicinal.

Distribution.—Carpathians, Riesengebirge, Eastern, Central, and Western Alps ; Jura, Vosges, Black Forest ; Erzgebirge, locally in Germany as far as Holstein ; France (except West and South), Central Asia, Siberia. In Britain in woods and by streams in South Wales and the south-west of England.

Aconitum paniculatum L.

Rootstock with tubers like turnips. Stem 2-4 feet high, very leafy, flexuous, pubescent at the top. Leaves not shining, shortly stalked, more broadly and coarsely divided than in the last. Raceme more leafy, rarely quite simple, frequently paniculate from the branching of the lower branches. Flowers violet, often paler or white or greenish towards the base, very rarely quite white or blue. Hood handsome, 1-1½ inches, but variable in size and height. In the same inflorescence are often flowers in which the two upper petals have straight and curved claws, and the hood is erect, oblique or nearly horizontal. Follicles 4, glabrous, spreading.

Damp woods and thickets, and occasionally on more open mountain sides, generally at about 5000 feet altitude. July, August.

Distribution.—Carpathians, Erzgebirge, Jura (rare), Alps of Savoy and Dauphiny ; Central Europe as far east as Roumania.



PLATE VI.

4/7 NATURAL SIZE.

- | | |
|-------------------------|-----------------------------|
| 1. POLYGONUM VIVIPARUM. | 2. RANUNCULUS ACONTIFOLIUS. |
| 3. POLYGONUM BISTORTA. | 4. PARNASSIA PALUSTRIS. |
| 5. SOLDANELLA ALPINA. | 6. ACHILLEA MACROPHYLLA. |
| 7. THESIUM ALPINUM. | |

All these *Aconitums* can be easily naturalised in shrubberies or copses, or in the bushier and more shady positions of large rock-gardens.

ACTÆA L.

Flowers nearly regular, small. Leaves chiefly radical, with distinct segments. Sepals 4, small, petal-like. Petals 4, small, clawed. Stamens numerous, with small anthers. Carpel solitary, becoming a berry when ripe.

A small genus, spread over the northern hemisphere.

Actæa spicata L. Baneberry.

Rootstock thick, blackish. Stem 1–2 feet high, glabrous, with 2 or 3 leaves in the upper part. Leaves large, thin, 2–3 ternate, with oval-acuminate leaflets, incised-dentate. Flowers white, small, in a short terminal raceme. Corolla regular, with 4 petaloid sepals, easily falling. Petals 4, almost invisible. Stigma sessile. Berry ovoid, green, and finally black and shining, with numerous seeds.

Damp, stony woods and steep, bushy declivities in sub-alpine districts up to 5000 feet. May to July. Poisonous.

Distribution.—Nearly all Europe from the Pyrenees to the Caucasus, and Norway, where it reaches the fir limit; Siberia, Himalaya. In Britain in the north.

PÆONIA L. Pæony.

Flowers solitary, red, regular. Petals numerous, very large. Sepals 5, green, herbaceous. Stamens numerous, inserted on a fleshy disc. Carpels 2–5, large. Leaves large, with distinct segments and chiefly radical.

A genus of very few species, indigenous in Southern Europe and temperate Asia.

Pæonia peregrina Miller (*P. officinalis* L.).

Stem 1–2 feet high, simple, glabrous. Leaves 2–3 ternate, with rather narrow segments divided into 2–3 lobes, hairy underneath. Petals oboval, rose coloured, very large. Anthers shorter than the filaments. Follicles 2–3, glabrous or with tomentum, more or less divergent, and spreading at maturity.

Limestone woods and pastures of southern mountains, growing at from 3250 to 4200 feet on the mountains behind Mentone (Moggridge), and up to 6000 feet in the Ligurian Alps. Very local. May, June.

Distribution.—Provence, Languedoc, Roussillon up to the Hautes-Alpes and l'Aveyron; Southern Europe from Portugal to Greece. In Switzerland only in Canton Tessin (Generoso, etc.).

This Pæony can be planted in good moist loam at any time from October to March, and it requires much the same treatment

as most of the Pæonies. The ground should be well trenched and manured if grown in quantity.

BERBERIDACEÆ

Shrubs or herbs. Stamens opposite the petals, and the same number as them. Ovary of 1 carpel, with seeds attached to the bottom or to one side of the cavity. A small family spread over the temperate regions and tropical mountains of the globe.

EPIMEDIUM L.

Sepals, petals and stamens 4 each ; flowers in a very loose raceme.

Epimedium alpinum L.

Rootstock rampant. Stem erect, 1-1½ feet. Root-leaves scaly ; stem-leaves biternate ; leaflets petioled, oval, heart-shaped at the base, with aristate teeth. Flowers in a loose panicle, hairy-glandular, yellow, with blood-red centre.

Groves and thickets. April, May. Occasionally seen in parts of Switzerland, but, as in Britain, sub-spontaneous and an escape from gardens. Not found in France.

Distribution.—Tyrol, Carniola, South and S.E. of Europe.

BERBERIS L. Barberry.

Shrubs, with usually prickly leaves. Sepals 8 or 9, yellow, outer sepals minute. Petals 6, in 2 series, with honeyed glands at the base. Stamens 6. Fruit a berry. A genus of numerous species indigenous chiefly in Asia and America. Many exotic species are cultivated in English gardens ; some, belonging to a section with pinnate leaves, are occasionally classed as a genus called *Mahonia*.

Berberis vulgaris L. Common Barberry.

A glabrous shrub with yellow wood, 6 or 8 feet in height, the branches armed with 3-lobed thorns at the base of the tufts of leaves. Leaves alternate or clustered, obovate, sharply toothed. Flowers yellow, in elegant drooping racemes. Berries small, oblong, acid, green, and then yellow, and finally bright red.

Hedges, open woods and hillsides from the plains up to 5000 feet, the colouring of the berries in early autumn being a beautiful sight. The flowers appear in May and June.

Distribution.—Nearly all Europe, and extending from temperate Asia to the Himalaya. But it has been so frequently planted that in Europe its real limits cannot easily be determined. In Britain it is scattered, but doubtfully indigenous.

Berberis ætnensis Roem. et Schult.

A smaller shrub, much branched and usually decumbent. Leaves ovate-oblong, stiff, very finely serrated at the edge. Thorns very strong, often longer than the leaves. Flowers in short clusters. Berries bluish black when ripe.

Distribution.—Mountains of Corsica, Sardinia, and Sicily, flowering in May and June.

NYPHÆACEÆ

Flowers regular. Stamens numerous. Stigma sessile on the many-celled ovary. A small family of aquatic plants, with large handsome flowers and floating leaves. About 35 species growing in the waters of almost the whole globe.

Castalia alba (White Water-lily) and *Nymphaea lutea*, the Yellow Water-lily, are found in lakes and ponds in the lowlands of Switzerland, etc., and *Nymphaea pumila* Hoffm. is much less common in mountain lakes in Switzerland, Tyrol, Carinthia, and the Vosges. It is smaller than the Common Yellow Water-lily, with much smaller flowers, unguiculate petals, and oblong, slightly peltate leaves.

PAPAVERACEÆ

Herbs with alternate leaves and milky juice. Flowers regular, usually of 4 petals. Sepals usually 2. Stamens indefinite. Ovules parietal. A family represented in the Alps and sub-Alps by very few species.

Papaver alpinum L. Alpine Poppy.

Root tapering, with prostrate, scaly branches and loosely tufted. Stem erect, simple, leafless, 1-flowered, hispid, like the whole plant. Leaves all radical, stalked, doubly pinnate. Segments linear lanceolate or wedge-shaped, entire. Flowers white with yellow centre, or yellow or orange when on granite soil. Stamens subulate. Capsules obovate, with stiff adpressed hairs.

Principally on limestone, or on granitic débris of the high Alps (5500–9000 feet), and sometimes descending into the valleys and beds of streams. June to August.

Distribution.—Eastern, Central, and Western Alps; Carpathians, Balkans, Apennines; high mountains of Europe from Spain to Norway; Northern and Central Asia.

In Switzerland it is represented by two sub-species: *P. Burseri* Crantz, a glabrous form found in the Alps of Gruyère, Chateau d'Oex, etc.; and *P. Sendtneri* Kerner, a hairy form with less cut leaves, which also grows above Chateau d'Oex and on Pilatus, etc.

The Arctic or Iceland Poppy (*P. nudicaulis*) is very similar to

P. alpinum; and *P. pyrenaicum* Willd. is only a form of *P. alpinum*, though formerly some botanists considered it a distinct species.

Papaver aurantiacum Loisel. (*P. rhœticum* Leresche).

Flowers yellow or orange. Leaves pinnatifid; segments thick, oval or broadly lanceolate, hairy. Flowering stem very hairy. Sepals covered with dark brown hairs. Capsule obovate, hispid, with erect, silky hairs.

Moraines and débris, especially on limestone. July, August.

Distribution.—In Switzerland in the Engadine and Valais, rare; Tyrol (Salzburg) and Carinthia.

The Alpine and Iceland Poppies are easily grown from seed, and they adapt themselves to any part of the rockery in sandy loam. The plants are best left undisturbed.

MECONOPSIS Viguiet.

Ovary ovoid, with a short style and slightly dilated stigma of 4–6 rays. Capsule opening at the top in as many short valves, the placentas inside lining the cavity, but not projecting to the centre.

A small genus containing, besides the European species, a few from Central Asia and North-West America.

Meconopsis cambrica Vig. Welsh Poppy.

Rootstock perennial, and forming large tufts, with thick tapering roots. Stems erect, about a foot high. Leaves on long stalks, pale green and slightly hairy, pinnate, the segments usually distinct, ovate or lanceolate, toothed or lobed. Flowers large, pale yellow, on long peduncles. Capsules narrow, ovate or oblong, glabrous.

Rocky woods and shady places in hilly districts. June–August.

Distribution.—Western Europe from Spain to Ireland, including the Pyrenees, Central Plateau of France, Wales, and Western England. Probably not in Switzerland.

CHELIDONIUM L.

Leaves much divided. Flowers yellow. Ovary 1-celled. Capsule linear, valves thin. Only 2 species. They extend from Europe to Japan.

Chelidonium majus L. Greater Celandine.

Though more strictly a plant of the plains, this well-known herb, with yellow flowers and handsome leaves and yellow juice, is not infrequently met with in the sub-alpine region, though even there it is usually in the neighbourhood of houses as, e.g. close to the villages of Evolène and Zinal in the Valais. The recently published coloured prints of *Chelidonium*, after the beautiful work of Albrecht Dürer 400 years ago, show the accuracy of form and colour that great master possessed.

FUMARIACEÆ

Flowers irregular. Sepals 2, deciduous. Petals 4, one or two of them gibbous or spurred. Stamens 6, in two bundles of 3 each. Ovary 1-celled. A small family, chiefly of western distribution.

CORYDALIS DC.

Flowers usually larger than in *Fumaria*, white, yellow, or purple; one petal only spurred. Fruit a 2-valved capsule, or narrow pod, many-seeded.

The species are spread over Europe, Temperate Asia, and North America, and many are handsome plants.

Corydalis cava Miller.

Root tuberous, hollow. Stem 8–18 inches high, with 1 or 2 deeply cut leaves, with no scale beneath as in *C. fabacea*. Flowers purple, lilac, white, or mottled, with thick curved spur.

Orchards, hedges, and copses, in colonies in the plains and hills, but local in Switzerland. April, May.

Distribution.—Central and Southern Europe, from Portugal to the Caucasus, and Sweden.

Corydalis fabacea Pers. (*C. intermedia* Ehrh.).

Tuber solid, bulb-shaped. Stem shorter than the last, with 1–2 leaves, having a scale below. Leaflets less cut up. Flowers purple, in a shorter terminal spike, nearly sessile, and with straight spur.

Woods and bushy places in the Alps and sub-Alps. April, May.

Distribution.—Ardennes, Vosges, Jura, Switzerland, Savoy, Dauphiny, Corsica, Central Europe from Sweden to Southern Russia.

Corydalis solida Swartz (*C. bulbosa* DC.).

Tuber solid, like a small bulb. Plant about the height of the first species, with 2–4 leaves, with 1–3 scales. Leaves twice ternate, with small incised lobes. Flowers purple, on longer stalks, spur straight. Flowers in a dense panicle which gets elongated after flowering. Peduncle as long as the capsule.

Hedges, hilly woods, and meadows, very local in Switzerland. March to May.

Distribution.—Western Switzerland, Jura, Vosges, Pyrenees, Central and Southern Europe, Northern and Western Asia. Not uncommon in the mountains of the Var, and extending almost throughout France.

Corydalis claviculata DC.

This pretty climbing plant, with very pale yellow or nearly white flowers, is not found in Switzerland, though in the Department

of Hautes-Alpes; but it grows in bushy places among the siliceous hills in the Pyrenees and Western Europe from Portugal to the South-West of Norway, and in Britain.

CRUCIFERÆ

Herbs or rarely under-shrubs with alternate leaves, and no stipules. The flowers in terminal racemes, which are usually very short, but lengthen out as flowering advances. Sepals 4. Petals 4, equal, or the two outer larger. Stamens 6, of which two are generally shorter. Ovary solitary, 2-celled. Style single, often very short, with a capitate or 2-lobed stigma. Fruit a pod, divided into 2 cells by a thin partition, from which the valves generally separate at maturity; or, in a few genera, the pod is 1-celled and indehiscent, or separates into several transverse joints.

An extensive family widely spread over the globe, but chiefly in the northern hemisphere. The characters of the genera are chiefly derived from the pod and seed; therefore to name a Crucifer it is almost necessary to have the specimen in fruit.

ARABIS L.

Annuals or perennials, usually erect and hairy, at least at their base, with a spreading tuft of radical leaves, which are occasionally lobed; the stem-leaves undivided, sessile or clasping the stem. Flowers white or purple. Pods long and linear, the stigma nearly sessile, the valves flat or slightly convex. Seeds more or less flattened, often winged.

A large genus spread over the temperate regions of the northern hemisphere.

Arabis alpina L. Alpine Rock-cress.

Stem 3-12 inches high, covered like the leaves with forked hairs. Leaves coarsely toothed, often with a wavy margin; root-leaves wedge-shaped; stem-leaves ovate or ovate-lanceolate. Petals white, rather large, 3 lines long. Siliques spreading, flat, about an inch long. Seed surrounded by a narrow membranous rim. Very polymorphic. Leaves thin and glabrescent when in shady places under rocks or trees.

Damp rocky places, especially on limestone in the Alps and sub-Alps up to 10,000 feet, and often descending to the plains in the beds of streams. May to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Auvergne, Cevennes, Pyrenees, Corsica, Riesengebirge, Harz and Westphalia, Scandinavia (to above the birch limit), Siberia, Himalaya.

Easily cultivated from seed in sandy loam, as indeed many

species of *Arabis* are. In August, 1911, the writer found *A. alpina* growing as high as 10,500 feet on the north ridge of the Diablons in Valais.

Arabis arenosa Scop.

Biennial. Stems 6–12 inches high, slender, branched, hairy like the whole plant. Root-leaves lyrate-pinnatifid; upper leaves few, dentate or entire. Flowers pale pink or lilac or rarely white. Sepals gibbous. Siliquas spreading, slender, forming a loose, spreading raceme.

Sandy places among rocks, local. Rare in Switzerland; got at Engelberg in 1910. April to July.

Distribution.—Northern and Central Switzerland, Central Jura, Vosges, Central France, Bulgaria.

A few Swiss specimens with pale lilac flowers have developed pure white blossoms in a West of England garden.

Arabis stricta Huds. (*A. scabra* All.) Bristol Rock-cress.

Stem 3–10 inches, erect, simple, covered with hispid hairs like the leaves. Leaves leathery, shining, dark green and occasionally purplish, ciliated, wavy, with a few rounded teeth; radical leaves in a dense rosette; cauline leaves 1–3, sessile, not auricled. Flowers a dirty white. Sepals as long as the pedicels. Fruiting-spike short, with widely erect pedicels. Siliqua erect, compressed. Seeds truncate and slightly winged at the summit.

Rocks, cliffs, and débris on limestone in the lower Alps and plains. May to July.

Distribution.—East and South of France, Switzerland (Common on the Salève near Genève), Jura, Pyrenees, Spain. On carboniferous limestone rocks and screes near Bristol on both sides of the Avon.

Arabis bellidifolia Jacq.

A glabrous and shining plant, or sometimes sparsely covered with simple hairs. Stem 6–20 inches high, erect, simple, leafy. Leaves thick; the root-leaves oblong-spathulate, slightly wavy; the stem-leaves oval or oblong, entire or toothed, half-embracing the stem. Flowers white. Side sepals swollen at the base, shorter than the pedicel. Anthers oblong. Fruiting-spike elongated, with erect pedicels. Siliquas long, numerous, erect, much compressed. seeds broadly winged.

Springs and damp pastures in the high mountains, commonest at about 5000–6000 feet. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, Norway.

Arabis pumila Wulf.

Root tapering, branched, with several crowns; root-crowns often resembling stolons, tufted. Stem erect or ascending, 3-5 inches high, simple, glabrous, or with fine hairs below. Leaves entire or slightly toothed, acute or obtuse, with simple and forked hairs, or only ciliate; root-leaves in a rosette, obovate or wedge-shaped, gradually narrowed below; stem-leaves linear or lanceolate, sessile. Petals white, obovate-lanceolate, patent. Seed-vessel erect, compressed. Seed surrounded by a membranous ring half the width of the seed.

Rocks and stony places in the calcareous Alps up to 8200 feet, often descending to the sub-alpine region. June, July.

Distribution.—Carpathians, Alps, and Apennines.

Arabis perfoliata L. (*Turritis glabra* Lamk.).

A biennial, glabrous and glaucous plant 2 to 3 feet high, robust. Stem pubescent at the base. Radical leaves downy, dentate-sinuate, in a rosette which soon withers; stem-leaves entire, glabrous, auricled at the base. Flowers yellowish white. Sepals equalling the pedicels. Fruiting-spike very long, narrow, and crowded. Siliquas long, compressed. Style very short.

Hedges, woods, and pastures. May to July.

Distribution.—Almost all Europe; local in Switzerland and Britain; Western Asia as far as the Himalaya; North America.

Arabis Turrita L. Tower Cress.

A tall, stiff, erect biennial, rough and hoary, with short stellate or forked hairs. Radical leaves spreading and stalked; stem-leaves oblong-lanceolate, sessile, and clasping the stem by their rounded auricles, all slightly toothed. Flowers small, dirty yellowish white. Pods 3 inches long, on short erect pedicels, all curved downwards to one side, in a long, dense, nodding raceme.

Rocks and stony woods on limestone mountains. May to July.

Distribution.—Central and Southern Europe including the Jura and Switzerland; Western Asia, Algeria, Australian Alps.

Introduced into Britain on walls at Oxford, Cambridge, etc.

Arabis hirsuta, *A. muralis* Bert., *A. auriculata* Lamk., *A. saxatilis* All., and *A. arcuata* Shuttle., are also occasionally met with in the sub-Alps of Switzerland and Central Europe.

Arabis serpyllifolia Vill.

Stem flexuose, and, like the leaves, whitish grey from branched hairs. Leaves narrowly ovate, entire, or slightly dentate; radical leaves prolonged into a leaf-stalk; stem-leaves sessile. Flowers white. Siliquas on short stalks, somewhat spreading, scarcely broader than the stalk, long, flattened, with a somewhat prominent midrib and lateral nerves. Seed not winged.

Rocks in the calcareous and lower Alps up to 6000 feet. June to July.

Distribution.—Jura; Central and Western Alps.

NASTURTIUM R.Br.

Capsule not more than 3 times as long as broad, long-stalked, and usually curved. Flowers small, white or yellow. Sepals equal, spreading. Leaves pinnatifid.

Glabrous annuals or perennials, widely spread over the whole area of the family (Cruciferæ).

Nasturtium pyrenaicum R.Br.

Stem 6–12 inches. Root-leaves long-stalked, oval, simple, or auricled; lower stem-leaves lyrate, the upper ones deeply pinnatifid. Petals yellow, nearly twice as long as the sepals. Siliqua one third the length of its pedicel.

Damp, sandy places from the plains up to 5500 feet, very local. May to August.

Distribution.—Central and southern Europe, Pyrenees, Switzerland, Vosges, Valley of Elbe, Baden, Alsace, widely spread in France except in the north.

CARDAMINE L.

Annual or perennial herbs, usually glabrous. Leaves pinnate or, if undivided, on long stalks. Flowers white or pink. Stigma capitate or small. Pod narrow-linear; the valves flat, without any conspicuous midrib.

A large genus, widely spread over the temperate and colder regions of both northern and southern hemispheres.

Cardamine trifolia L.

Rootstock slender, stoloniferous, knotted. Stem slender, naked or with one small leaf. Leaves ternate; leaflets rounded, petioled almost equal, thick, shining, crenate. Flowers white. Anthers yellow. Fruiting-spike short, erect. Plant with creeping runners.

Damp and shady places in lower mountains. April to June.

Distribution.—Eastern Alps, Bavaria, Bohemia, Silesia; Central Europe from the Jura to Italy, and Transylvania. Very local in Switzerland (Chasseral, Bex, etc.), and in France only known from Mont Pouillerel in the Jura.

On rockeries it is easily grown in shady places and, owing to its creeping habit, it soon covers a large area, and must be kept in check.

Cardamine asarifolia L.

A glabrous, bright green plant. Stem leafy, 1–1½ feet high. Leaves all simple, cordate-orbicular, coarsely dentate, shining.

Flowers white, rather large. Anthers violet. Pods erect, twice as long as the stalk.

Damp, stony places in the mountains, especially by streams. July.

Distribution.—Basses-Alpes, and both French and Italian Maritime Alps, Piedmont, Tyrol, Spain. In Switzerland, near Poschiavo.

Easily cultivated in wet, stony places, but not often seen in gardens, though a very distinct plant. It does not object to the shade of trees or rocks.

Cardamine latifolia Vahl.

Similar in habit and culture to the last species, from which it differs in having lyrate leaves with 3-7 large leaflets which are shortly stalked; the terminal leaflet is larger and suborbicular. The flowers are lilac and the anthers yellow. The pods are erect, more spreading, and on longer stalks than in *A. asarifolia*.

Springs and rivulets in the lower mountains (at about 3500 feet in the Eastern Pyrenees). May to July.

Distribution.—Pyrenees, Corbières, Spain, N. Italy.

Cardamine pratensis L. (Cuckoo-flower), *C. amara* L. (flowers white, anthers violet), *C. impatiens* L., *C. flexuosa* With. (with zigzag stem), are four British species spread throughout the plains of Switzerland, and often seen in damp mountainous woods or meadows up to 5000 feet, both in the Alps and Eastern Pyrenees.

Cardamine bulbifera Crantz (*Dentaria bulbifera* L.). Coralroot.

Rootstock scaly, whitish. Stem weak, 1-2 feet high, bearing several leaves, often with a small ovoid bulbil at their axil; lower leaves pinnate with 5 or 7 segments, the upper ones with fewer segments or quite undivided; all segments lanceolate, entire, or toothed, 1½-2 inches long. Flowers few, rather large, bright lilac, rarely white. The pod is seldom formed, as the plant is propagated by the axillary bulbils falling to the ground and growing.

Woods and shady places in the plains and hills. April to June.

Distribution.—Spread over Continental Europe from Scandinavia and the north of France to the Caucasus. In England in some of the 'home counties.'

Cardamine pentaphylla R. Br. (*Dentaria digitata* Lamk.).

This is a smaller plant with no bulbils. The leaves are digitate and divided into 3-5 leaflets, which are oblong-lanceolate and toothed irregularly. Flowers rose or lilac. Siliqua erect, spreading. Rootstock fleshy, scaly.

Figured in Curtis's *Bot. Mag.*, tab. 2202 (1821).

Mountain woods. May, June.

Distribution.—Widely spread in Switzerland, and in France from the Jura and Vosges to the Pyrenees; Central and Southern Europe.

Cardamine pinnata R.Br. (*Dentaria pinnata* Lamk.).

Rootstock scaly, obtuse. Stem stout, $1\frac{1}{2}$ –2 feet. Leaves pinnate, with 5–9 leaflets which are opposite, ovate-lanceolate, and irregularly toothed. No bulbils. Flowers large, lilac, rose, or white. Petals 3 times longer than the calyx. Siliqua and pedicels erect, spreading.

Mountain woods in Switzerland, Central and Southern Europe from Spain to Styria. Coste says, "Not in the west or north of France and rare in the south."¹ April to June.

Cardamine polyphylla O. E. Schulz (*Dentaria polyphylla* Waldst. and Kit.).

Rootstock scaly. Stem with 2–4 leaves and 7–14 flowers. Leaves pinnatisect, with lanceolate segments, very acuminate, and with sharp teeth. Petals yellowish white.

Bushy places among mountains, rather rare, up to 5000 feet. April to May.

Distribution.—Switzerland, rarely in a few Cantons only.

In Switzerland *Dentaria digitata* is the commonest of the four species found in the country. In Tyrol and the Eastern Alps several other species occur in the lower mountains, viz. *D. cuneaphyllos* L. with yellowish white petals and ternate leaves in whorls of three; *D. alternifolia* Hausskn. with yellowish white flowers and ternately-digitate leaves, and *D. intermedia* Sond. with lilac or white flowers and leaves quinately digitate.

The Dentarias, as they are still commonly called, are useful spring flowers for shrubberies and shady borders. They do well in sand and peat or in sandy leaf-mould, and can easily be increased from the small tuber-like roots, or by planting the bulbils of *D. bulbifera*.

MATTHIOLA Br. Stock.

Annual or perennial shrubby plants covered with hoary tomentum. Leaves entire or sinuate. Flowers usually purple or lilac, never yellow, rather large. Petals spreading, on long erect claws. Pod long and narrow. Stigmas sessile, erect, sometimes with a horizontal horn at the base of each.

Mostly sea-coast plants from the Mediterranean and Western Europe, with two British species.

Matthiola vallesiaca Boiss.

Stem very leafy at the base, about a foot high, though sometimes higher in older plants. Leaves linear, obtuse, entire, covered with glandular and stellate hairs, lengthened at the base and dilated into a sheath. Flowers reddish violet or mauve. Pod compressed, tomentose. Stigma bilobed.

¹ Found in 1903, by the writer, in a wood above Carcanières, Pyr. Or., at about 4000 feet.

Dry, rocky places in the sub-Alps, very rare. May to July.

Distribution.—Formerly only known to grow in the Valais on the Simplon and near Binn in the Maurienne and possibly in Tyrol; but Prof. Chodat has recorded it from Susa near Turin and in the Cogne Valley.¹

LUNARIA L.

Petals purple or lilac. Fruit very large, flat, oval, or oblong, lengthened into a false pedicel above the real pedicel. Valves without nerves. Seeds few.

Only 2 species inhabiting Europe and Western Asia.

Lunaria rediviva L.

Stem about 3 feet high, erect, branched at the top, generally, though not always, glabrous. Leaves petioled ovate-cordate, finely toothed. Flowers violet, veined, sweet-scented. Pods oblong-elliptic, pointed at both ends, drooping finally.

Mountain woods up to 5000 feet. May to July.

Distribution.—Almost all Europe, from Portugal to Sweden and Russia; Siberia. Very local in Switzerland as, e.g. in woods near Engelberg and on the Salève near Geneva.

It might be grown in shady gardens and at the back of big rockeries under trees.

The only other species is the well-known 'Honesty' *L. biennis* Mœnch. It grows in Switzerland about Orsières and Lugano, etc., but probably as an escape from gardens. Native in S.W. Europe.

HESPERIS L.

Erect herbs, more or less hairy, with toothed leaves and handsome purple flowers. Sepals saccate. Pods long and linear. Stigma oblong, erect, and shortly divided into 2 lobes.

A small genus confined to Europe and Northern Asia.

Hesperis matronalis L. Dame's Violet.

Stems 2–3 feet high, slightly branched. Leaves shortly stalked or tapering at the base, toothed, ovate-lanceolate or lanceolate, 2–3 inches long, the upper ones smaller. Flowers large, white or lilac-violet, usually fragrant in the evening. Pods 2–4 inches long, almost cylindrical, but contracted between the seeds.

Hedges, woods, thickets, and watersides in the plains and lower mountains. May to June. Probably naturalised in Switzerland as in England.

Distribution.—Central and Southern Europe, Northern and Western Asia. Often cultivated in cottage gardens.

¹ Chodat et Pampanini, "Sur la distribution des plants des Alpes Austro-Orientales" in *Le Globe* (Genève), 1902, p. 50.

VESICARIA Poir.

About 30 species indigenous to Southern Europe and America. (Silicule globular, many-seeded.)

Vesicaria utriculata Lamk.

Stem 12–18 inches high, rather woody at the base. Leaves entire, oblong, glabrous; lower leaves ciliated, almost spatulate. Inflorescence umbellate at first, elongated later. Flowers yellow, rather large. Petals longer than the calyx. Silicules 8–12 mm. long, oval, glabrous. Seeds broadly winged.

Rocky places and limestone débris in the sub-alpine region and lower valleys. Very local in Switzerland.

Distribution.—Switzerland (Lower Rhone Valley, Trient and Bagnes valleys), Savoy, Dauphiny; Southern Europe as far east as Greece; Bithynia.

ALYSSUM L.

Annuals or low-branching perennials, with hoary or short stellate down and white or yellow flowers. Filaments of the stamens usually winged near the base, or thickened, or furnished with small teeth. Pod sessile within the calyx, orbicular or oval, the partition broad, the valves convex and not veined. Seeds 1–4, or very rarely more.

A large genus extending over Europe and Northern Asia. Distinguished from *Draba* chiefly by the short few-seeded pod, with more convex valves.

Alyssum montanum L.

Stem diffuse, downy, woody at the base, whole plant greyish green, with adpressed, stellate pubescence. Leaves oboval or oblong-lanceolate. Flowers bright yellow. Petals emarginate; longer filaments winged. Silicule circular, swelling in the middle, slightly emarginate. Style equalling the silicule or shorter. Seeds narrowly winged.

Sandy places and limestone hills, in sunny places, 2000–6000 feet. May to July.

Distribution.—Alps, Pyrenees; Central and Southern Europe, Western Asia, N. Africa.

Alyssum alpestre L.

Stem somewhat shrubby at base, diffuse, hoary, like the whole plant. Raceme simple, corymbose. Flowers yellow. Petals entire, rounded. Silicules small, obovate-oblong, swelling in the middle. Seeds slightly winged. Plant covered with stellate hairs.

Rocky and sandy places in the mountains, especially in river beds. June to August. Very variable.

Distribution.—Savoy, Dauphiné, Provence, Cevennes, Eastern

Pyrenees ; Zermatt Valley in Switzerland ; Mont Cenis, Southern Europe ; Western Asia ; North Africa.

A. serpyllifolium Desf. is a small-leaved, pale yellow-flowered, and very hoary variety, found at Mont Cenis and in Spain, etc.

Alyssum halimifolium L.

Plant shrubby, 1 foot high, with twisting branches. Leaves oblong, obtuse, silvery. Flowers white, large. Petals slightly emarginate, oval. Fruiting-spike a dense corymb. Silicules circular, glabrous, twice as long as the style. Seeds broadly winged.

Limestone rocks in the low mountains of the South. May, June.

Distribution.—Maritime Alps and Department of the Var ; Liguria, Col di Tenda, and Piedmont. Very local.

This very distinct species might be more cultivated in warm places in limy soil on the rockery.

All the rock and Alpine Alyssums are easily grown in light, sandy, or other dry soil. *A. saxatile*, from Southern Russia, is the best-known species in gardens, where it makes great masses of yellow colour in April and May. None of the Alyssums can have too much sun in summer, or too little damp in winter. Several are very liable to attacks by slugs.

CLYPEOLA L.

A genus of about 8 species inhabiting southern Europe, Western Asia, and N. Africa. Flowers very small, yellow, turning whiter. Silicule orbicular, edged, compressed, 1-celled, and 1-seeded.

Clypeola Gaudini Trach.

Stem ascending, 3–6 inches long. Leaves grey, covered with stellate hairs, small, sessile, oblong spatulate. Flowers very small, yellow, then white, in a long spike. Silicules orbicular, flat, rather large (4 mm.), glabrous, on arched peduncles.

Sandy places and stony hills. Local. April, May.

Distribution.—Rhone Valley in Switzerland, Maritime Alps, Southern France, Mediterranean Europe, Corsica, Western Asia.

BERTEROA DC.

Stem leafy. Filaments of stamens short, furnished with a distinct tooth. Otherwise like *Alyssum*.

Berteroa incana DC. (*Alyssum incanum* L., *Farsetia incana* R.Br.).

A biennial plant, grey, with stellate hairs, 1–2 feet high. Stem erect, generally branched above. Leaves sinuate-dentate. Fruit elliptic. Petals white, bifid.

Sandy roadsides in hot valleys. June.

Distribution.—Rare in Switzerland (Geneva, Martigny, Morges, etc.), North, East, and South-East Europe, Western Asia. Naturalised in a large part of France, and in England.

DRABA L.

Small annuals or perennials, usually hairy or hoary, with spreading or tufted radical leaves, entire or toothed, with few or no stem-leaves. Flowers white or yellow. Filaments of the stamens without appendages. Pod oblong or elliptical, more or less flattened; the partition broad; the valves flat or convex. Seeds several in each cell. They mostly differ from *Alyssum* in their longer pod.

A considerable genus, ranging over the northern hemisphere, ascending to the highest elevations and to high Arctic latitudes; and extending along the great mountain chain of America into the southern hemisphere.

Draba aizoides L.

Stem erect, 1-4 inches high, simple, glabrous, leafless. Leaves in a radical rosette, linear or linear-lanceolate, acute, entire, ciliated, with long stiff bristles, otherwise glabrous, shining. Flowers bright yellow. Petals slightly emarginate. Silicule oval, elliptical, or lanceolate, usually glabrous, surmounted by a long style.

Limestone rocks and débris, descending to stony places in the lower mountains and hills. May to August, according to altitude. Few plants have so wide a range of altitude. The writer has seen it at various heights from 2000 feet in Haute-Savoie to about 11,000 on the Diablons in Switzerland. In England it grows at sea-level in Glamorgan, where it was probably introduced.

Distribution.—Eastern, Central, and Western Alps, Carpathians, Var, Pyrenees, Corbières, Cevennes, Jura.

The variety *montana* Koch, which is frequent in the Jura, is distinguished by its robust habit and its oblong head of golden yellow flowers, few in number.

The variety *Hoppeana* Reichb. (*D. Zahlbruckneri* Host.) is a small dwarf form found on the higher mountains. It has a style much shorter than the diameter of the silicule.

Draba nemorosa L.

Annual. Stem erect, simple, hairy and leafy below, glabrous and naked above. Leaves oval, entire or toothed; stem-leaves sessile, close together, not auricled. Flowers yellowish, small. Petals emarginate. Fruiting-spike elongated, loose, with spreading pedicels 2 or 3 times the length of the silicules, which are oblong and pubescent. Style almost wanting.

Woods and screes in the mountains. May to July.

Distribution.—Savoy, Eastern Pyrenees, Caucasus. Europe from Spain to Scandinavia; Asia, N. America.

Draba muralis L.

Annual. Stem erect, slender, hispid with bifid hairs, leafy. Radical leaves oval, toothed, petioled; stem-leaves distant, amplexicaul, strongly toothed. Flowers white, very small, in a loose spike, with spreading pedicels. Silicule elliptic.

Walls, rocky and shady places in the plains and hills. April to June. Local.

Distribution.—Rare in Switzerland (Bâle, Martigny, etc.). Almost all Europe; Western Asia, Canada. British.

Draba incana L.

Plant greyish white, with stellate hairs. Stem erect, very leafy. Leaves entire or toothed; the root-leaves in a rosette, lanceolate; stem-leaves oval or lanceolate, sessile. Flowers white, in a long spike. Silicules linear-oblong, on short pedicels, glabrous or pubescent, arranged densely on the axis.

Stony places and mountain pastures, both in the Alps and sub-Alps. Local in Switzerland. May to July.

Distribution.—Alps, Pyrenees; Northern and Central Europe; Caucasus, Iceland. Asia, N. America.

Draba verna L. (*Erophila vulgaris* DC.).

This little annual plant, so well known in England, and so variable, is common in various forms and varieties in Switzerland, and ascends the Alps of Central Europe to the Pine-forest zone at least. February to May.

Distribution.—Europe, Asia, Africa, N. America. British.

KERNERA Medikus.

Sepals short, spreading. Flowers small, white. Pods many-seeded.

A very small genus scarcely distinct from *Cochlearia*.

Kernera saxatilis Reichb. (*Cochlearia saxatilis* Lam.).

Stem erect, 6–12 inches high, glabrous like the leaves, or slightly hairy in lower parts, usually branched. Root-leaves in a rosette, oblong, obtuse, entire or toothed, slightly hispid; upper leaves lanceolate, obtuse. Flowers milk-white. Silicules glabrous, oboval. Style very short. Six seeds in two rows.

Rocks and stony places in the calcareous Alps and lower Alps (e.g. the Salève and Môle) and descending sub-alpine valleys. May to August.

Distribution.—Alps, Jura, Cevennes, Corbières, Pyrenees, Var, Central and Southern Europe from Spain to Greece.

CAMELINA Crantz.

Flowers small, yellow. Pod obovoid, valves very convex, mid-rib distinct, with flattened edges forming a narrow margin round the pod. Style slender. Erect annuals with auricled leaves.

A genus of only about 3 species (Europe and North Asia) growing in crops. Bentham said they may "possibly be reducible to one species."

In Switzerland botanists have named three forms: *C. sativa* Crantz, which is subspontaneous here and there, *C. microcarpa* Andrz., and *C. Alyssum* Thellung, which is usually found in fields of Flax.

One of these forms we noticed in 1911 in a field where Flax had been previously grown at 4500 feet, near Argentière in Haute-Savoie.

SISYMBRIUM L.

Annual, or rarely perennial, erect herbs, glabrous or with spreading hairs. Flowers small, yellow or white. Pods linear, nearly cylindrical, the lateral nerves of the valves more or less distinct. Stigma entire, small or capitate, closely sessile on the summit of the valves. Seeds in a single row, ovoid or oblong, not flattened.

A large genus spread over the northern hemisphere, but with very few Alpine species.

Sisymbrium tanacetifolium L. (*Hugueninia tanacetifolia* Reich.).

Stem 2 feet high or more, erect, branching at the top, very leafy. Leaves pinnatifid, with numerous lanceolate, incised, dentate lobes, pale green. Flowers yellow, small. Sepals 2-3 times shorter than the pedicel. Fruiting-spikes short, in corymbose panicles, with erect pedicels. Silicules ascending, short, compressed. Valves with 1 nerve. Seeds large, oval, brown, finely spotted.

Pastures and stony places in siliceous mountains, especially in the Mountain Alder zone. July, August.

Distribution.—Savoie, Dauphiné, Provence, Central Pyrenees, Spain, Piedmont, as at Mont Cenis. In Switzerland only in Valais.

A useful plant for the shadier parts of the rock garden among big stones; the foliage being handsome.

Sisymbrium strictissimum L.

A large perennial species, 3 feet or more high, erect, branching, and very leafy, pubescent. Leaves lanceolate, entire, or toothed, often glandular. Flowers yellow, larger than in most species, fragrant. Sepals shorter than the pedicels, which are erect, but spreading. Silicules spreading or curved, long, cylindrical, slender. Valves with 3 nerves. Seeds linear-oblong, brown, glossy, in one row.

Hedges, roadsides, and thickets in the sub-alpine region, local. June to August.

Distribution.—Alps of Savoy and Dauphiny, occasionally in Switzerland (Engadine, etc.), Central and Eastern Europe.

ERYSIMUM L.

Erect annuals or perennials, pale or hoary, with closely adpressed hairs, rarely quite glabrous. Leaves entire or slightly toothed. Flowers yellow or rarely white. Pod linear, nearly quadrangular from the prominent midrib of the valves. Stigma broadly capitate, or with short, spreading lobes. Seed ovoid or oblong, the seed-stalk not flattened.

A rather numerous genus in the northern hemisphere; differing from Wallflower and *Sisymbrium* in the seed-pods.

Erysimum dubium Thellung (*E. ochroleucum* DC.).

Root thick. Stem angular, 9–18 inches high. Leaves linear-lanceolate, entire or slightly toothed. Flowers large, lemon-yellow and then straw-coloured, scented. Sepals dilated at the base, 1–3 times longer than the pedicel. Pod compressedly 4-edged. Style 3 times width of pod. Stigma 2-lobed.

Rocky places in the Alps and sub-Alps. May, June.

Distribution.—Jura (Dôle, Reculet, etc., not otherwise in Switzerland), Mont Ventoux, Corbières, Pyrenees, Spanish Peninsular, Carpathians.

Erysimum longifolium DC. (*E. australe* Gay.).

A greyish green plant, with rootstock sending up erect branches. Stem about a foot high or higher, erect, angular. Leaves linear or linear-lanceolate, entire or sinuate-dentate; stem-leaves numerous. Flowers fairly large, but smaller than in the last, bright yellow. Sepals 1–2 times longer than the pedicel. Pods erect, spreading. Stigma somewhat thick, obtuse. Calyx hoary, yellowish. Hairs simple, adpressed.

Rocky places in the mountains. May to August.

Distribution.—S. and S.-E. of France, Alps of Savoy, Southern and Central Europe.

Erysimum helveticum DC.

Sometimes considered a variety of the last, with larger flowers and longer pods. Stem usually erect, angular. Leaves narrow, decreasing in width at each end, entire or slightly sinuate-dentate. Pedicels and pods spreading erect, the pods being often 20 times the length of the pedicels.

Waste and rocky places in the lower mountains. June.

Distribution.—Switzerland (Tessin, Grisons, and Valais), Savoy

Erysimum hieracifolium L.

A biennial species. Stem $1\frac{1}{2}$ –3 feet high, erect, stiff, angular, simple or branched. Leaves oblong-lanceolate, entire or toothed, with trifid hairs. Flowers bright or pale yellow. Lateral sepals slightly inflated at the base, half as long again as the thick pedicel. Petals small, spreading. Fruiting-spike dense. Seeds winged at the top.

Rocky mountainous places and roadsides. June.

Distribution.—Almost all Europe from Norway to the Caucasus ; Western Asia. Common in the East of France, but only occasional in Switzerland.

E. virgatum Roth. is a sub-species with linear-lanceolate and usually entire leaves.

In cultivation *Erysima* do best in ordinary loam in sunny places on the rockery, and *E. dubium* is apt to die out on heavy soils. *E. pumilum*, a high Alpine species described in *Alpine Plants of Europe*, is a dwarf plant which can be tightly wedged between two stones in a hot, dry place with small bits of limestone scattered round it.

THLASPI L. Pennycress.

Annuals or low perennials. Leaves usually undivided, the upper ones clasping the stem. Flowers small, white, mauve, or rose. Petals equal or nearly so. Pod orbicular or obovate, flattened laterally at right-angles to the narrow partition, the valves boat-shaped, their midrib or keel more or less expanded into a green wing surrounding the pod. Seeds two or more in each cell.

A small genus spread over Europe, Northern and Central Asia, and N.W. America, distinguished from *Iberis* by having more than one seed in each cell of the pod, from all others by the winged pod.

Thlaspi alpinum Crantz.

Root fusiform. Stem simple, loosely cæspitose, erect or ascending, 2–4 inches high, glabrous, like the entire plant. Leaves bluish green, entire or toothed; root-leaves spatulate and forming rosettes; stem-leaves ovate-lanceolate or lanceolate, cordate, amplexicaul. Pods obcordate-lanceolate at base, narrow at apex, $\frac{1}{4}$ inch broad, narrowly winged, pointed at lower end, slightly emarginate at the summit. Style prominent, filiform, 1–4 seeded. Flowers white. Seeds smooth.

Pastures and stony places in the calcareous mountains. June, July.

Distribution.—Eastern and Western Alps. In Switzerland near Zermatt and possibly in Tessin.

Not to be confused with *T. alpestre* L., which is very similar and grows on limestone hills in Central and Western Europe and in Northern England and in Somerset; nor with *T. montanum* L.,

which is found in similar places in Central and Southern Europe, but not in Great Britain.

Thlaspi alpestre L.

Usually glabrous, 4–15 inches high, biennial or perennial, forming a branched or tufted stock, with obovate-oval or oblong, stalked, radical leaves. Stems simple, erect or ascending. Stem-leaves narrow, clasping the stem with small auricles, entire or toothed. Petals white, occasionally pinkish. Pod oboval, winged at the summit, less broad than in *T. montanum* or *T. perfoliatum*, slightly emarginate. Style prominent, as it is in *T. montanum*.

Mountain pastures and rocky places, especially on limestone in the Alps, sub-Alps, and plains. May, June.

Distribution.—Western and Central Europe, extending northward to Southern Sweden. Himalaya. British.

In Switzerland, the Jura, and elsewhere at least two sub-species are known, viz. : *T. brachypetalum* Jordan, whose anthers remain yellow after pollination, and *T. sylvestre* Jordan, whose violet anthers turn blackish after pollination. *T. virens* Jordan is sometimes considered a distinct species. Its leaves are a bright green and the flowers are larger than in *alpestre*. The style is also longer and more prominent. The anthers are violet and then blackish. It is usually found at higher elevations, at any rate in Switzerland.

Thlaspi montanum L.

A glabrous and glaucous plant, 6–10 inches high, with stoloniferous shoots springing from the rootstock. Stem simple. Radical leaves oblong, petioled; stem-leaves oblong, auricled or heart-shaped, sessile. Flowers rather large, Petals twice the length of sepals. Anthers pale lilac. Pods oboval, rounded at base, with a broad shallow notch, and rounded, obtuse wings. Style prominent. Seeds shining, 1–2 in each cell.

Hills and rocky places, especially on limestone. April to June.

Distribution.—Central and Eastern France, Eastern Pyrenees, Jura, rare in Switzerland. Central and Southern Europe.

Thlaspi rotundifolium Gaudin.

This beautiful violet or mauve-coloured species (described and figured in *Alpine Plants of Europe*, p. 62, is usually seen only on detritus at high elevations, but Mr. Reginald Malby has a photograph of it growing in a river bed in Switzerland at the remarkably low elevation of about 3000 feet.

IBERIS L. Candytuft.

Glabrous or minutely downy annuals or branching perennials, with narrow or pinnatifid leaves, and white or pink flowers, 2 adjoining exterior petals larger than the 2 others. Filaments

without appendages. Pod orbicular or oval, laterally flattened, notched at the top, the valves boat-shaped, the keel or midrib expanded into a wing. One seed only in each cell.

About 20 species inhabiting Southern Europe, Asia Minor, and Algeria, of which several are cultivated under the name of Candytufts, and all readily known by the unequal petals.

Iberis sempervirens L.

Stem 5–10 inches, woody and twisted at the base, diffuse, trailing. Flowering-stems glabrous. Leaves smooth, linear, oblong, obtuse, entire, ciliated, numerous, and close together. Flowers white, rather large. Sepals whitish at the borders. Filaments violet at the top. Fruiting panicle rather loose, with spreading pedicels. Silicules large, oval, broadly winged, each lobe pointed. Style passing beyond the lobes.

Rocks and stony places in the mountains. June to August.

Distribution.—Pyrenees, Corbières, Basses-Alpes; Southern Europe from Portugal to Greece; Asia Minor.

This is the commonest perennial Candytuft. Being half-shrubby, dwarf, and evergreen it is a useful edging for beds or shrubberies, for on any soil it quickly forms low masses of dark green foliage, which in April and May in England change into sheets of white. It loves the sun, and can be increased by seed or from cuttings.

Iberis saxatilis L.

Stems 3–8 inches high, woody and twisted at the base. Leaves entire, linear, alternate, rather fleshy, the upper ones pointed or mucronate, the lower ones obtuse, glabrous or ciliate, numerous, and close together. Flowers white, rather large. Sepals coloured at the edges. Filaments white. Silicules large, oval or oboval, slightly notched, broadly winged. Style short.

Rocks and limestone hills. May to July.

Distribution.—Jura, very rare in Switzerland, Dauphiny, Provence, Cevennes, Corbières, Spain, Italy, Taurus.

This species differs from the last, which it closely resembles, in having pubescent flowering stems, almost linear leaves, silicules more openly emarginate and the two lobes are rounded at the top, and the style is shorter.

Iberis Candolleana Jord.

Biennial, glabrous. Stems 2–6 inches high, simple, leafy to the top. Leaves fleshy, not ciliated, entire, the radical leaves oboval, the stem-leaves spatulate, oblong or linear-oblong. Flowers purple-lilac, rather large. Fruiting-head in a tight corymb, with short, thick pedicels. Silicules large, oval, with rounded base, obtusely notched, with short, pointed lobes, and a style longer than the lobes.

Screes and limestone rocks. June to August. Very local.

Distribution.—South-East of France (Drôme, Vaucluse, Alpes Maritimes).

ÆTHIONEMA R.Br.

Sepals erect. Petals equal. Filaments broadly winged. Silicules suborbicular, emarginate, compressed, dehiscent, with keeled valves and broadly winged. Flowers usually pink, veined, small. Leaves thick, entire, oboval or lanceolate. Glabrous, perennial plants.

About 40 species, inhabiting Southern Europe, Western Asia, and N. Africa, several of which are now cultivated in this country. They require deep soil and a sunny position.

Æthionema saxatile R.Br.

Stem ascending, often curved and prostrate, almost woody at the base, 8–12 inches high, simple or branched, glabrous and glaucous like the whole plant, very leafy. Leaves leathery, often of a violet tinge, shortly petioled, entire, the lower ones obovate, almost sessile, the upper lanceolate-acute. Sepals sessile, with 3 nerves. Flowers white, mauve, or flesh-coloured. Fruiting-spike elongated, with spreading pedicels. Silicules rounded at the base, emarginate, with 2 many-seeded cells. Style shorter than the lobes.

Rocky places and débris in the mountains and sub-Alps, especially on limestone. April to June.

Distribution.—Jura, East and South of France, Switzerland (rather rare), Cevennes, Corbières, Pyrenees, Carpathians, Southern and Central Europe; Algeria, Asia Minor.

BISCUTELLA L.

Sepals usually equal. Flowers yellow. Silicule circular and separating into 2 distinct 1-seeded valves. Style long. A genus of about 5 species only.

Biscutella lævigata L.

Root tapering, branched, tufted, with many heads. Stem erect, branched, glabrous or with stiff hairs on the lower part. Leaves very variable, entire or more or less dentate, acute, generally hairy, dark green, shining, the lowest leaves lanceolate and narrowed into a foot-stalk, the upper lanceolate or linear, sessile, with rounded, semi-amplexicaul base. Flowers yellow, fragrant. Silicules of two circular flattened lobes, with winged membranous border. Style about as long as the diameter of one lobe.

A polymorphic plant, generally considered Alpine, for it is very frequent in the Alps up to 8000 feet, but it is also found in uncultivated and rocky places throughout Central and Southern Europe from Belgium to Portugal and Roumania. May to August.

There are only about 5 species of *Biscutella*, all characterised by the peculiar circular silicules and long style, but we believe *B. lævigata* is the only perennial example of the genus; e.g. *B. cichorii-folia* Lois. is a handsome annual of hispid growth and wavy leaves embracing the stem, which is often seen in waste or rocky places in the South of Europe. It grows in one or two places in Tessin and the Valais (Capolago, Aubonne).

HUTCHINSIA R.Br.

Flowers small, white. Petals equal. Filaments without scales. Leaves pinnatifid. A genus of only 4 species, but represented in all the continents.

Hutchinsia alpina R.Br. (*Noccea alpina* Reich.).

Stem simple, ascending or recumbent, leafy at the base, 1-4 inches high, slender, sometimes pubescent. Leaves glabrous, pinnate, with small oval or oblong lobes. Flowers pure white, rather large for the plant. Petals oboval, twice the length of the calyx. Raceme long and loose when in fruit, with spreading erect pedicels equalling the silicules. Silicules elliptical, acute at both ends. Style short, with 2 seeds in each cell.

Damp, stony, and often shady places in the Alps, up to 10,000 feet and above. Common, especially on limestone. May to August.

Sometimes carried long distances by Alpine torrents, in the sandy bed of which its roots penetrate far.

Distribution.—Eastern, Central, and Western Alps, Jura, Pyrenees, Carpathians.

CISTACEÆ

Flowers fugacious, usually large. Sepals and petals usually 5. Stamens numerous. Ovary usually 1-celled, with 3 parietal placentæ. Style 1. Stigmas 3. Herbs or shrubs, often fragrant and resinous.

HELIANTHEMUM L.

Sepals 3-5, the 2 outer usually smaller. Petals 5, crumpled in the bud. Oboles numerous. Style jointed at the base. Stigma capitate or 3-lobed. Leaves opposite.

About 35 species, chiefly spread over Southern and Western Europe and N. Africa, with a few in America.

Helianthemum alpestre Dunal.

Shrubby, about 6 inches high, woody at the base. Branches ascending. Leaves opposite, lanceolate, narrowed at the base, more or less hairy, shortly stalked, without stipules. Racemes loose, bracteate. Petals golden yellow, twice as long as calyx. Style as long as the ovary.

Stony Alpine and sub-alpine pastures, especially on limestone, extending to 8200 feet. June to August.

Distribution.—Alps, Apennines, Southern France, Spain, and Portugal.

Helianthemum canum Baumg.

A rather shrubby prostrate plant, covered with silky hairs, especially on the younger leaves, which are elliptical, sometimes silver-white on the upper side and covered with a grey felt on the under side. Flowers small, yellow. Racemes numerous and short, with small bracts at the base of the pedicels.

Stony, hilly districts, especially in the forest region. May to August.

Distribution.—Central, Western, and S.-Western Europe from Southern Sweden to Spain. In Switzerland only on the Jura frontier and Valais. On limestone rocks rarely in N.-W. England and Ireland.

Helianthemum apenninum Lam. et DC. (*H. polifolium* DC.).

A shrubby plant about 6 inches to a foot high, with woody base, and less straggling habit than *H. vulgare*. Leaves narrow, rolled back at the edges, hoary on both sides but especially beneath. Flowers white, with yellow eye. Capsule large, sub-globular, tomentose. Seeds numerous, granular.

Dry, stony limestone hills, local. May, June.

Distribution.—South, Western, and parts of Central Europe, rare in Switzerland (near Geneva and Locarno, etc.), Algeria. In England on Brean Down, Somerset, and near Torquay.

Helianthemum vulgare Gaertn., *H. Chamæcistus* Miller. Common Rock-rose. (Plate XI.)

A low undershrub, with short, much-branched, woody stem, and annual flowering branches from 3–10 inches long. Leaves shortly stalked, more or less oblong, but varying from ovate to lanceolate, glabrous or slightly hairy, and more or less hoary beneath. Stipules linear-lanceolate. Racemes loose, the pedicels deflected. The 3 larger sepals marked with 3 prominent ribs, the 2 outer very small. Petals bright yellow, broadly spreading. Very polymorphic.

Dry pastures and fields, from the plains to a considerable distance in the mountains. Above 8500 feet on the Col de Torrent, Switzerland, in 1911. Very common. May to August.

Distribution.—Nearly all Europe, Western Asia. England and Eastern Scotland, but apparently in Ireland only as a casual.

Helianthemum grandiflorum DC. (*H. virescens* Gren. and Godr.).

This is possibly only a large-flowered variety of the last, which assumes so many forms in the Alps. Flowers up to 26 mm. in

diameter, solitary or in twos or threes. Leaves bright green on both sides and generally broader than those of *H. vulgare*.

Dry Alpine pastures up to 7400 feet. June to August.

This large-flowered variety is particularly fine at Mont Cenis, in Savoy and the Ligurian Alps.

Messrs. Schinz and Keller in their *Flore de la Suisse* give two sub-species of *H. vulgare*, viz. *H. barbatum* Lam. and *H. nummularium* Miller. The leaves of the former are green and glabrescent, and those of the latter white-tomentose beneath.

In the Ligurian and Maritime Alps there are two pretty rose-coloured plants which Mr. Bicknell¹ describes under *H. vulgare*:

Var. *roseum* Burnat=*H. roseum* Bert.

Plant greyish by reason of the short hairs covering the stems, leaves, and pedicels. Flowers usually pink, rarely crimson or nearly white. Very common on dry banks in the littoral region.

Var. *semiglabrum* Burnat=*H. semiglabrum* Bad.=*H. Jacquini* Ard.

Leaves light green, narrow, and shining, the upper ones as well as the pedicels glabrous, or nearly so. Flowers pink. Not common in the littoral region. Val Nervia, etc. It is very common about Pigna in the Ligurian Mountains.

Various other species grow in Spain and the Mediterranean district, among the foot-hills and lower mountains, several of which are worth cultivating.

The Rock Roses are of the easiest culture in almost any light, rather poor soil fully exposed to the sun; and they strike readily from cuttings. If cut back after flowering they tend to grow more compact. The hybrids are very numerous and many of them extremely beautiful, being in all shades of yellow, salmon-pink, rose, and crimson. Few plants are of greater value for the rockery, for in addition to their beauty they grow very quickly. The nomenclature, however, of this genus seems somewhat confused. The tendency to hybridise may partly account for this.

FUMANA Spach.

A genus closely allied to the last. The flowers are usually smaller and the habit shrubbier. The sepals are always 5, the 2 exterior being smaller; and the capsule is 3-celled.

Fumana procumbens Gren. et Godr.

A recumbent small undershrub, 3-10 inches high, with woody base and branching stems. Leaves linear, sub-obtuse, mucronate, green, not stipuled, rough-edged. Flowers solitary, yellow, 1-4 on the upper part of the branches. Pedicels thick, deflexed, shorter

¹ *Flora of Bordighiera and San Remo* (1896).

than the sepals. Valves of the capsules slightly open at maturity and containing 12 seeds.

Dry screes and limestone rocks. Common. May to July.

Distribution.—Central and Southern Europe as far north as the Baltic Isles; Mediterranean region, Western Asia. In Switzerland locally in Tessin, Grisons, the Rhone Valley, and other warm places. On Monte Torraggio in Liguria we have seen this plant at some 4000 feet.

VIOLACEÆ

A family represented in Europe by a single genus.

VIOLA L.

Leaves radical or alternate, stipulate. Flowers axillary, solitary, or in cymes, with 2 small bracts. Sepals 5, usually unequal, and produced at the base beyond their insertion. Corolla irregular, of 5 spreading petals, the lowest produced into a spur at the base. Style single, with a dilated or thickened or hooked stigma. Capsule 1-celled, 3-valved. Seeds attached to 3 parietal placentæ.

There are about 150 species of *Viola* spread more or less throughout the globe.

Viola pinnata L.

Glabrous. Leaves all radical, digitate, multi-partite, with obtuse teeth. Flowers pale violet or blue, rarely white, fragrant. Petals small. Capsule trigonous.

Stony, rocky places in the Alps from 4500–7000 feet. June, July.

Distribution.—Eastern, Central, and Western Alps; very local. Rare in Switzerland and commoner in Tyrol and Carinthia; Ural Mountains, Siberia.

Viola biflora L. (Plate VII.)

Rootstock cylindrical, scaly, fleshy, oblique, branched above. Stem erect or ascending, limp, glabrous like the flowers and leaf-stalks. Leaves reniform, crenate, obtuse, or shortly acuminate, finely ciliated, otherwise mostly glabrous, bright green. Stipules ovate-lanceolate, acute, entire. Flowers usually 2 in a leaf-axil. Petals yellow, the odd one streaked with brown at the base. Calyx-teeth acute. Stigma abrupt, hollow, somewhat 2-lobed. Capsule elongated, obtuse, glabrous, pendent.

Bushy, stony places and damp rocks, and in moist mountain woods; 4000–9000 feet, though rarely above 8000 feet. June to August.

Distribution.—Throughout the Alpine Chain; Carpathians, Scandinavia, Jura, Corsica, Pyrenees; Asia, from the Urals and Caucasus to India; N. America.

Easily grown in a deep loam with plenty of leaf-mould, and



PLATE VII.

47 NATURAL SIZE.

1 VIOLA CALCARATA L. 2 V. PIFLORA L.
4 V. ALPESTRIS (DC.) WITTR.

3 V. MONTANA L.
5 V. SYLVATICA FRIES.

thrives in half-shade, especially among damp boulders and under dripping rocks or in shallow caves.

Viola calcarata L. (Plate VII.)

Leaves crenate, ovate, the upper ones lanceolate. Stipules entire, tripartite, or pinnatifid. Stem 1-flowered, erect, 3 inches or more in height. Flowers at least an inch in diameter, usually violet-blue, rarely yellow or white. Spur as long as corolla, i.e. at least $\frac{3}{4}$ inch, and so long and narrow that only butterflies with a sufficiently long proboscis can penetrate as far as the nectar at its extremity. Plant glabrous, branched, and leafy at the base, with creeping runners.

Alpine pastures from 5000–9000 feet, often so abundant as to form a carpet of violet-blue. June, July.

Distribution.—Eastern, Central, and Western Alps, Jura, Apennines, Central and Southern Europe from Bavaria to Sicily and Greece.

Viola lutea Hudson.

Stem usually simple, ascending, leafy. Leaves crenate, the lower ones ovate-cordate or ovate-lanceolate, upper ones lanceolate. Stipules palmate-multifid, with linear or linear-oblong lobes. Spur scarcely longer than the auricles of the sepals. Flowers yellow, more rarely violet or yellow and violet.

Alpine and sub-alpine pastures (limestone and schist) up to 7500 feet. May to July.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps; rare in the Pyrenees. British.

Viola valderia All.

Stem 6–10 inches high, spreading. Leaves small, the lower broadly ovate, the upper oblong or elliptic-lanceolate, mostly entire. Stipules multifid, with 2–7 unequal lobes. Flowers rather large, usually pale violet but variable. "The lateral and lower petals have a pencilled purple dash and beard at their junction, which gives intelligence to the expression of the soft lavender flowers, with their delicate golden eyes" (Reginald Farrer in *Gard. Chron.*, July 23rd, 1910). Flowers longly petioled. Sepals lanceolate-acute. Capsule oval, pointed, equalling the calyx.

Sandy, stony slopes and screes at 4000–5000 feet; rare. April to July.

Distribution.—Peculiar to a few places in the French and Italian Maritime Alps, and the mountains of Liguria on the east side of the Col di Tenda.

Viola cornuta L.

Root fibrous. Stem ascending, leafy. Leaves rounded, crenate, ciliate; upper leaves oval-cordate or truncate at the base. Stipules large, obliquely cordate, incised-dentate, ciliate. Sepals subulate. Spur subulate, larger than the calyx. Capsule obtuse.

Pastures in the Alpine and sub-alpine regions; local. June to August.

Distribution.—Pyrenees, Spain, Haute Savoie (Grammont), Apennines.

Viola palustris L. Marsh Violet.

The rootstock often sends out runners, as in *V. odorata*. A small perfectly glabrous plant, or with rarely a few hairs on the peduncles. Leaves reniform or orbicular, cordate at the base, very slightly crenate. Flowers small, pale blue or bluish lilac with purple streaks, scentless. Sepals obtuse. Spur very short. Stigma broad.

Marshy ground and bogs in woods and on mountains, extending well above the sub-alpine region. May to June.

Distribution.—All Europe except the Mediterranean region, Northern Asia, N. America. British. In Norway it ascends above the birch limit.

Viola mirabilis L.

A tall species, sometimes a foot in height, with robust stems having a line of hairs throughout, and broadly ovate leaves, heart-shaped at the base. Stipules ovate-lanceolate, entire, or ciliated. Lower leaves longly petioled, the 2 upper leaves subsessile. Flowers large, pale lilac. Sepals ovate-lanceolate. Capsule glabrous.

Mountain woods. April to June.

Distribution.—South-Eastern France, Cevennes, Switzerland (widely spread), Central and Southern Europe. Occasional in Norway to above the fir limit.

Viola montana L. (Plate VII.)

Leaves oblong-ovate, heart-shaped at base. Stipules 10–20 mm. long. Flowers large, blue to whitish. Petals oblong. Stems erect, few.

Meadows, marshes, and borders of woods from the plains to the lower Alps. May, June.

Distribution.—Switzerland, Savoy.

Viola alpestris Jordan (Plate VII) = *Viola tricolor* L. sub-sp. *alpestris* (DC.) Wittr.

A large-flowered, erect, and bushy variety of the common *V. tricolor*. Calyx half the length of corolla. Upper petals obovate, usually yellow. Spur very long. "Approaches *V. variata* very closely and has often been confused with it" (Dr. E. Drabble).

Meadows, rocky places, etc., in the sub-alpine region. May, June.

Distribution.—Switzerland, Savoy, Norway. British.

Figures of *V. alpestris* Jordan appear in an article by Dr. Eric Drabble on "The British Pansies" in *Journal of Royal Hort. Soc.*,¹ xxxv. (1909), Pt. II.

¹ "The flowers are yellow, and thus differ from the typical form of *V. variata*; but the latter may also possess yellow flowers, and it is such plants that have been confused with *V. alpestris*."—E. Drabble, *loc. cit.*

Viola sylvatica Fries. Common Wood Violet. (Plate VII.)

Leaves ovate, heart-shaped, acuminate, glabrous or with scattered hairs. Petals oblong, lilac or violet, the lower one shaded with darker colour. Stigma hairy on both sides and slightly arched beneath the top. Stipules linear-lanceolate, fringed-ciliate. Capsule glabrous.

Woods, thickets, etc., up to 5000 feet in Switzerland and to 6000 feet in the Eastern Pyrenees. April, May.

Distribution.—Europe, Asia from Siberia to Japan, Algeria, Canary Isles. British.

POLYGALACEÆ

A family represented in Europe only by *Polygala* itself. The other genera being chiefly tropical and differ from *Polygala* in the form of the fruit, or, in minor details, in the structure of their flowers.

POLYGALA Linn.

Herbs or shrubs, with entire leaves, usually alternate, no stipules, and very irregular flowers in terminal racemes. Sepals 5, of which the two inner are larger, usually petal-like, and commonly called wings. Petals 3, 4, or 5, the lowest very small and subulate, and all more or less united with the stamens. Stamens united in two parcels. Style 1, with a single stigma. Ovary and capsule flat, 2-celled, with a single pendulous seed in each cell.

A numerous genus, widely spread over most parts of the globe. Some of the showy S. African species are often cultivated in our greenhouses.

Polygala Chamæbuxus L. (Plate V.)

Stem shrubby, creeping, branched; branches prostrate or ascending, glabrous like the whole plant. Leaves narrowly lanceolate or elliptical, entire, mucronate, the lower ones smaller, obovate. Flowers solitary or in pairs, terminal, or in the axils of the leaves. Corolla with a small, 4-lobed crest, as long as or shorter than the wing-sepals, which are ovate, oblique, erect or recurved, nerveless, with branched veins. Wings pale yellow before fertilization, often red, brownish or purple later. Corolla tube deep yellow, but purplish after fertilization.

Woods and rocky or grassy places in the mountains, extending up to the Alpine region, where it is usually dwarfer and more floriferous. Very common. A difficult plant to get up by the long, slender roots, for they penetrate long distances, and yet there is little of them to survive a journey to this country. May to July.

Distribution.—Central Europe from the Eastern Pyrenees to Roumania. Rare in the Jura.

This evergreen creeping shrub likes a shady place in sandy peat and loam, or in good leaf mould, and can be increased when well established by careful division.

Polygala alpinum Steudel.

A small species, 2-4 inches high, with branched, recumbent stems. Leaves oboval or oblong, forming a rosette; stem-leaves narrower and much smaller. Flowers pale blue, very small, in small, dense, terminal heads. Capsule small, rather shorter, but broader than the wings.

Mountain pastures; local. June, July.

Distribution.—Western Alps, including Southern Switzerland, Pyrenees.

Polygala alpestris Reichb.

Stems numerous, woody, filiform, spreading, ascending. Lower leaves short, broadly ovate, often forming a rosette; upper leaves longer, clothing the lower part of the panicle. Flowers small, pale blue. Wings of calyx ovate, as broad as, and longer than the capsule.

Alpine and sub-alpine pastures, especially on limestone. June, July.

Distribution.—Juras, Central and Western Alps, including Piedmont.

This species is not much understood, and is often confused with *P. alpina* Perr. et Long. *P. alpestris* may perhaps be a form of *P. amara* L., and it is synonymous with *P. amarella* Crantz var. *alpestris* Borbas.

For the rock-garden there are other more beautiful species than the above which, though not Alpine, are more worthy of a place on rockeries. *P. nicæensis* Risso, a Mediterranean plant extending into the Maritime Alps up to 2000 feet, has handsome purple flowers. The Common Milkwort *P. vulgaris* L., with flowers of blue, rose, purple, or white, attains a remarkable size in the mountains, and is well worth more attention in our gardens, for it will grow anywhere and is very pretty.

CARYOPHYLLACEÆ

Annual or perennial herbs, with opposite, entire leaves, and no stipules, except in a few genera which have small, scarious stipules; the branches usually knotted at each pair of leaves. Flowers frequently in dichotomous cymes or panicles. Sepals 4 or 5, free or united into a tubular calyx. Petals 4 or 5, twisted in the bud, sometimes minute. Stamens free, inserted under the ovary. Styles 2 to 5, linear, stigmatic along their whole length. Capsule 1-celled, or divided into cells at the base only, opening at the top into twice as many teeth as there are styles. Ovules numerous.

A large family widely spread over the globe, and very numerous in temperate regions, especially in the northern hemisphere, extending into the Arctic Circle and to the summits of the Alps. The genera into which species are distributed are often very artificial, depending on the number of sepals, petals, stamens, or styles. As these numbers are not strictly constant, even in different flowers of the same species, care must be taken in some of the small-flowered *Alsineæ* to count the parts of *several* flowers if hesitation be felt as to the genus it should be referred to.

DIANTHUS L. Pink.

Stiff perennials, or more rarely annuals, with narrow leaves. Calyx tubular-campanulate, 5-toothed, with 2-6 imbricating scales at the base. Petals usually crenate, or jagged. Stamens 10. Styles 2. Capsule stalked within the calyx, opening at the top in 4 teeth or short valves.

A large genus, spread over Europe and Asia, with a few in S. Africa.

Dianthus prolifer L. (*Tunica prolifera* Scop.).

A stiff, erect, glabrous, annual species, simple or with a few erect branches, 6-12 inches high. Leaves few, narrow, erect, and usually pointed. Flowers small, pink, in compact, oblong terminal heads, the calyx concealed by broad, dry, shining, imbricated scales, from the top of which the small, spreading petals appear.

Dry places, roadsides, and hilly pastures, from the plains to the sub-alpine region, as, e.g. in the Gorge de Trient at about 3500 feet. May to September.

Distribution.—Almost all Europe; Western Asia, N. Africa. British.

A hairy, glandular variety, with longer sheath to the leaves and pedicelled calyx, is called *D. velutinus* Guss.

Dianthus saxifragus L. (*Tunica saxifraga* Scop.).

Stem slender, glabrous, 6-8 inches high, with spreading branches. Leaves linear-acute. Corolla pale rose, veined, small, solitary. Calyx bell-shaped. Capsule ovoid.

Arid places from the plains up to about 5500 feet in the Alps, as e.g. near Evolène in 1911. June to August.

Distribution.—From the Pyrenees and France to Eastern Europe; Western Asia as far as Persia. It has recently appeared in Pembrokeshire as an escape from cultivation.

TUNICA is a small genus, not always separated from *Dianthus*, and differing from it in the calyx being pentagonous and the corolla having no corona.

Dianthus superbus L. (Plate V.)

Stem 18 inches high, rounded, branched above. Leaves linear-lanceolate, soft, but rough at edges, the inferior sub-obtuse, the superior acute. Scales oval, mucronate, $\frac{1}{4}$ or $\frac{1}{3}$ length of calyx-tube, purple-red. Petals large, slit and fringed, pink or lilac, with reddish hairs and green spots at the base, rarely white, scented.

Woods and damp meadows from the plains up to 6500 feet. June to September.

Distribution.—Central and Southern Europe; Western Asia, Japan.

D. speciosus Reichb. is a rare Alpine variety, found in meadows in Southern Switzerland and Tyrol from 5000–7500 feet.

D. superbus does not live very long, and is generally treated as a biennial. It requires deep, peaty soil or a mixture of sand and leaf-mould.

Dianthus monspessulanus L.

This belongs to the same group as *superbus*, and may be treated in a similar way, though it grows in drier places. The variety *alpicola* Koch (*D. alpestris* Sternb. and Hoppe) has 1-flowered stems. It is found locally in meadows in Southern Tyrol and Carinthia, at from 1600–2400 metres.

D. monspessulanus is a native of Southern Europe.

Dianthus Carthusianorum L. (Plate VIII.)

Stem about a foot high or higher, simple. Leaves linear-acute; the stem-leaves with a long sheath. Flowers a deep red, sessile, 2–8 in a dense panicle, surrounded with coriaceous bracts. Scales of calyx scarious, the point reaching the centre of the calyx-tube. Calyx dark purple. Petals obovate, hairy at the throat, toothed; capsule cylindrical.

Arid, stony, and bushy places in the Alps and plains, up to 7000 or 8000 feet in the Alps. June to September.

Distribution.—Central and Southern Europe, but rare in the Mediterranean region.

A very variable plant with several named varieties, such as *atro-rubens*, *vaginatus*, etc.

Dianthus Seguieri Vill.

Glabrous; forming tufts of leaves, Stem 12–18 inches high, branching, angular. Leaves linear, flat. Flowers pink, with a purple circle round the centre, in heads of 2–4. Scales long, striated, with erect spreading point, equalling the tube of the calyx. Calyx rather long, striated throughout, with sharp lanceolate teeth. Petals hairy at the throat, deeply toothed. Capsule cylindrical.

Dry, bushy places in the lower mountains and hills; local. June to August.



PLATE VIII.

4/7 NATURAL SIZE.

- 1 SILENE INFLATA (WITH MAUVE FORM) 2 DIANTHUS SYLVESTRIS.
3. DIANTHUS CARTHUSIANORUM.

Distribution.—Western Alps, Eastern Pyrenees, Central Europe and Western Asia. Only in trans-alpine Switzerland.

Dianthus furcatus Balb.

Glabrous. Stem 5–9 inches high, angular. Leaves soft, the lower ones short and broadly linear, obtuse, with 3–5 nerves; the stem-leaves longer and pointed. Scales 4, erect, the lower two herbaceous, oval, the point reaching half the length of the calyx. Calyx rather short, 13–16 mm., narrow, striated throughout its length, teeth lanceolate acuminate. Petals glabrous, entire or toothed. Flowers pink or whitish, 1–3 at the top of the stem, longly petioled. Capsule cylindrical, extending slightly beyond the calyx.

Rocks and dry pastures in the Southern Alps; rare. June to August.

Distribution.—Maritime Alps, Liguria, Piedmont; Hautes-Alpes and Basses-Alpes.

Dianthus sylvestris Wulf. (Plate VIII.)

Considered by some a sub-species of *D. Caryophyllus* L., which is not Alpine, but grows on rocks and walls in Southern Europe, and in Algeria and Morocco. *D. sylvestris* is a dwarfer plant, more tufted, with 2 small scales to the calyx, and a slight scent. The flowers are bright pink and rather large, and usually in panicles of 1–3 on longish peduncles. The leaves are narrow, linear, acute, pale green or glaucous. A polymorphic plant.

Steep hillsides and rocks in the mountains, and sometimes in open woods; common. It attains 7500 feet, and descends to the plains. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Corsica; Pyrenees; Central and Southern Europe.

It should have an open, sunny position in dry, stony loam, or in rock crevices with plenty of soil.

Dianthus glaucus Huds. (*D. cæsius* L.). Cheddar Pink.

A very glaucous plant, forming a short, densely tufted, almost woody stock. Lower leaves crowded, stiff, narrow-linear, but obtuse, about an inch long. Flower-stems 5–10 inches high, simple, 1-flowered, or rarely forked, with a few pointed leaves. Flowers rather large, fragrant. Calyx thick, with short teeth, the 4 outer scales broad, shortly pointed, not half-length of calyx. Petals broad, irregularly crenate or toothed.

Dry, rocky places, especially on limestone, very local. June, July.

Distribution.—Jura, Alps of Savoy and Dauphiné, Swiss plains, but not in the Alps; Central Europe. Cheddar Cliffs in England.

It grows very well on garden walls.

Dianthus subacaulis Vill.

This small species is well-suited to the rockery, and especially on limestone, like the Cheddar Pink, but it does not seem known in this country. The root is woody, and it sends up tufts of short, rough, linear leaves; stem angular, simple, from 2-6 inches high. Flowers rose, rather small, solitary. Scales of the calyx broad, short ($\frac{1}{3}$ to $\frac{1}{2}$ the length of the calyx), and with short point. Calyx short, striated above, with ovate teeth. Petals entire or crenate. Capsule conical. A variable species.

Rocks and rocky pastures, especially on limestone. May to August.

Distribution.—Alps of Dauphiné and Provence, Cevennes, Eastern Pyrenees; Spain.

GYPSOPHILA L.

Calyx short, campanulate, pentagonal, without scales at the base. Petals 5, gradually narrowed to the base, without a corona. Styles 2. Stamens 10. Capsule with 1 cell and numerous seeds.

About 55 species inhabiting Europe and Asia.

Gypsophila repens L. (Plate XV.)

Root tapering, branched. Stem 3-6 inches high, erect or ascending, simple or branched above, glabrous like the leaves. Leaves linear-lanceolate or linear, entire, acute, bluish green, moderately thick. Flowers in loose paniculate cymes. Petals 2-3 lines long, white or pale rose-coloured, more or less emarginate. Calyx bell-shaped, 5-cleft; teeth lanceolate, membranous at the margin, 1-nerved, straight, obtuse, with a short mucro. Capsule subglobular, obtuse, with a very short carpophore.

Dry, rocky, and gravelly places in the calcareous Alps and sub-Alps,¹ 3000-8000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, from Savoy to Roumania and the Carpathians; Central Pyrenees, Jura, Poland, Germany.

Very easily grown in dry, sunny places, and increased by layers, or from seed. It quickly forms mats of dense foliage and flowering spikes, and hence is very suitable for covering ugly rocks, etc.

SAPONARIA

Calyx tubular, 5-toothed, without scales at the base. Petals with a corona. Disc small. Styles 2. Ovary 2-celled at the base. Capsule 4-valved.

This genus, artificially distinguished by the number of styles, as Bentham says, comprises several European and West Asiatic species.

¹ On granite its place is taken by *Silene rupestris*.

Saponaria ocymoides L. (Plate XX.)

Stem trailing. Plant hairy, glandular at the top. Leaves broadly lanceolate or oblong, ciliated, with 1 nerve. Flowers bright rose, sometimes paler, and rarely white, shortly petioled, in panicles. Calyx cylindric, hairy, glandular, with 15-20 nerves and obtuse teeth, often very red. Capsule oval, 4 times the length of the glabrous carpophore.

Stony places and limestone rocks in full sun. May to July. In the Alps it extends up to 7800 feet, but it is by no means a purely Alpine plant, being, e.g. found over the greater portion of hilly France.

Distribution.—Central and Southern Europe from the Iberian peninsula to Bavaria and Carinthia; Corsica, Sardinia.

Of very easy culture in sunny positions in deep, loamy soil. Being such a good trailer it is best to plant it so that it will fall over or decorate a rock or bank. It prefers dry soils, and is often killed in wet English winters.

Saponaria officinalis L. Common Soapwort.

This tall and rather handsome species, with large pink flowers, is sometimes seen by streams in the foot-hills of Switzerland and France.

Saponaria Vaccaria L. is an annual found in waste places and in crops. In 1911 it was growing in a crop of flax above Argentière, near Chamonix, at a height of 4500 feet.

LYCHNIS L.

Calyx tubular or inflated, with 5 teeth. Petals 5, with erect claws and a spreading lamina, entire or 2-cleft. Stamens 10. Styles 5, or very rarely 4. Capsule 1-celled, or divided at the base into 5 cells, and opening in 5 or 10 teeth or short valves at the top.

About 40 species, widely spread over the northern hemisphere without the tropics.

Lychnis alpina L.

In *Alpine Plants of Europe*, p. 80, this plant, now usually called *Viscaria alpina* Don, was erroneously stated to be unrecorded from Switzerland. As a matter of fact it is occasionally found in Grisons (Engadine, Poschiavo, etc.), the Bernese Oberland (Gemmi), and the Valais, as at Zermatt and above Zinal (at 8500 feet in August, 1911). It does not appear to descend to the sub-alpine region of Central Europe, but we have seen it in the Eastern Pyrenees in abundance in some of the more open pine forests at about 5500 feet. It extends upwards in that district to 7000 feet.

Lychnis viscaria L.

Stems 6 inches to a foot high, glabrous, very viscid in the upper part. Leaves long and narrow, resembling those of the last species.

Flowers red, in close, sessile, or shortly stalked, opposite clusters, forming an oblong panicle or head. Calyx tubular, with 10 veins and 5 short teeth. Petals slightly notched.

Rocks and hilly pastures. May to July.

Distribution.—Central and Northern Europe to Norway ; Siberia ; Caucasus ; a few places in N. Wales and Scotland.

Lychnis Flos Jovis Desr.

Plant covered with whitish, silky tomentum. Stems 10–18 inches high, erect, simple. Leaves oblong-lanceolate, acuminate, the upper ones narrower. Flowers deep pink, crowded. Petals deeply divided. Calyx coriaceous, with 10 prominent nerves and broadly acute teeth. Capsule oblong-acute, with five teeth, much shorter than the carpophore.

Sub-alpine pastures and broken ground. June to August.

Distribution.—Western and Southern Alps, Southern Switzerland, Italy, Tyrol.

Lychnis Coronaria L.

A taller plant, covered with dense white silky tomentum. Leaves oblong-lanceolate, acute. Flower solitary, axillary, and terminal, large and handsome, reddish purple, or rarely white, longly petioled in a loose, dichotomous spray. Calyx with 10 unequal nerves and linear teeth, much shorter than the corolla. Petals entire or slightly crenate. Capsule oblong-acute, without carpophore, 5-toothed.

Wooded hills and rocky, bushy places in the plains and sub-Alps. Reaches a considerable height in Val Tournanche and the Saas Valley. May to July.

Distribution.—Southern Europe from Portugal to the Caucasus ; probably only in Valais in Switzerland, except where it has escaped from gardens, it being a favourite plant in cottage gardens, as in England.

SILENE L.

Calyx, corolla, and stamens as in *Lychnis*. Styles 3. Capsules opening at the top in 6 teeth or short valves. A very large genus, of about 250 species, widely spread over Europe, Central and Northern Asia and N. America, with a few species in S. Africa.

Silene acaulis L.

Usually stemless or with stems $\frac{1}{2}$ to 1 inch high.

Root woody, branched, with many aerial shoots, covered with the withered leaves, and bearing a rosette of fresh leaves forming dense, cushion-like tufts. Sometimes hemispherical masses a foot across are seen covering rocks or grassy ground in Alpine pastures. Leaves radical, linear, acute or acuminate, entire, shortly ciliated, otherwise glabrous. Flowers diœcious or hermaphrodite, solitary at the extremity of the shoots. Calyx cylindrical, or bell-shaped, with

10 nerves; teeth ovate, obtuse. Petals obovate, lanceolate, rose-coloured, slightly emarginate.

Rocks and pastures in the Alps; common, 5000–11,000 feet. May to July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, British Isles, Arctic Europe, Asia and America; Iceland, Spitzbergen. Rocky Mountains of Canada.

There are two varieties which grow in the Alpine zone only:

Var. *exscapa* DC., a stemless, small form with lighter pink flowers, and Var. *elongata* DC., a rare form with longer stems than in the type, larger flowers, and a looser habit.

Though a shy bloomer in this country, *Silene acaulis* is a very useful rockery plant. It should have plenty of sun, and a poor, gritty soil, or it will make too much soft green growth, which gets cut off in winter. It may be wedged between stones in crevices of rock.

Silene inflata Smith (*S. Cucubalus* Wibel.). Bladder Campion. (Plate VIII.)

Loosely branched at the base, with ascending or erect stems a foot or more long, of a glaucous green, and usually glabrous. Leaves ovate, oblong, or rarely nearly linear, and usually pointed. Flowers few, white, or pinkish in the mountains, often slightly drooping, in loose terminal panicles. Calyx becoming at length globular, inflated, and much veined. Petals deeply 2-cleft. A variable species, especially in the mountains, where it sometimes assumes a pinkish tinge, as in the plate.

Fields, waste places, and Alpine pastures; very common. April to August.

Distribution.—All Europe, Western and Central Asia, Northern Africa, N. America. British.

In Mr. F. N. Williams' *European Varieties of Silene inflata*¹ he describes the var. *alpina*, Mert. and Koch, and mentions that it was gathered by the present writer on the Col du Galibier in Dauphiny at 2440 m., "the greatest altitude hitherto recorded for the plant." It was however, recorded at 3000 m. on the Gorner Grat,² by Heer.

Silene Elizabethæ Jan.

Rootstock densely covered with leaves; stem simple, ascending, 3–6 inches high, finely glandular, hairy above. Root-leaves lanceolate, acute, narrowed at the base; stem-leaves ovate-lanceolate. Flowers 1–3, terminal, very large and handsome, bright pink; lamina of petals obcordate, fan-shaped, cut and toothed. Calyx 5-cleft.

¹ In *Bulletin de l'Herbier Boissier* (1908).

² Professor Lino Vaccari, *La Flora Nivale del Monte Rosa* (1911), p. 14.

Alpine pasturcs on limestone, 4000–5000 feet ; rare. June, July.

Distribution.—South-west Tyrol, Val Vestino.

Silene alpestris Jacq.

Root tapering, branched, with woody shoots, tufted. Stems erect or ascending, 6–12 inches high, stiff, glabrous, or with scattered hairs, dichotomously branched above, and viscid at upper part, like the flower-stalks. Leaves lanceolate, acute or obtuse, thick, entire, ciliated near the base, otherwise glabrous, connate ; lower leaves narrowed into a foot-stalk. Flowers in a terminal, loose few-flowered cyme, white or pinkish. Petals 4–5 toothed. Corona acutely toothed. Calyx finely glandular, downy, or rough, erect, not changed when fruit is ripe ; calyx teeth ovate, obtuse. Capsule twice as long as calyx, 1-celled, dehiscent, with twice as many teeth as styles. Seeds reniform, compressed, surrounded at edge by a radiate, 4-nerved crest of linear scales.

Abundant in the calcareous Alps and lower Alps, 3000–6000 feet, often descending into the valleys with débris. May to August.

Distribution.—Carpathians, Eastern Alps (Tyrol to Carinthia).

Silene Saxifraga L.

Root tapering, branched, tufted, with woody shoots. Stem prostrate or ascending, swollen at the nodes, 4–6 inches high, grass-green like the leaves, usually simple, finely downy or glabrous above, 1–2 flowered, rarely more. Leaves narrowly linear, acute, entire, rough at the edge, sessile, with narrowed connate bases. Calyx turbinate, 10-nerved, glabrous, erect, pale green or brownish ; calyx-teeth ovate or obtuse. Flowers white or pink within, greenish red without ; Petals 2-cleft. Corona scale-like.

Stony places and débris on the calcareous lower Alps ; local. Up to 6600 feet in Valais.

Distribution.—Carpathians, Switzerland to Carinthia.

In cultivation there must be lime in the soil, and it should have plenty of sun.

Silene quadrifida L. (*Heliosperma quadrifidum* Reichb.).

Root with fusiform branches, and tufts of procumbent, slender, brittle stems. Stems 2–6 inches high, viscid above, glabrous, or with a few scattered hairs, dichotomously branched above. Leaves narrowly linear, acute, entire, ciliated at the base, slightly connate, the lowermost gradually narrowed into the leafstalk. Flowers in a terminal, loose, few-flowered cyme, white. Petals 4-toothed. Corona sharply dentate. Calyx glabrous, erect, teeth ovate, obtuse, unchanged when fruit is ripe. Capsule as long as calyx. A very slender little plant, growing in shaded, moist limestone rocks and cliffs in the Alps, from 3500 to 7600 feet. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura (Reculet); Central and Western Pyrenees. From Spain to Macedonia.

Silene rupestris L. (Plate XV.)

Stems dichotomously branched, ascending or erect, glabrous and glaucous like the whole plant. Leaves lanceolate, narrowed at the base, sessile; upper leaves broader. Flowers milk-white or rose-coloured. Petals emarginate, almost twice as long as the calyx.

Rocky Alpine and sub-alpine situations, preferring granite and siliceous rocks; its counterpart on limestone being *Gypsophila repens*. It extends up to 9000 feet. June to August.

Distribution.—Eastern, Central, and Western Alps, Spain, Pyrenees, Cevennes, Vosges, Corsica, Lapland, Scandinavia, Altai.

Like many of the genus it is easily propagated from seed, and, disliking lime, it should have plenty of grit or granite chips.

Silene nutans L. Nottingham Catchfly.

Stock tufted, with a rather thick top-root, short, procumbent, barren shoots, and erect flowering stems, 1-2 feet high, more or less hoary with short hairs and viscid in the upper part. Lower leaves oblong-obovate, pointed, narrowed into a long stalk; stem-leaves few, narrow, and sessile. Flowers nodding in a loose panicle, 3 or 5 together on short opposite peduncles. Calyx tubular, 8-12 mm. long. Petals white or greenish underneath, deeply 2-cleft, with long claws, the style and stamens projecting beyond the flower.

Hilly or stony pastures, rocky and waste places by roadsides; very common. June, July.

Distribution.—Nearly all Europe, Russian Asia to the Arctic Circle. British.

It is a common plant in the sub-alpine region, and we once found the var. *spathulæfolia* Burnat as high as 8000 feet, near La Grave in Dauphiny.

Silene cordifolia All.

A pubescent-viscous and leafy species, with ascending stems, about 10 inches high. Leaves ovate-acuminate, the upper ones larger and heart-shaped at base. Flowers white or pink, shortly peduncled, erect, 1-4 on the branches. Calyx broad, with 10 nerves and linear-lanceolate teeth. Petals deeply 2-cleft, often reflexed. Capsule oblong, twice as long as the glabrous carpophore.

Rocks and scree of the Alpine and sub-alpine region in the French and Italian Maritime Alps; rare. July, August.

Silene vallesia L.

A robust but dwarf pubescent-glandular species. Stems 4-6 inches high, 1-3 flowered, leafy. Leaves lanceolate acute; stem-leaves sessile; root-leaves narrowed into a petiole. Calyx tubular,

glandular, with lanceolate teeth. Petals bifid, pinkish white above, crimson underneath. Capsule pubescent and equalling the glabrous carpophore in length.

Stony places on siliceous rocks ; very local. July, August.

Distribution.—In Switzerland only on some of the Southern Alps in Valais, on the Italian frontier ; Alps of Savoy and Dauphiné (as at La Grave), Italy, Dalmatia, Bosnia, Montenegro, etc.

This little known plant is worth introducing into gardens and may be treated much as *S. rupestris* is.

CERASTIUM L.

Small herbs, usually hairy or downy and often viscid, branching at the base, with white flowers in terminal forked cymes, or rarely solitary ; the upper bracts often, like the sepals, scarious at the edges. Sepals 5, rarely 4. Petals 5, rarely 4, usually 2-cleft, sometimes minute or wanting. Stamens 10 or occasionally 5 or fewer. Styles 5, rarely 4 or 3. Capsule opening at the top in twice as many short teeth as there are styles.

A rather large genus, spread over the globe, but most numerous in the temperate regions, especially of the northern hemisphere.

Cerastium arvense L. Mouse-ear Chickweed.

Stem perennial and much branched at the base, and frequently prostrate and creeping, ascending to about 6 inches high. Leaves crowded in lower parts, narrow, linear-lanceolate, glabrescent. Flowers large and white, in loose cymes on rather long pedicels. Petals twice the length of the sepals, cleft to the middle. Capsule oblique, usually longer than the calyx. A variable plant.

Dry, hilly fields, pastures, and banks, extending from the lowlands of England to 8700 feet in the Alps, and often mistaken there for *C. alpinum*. May to July.

Distribution.—Europe, Russian Asia, N. America, Andes of S. America, Morocco.

There are several Alpine varieties, the commonest of which is *strictum* Haenke (*alpicolum* Fenzl.), which is smaller, very thick-set, and with narrower leaves and smaller flowers. We have gathered it at 9000 feet on the Aiguille du Goléon in Dauphiné and on the Col de la Lisse in Savoy at the same elevation.

Cerastium grandiflorum W. and K.

A useful and well-known rock-plant, covered with greenish grey tomentum. Leaves linear, fleshy, often with curled hairs at the base. Flowers large, handsome, sometimes covering the whole plant with white. Teeth of capsule revolute.

Rocky pastures in Upper Styria and elsewhere in the Eastern Alps ; rare. July, August.

Grows easily and freely from cuttings or by division, but is

somewhat too rampant to associate with the smallest and choicest Alpines.

The majority of the *Cerastia* are either lowland plants or distinctly high Alpine; though occasionally in the sub-Alps we find *C. pumilum* and *semidecandrum* from the plains, and *C. trigynum* and *C. alpinum* descending from the higher mountains.

ALSINE Wahl.

Petals 5, or rarely 4, entire or slightly notched. Stamens 5, 8, or 10, all attached to the disc. Styles usually 3. Capsule 3-valved. Leaves mostly linear or linear-lanceolate.

A considerable genus spread throughout the greater part of the globe, but especially in temperate regions. Most species are now placed in *MINUARTIA* Leofling.

Alsine fasciculata Mert. and Koch.

Annual or biennial, glabrous or downy. Stems 2–10 inches high, erect, stiff. Leaves linear-awl-shaped. Flowers in thick, erect corymbs. Pedicels shorter than calyx. Sepals scarious lanceolate-acuminate, with 1 nerve. Petals half length of sepals. Stamens 10. Capsule oblong-conical, equalling or shorter than the calyx. Seeds tuberculous.

Rocks and arid, sandy places in the mountains and hills. June to August.

Distribution.—Jura, Alsace, Savoy, Dauphiny, Cevennes, Pyrenees, Southern Switzerland. Southern Europe, Morocco.

Alsine rostrata Koch (*A. mucronata* L.).

Stems upright and loosely cæspitose in habit. Leaves usually in tufts, linear, subulate, stiff. Sepals almost entirely scarious, or, in other words, white with 2 green stripes on the back, lanceolate-acuminate, 1-nerved. Petals almost equalling the sepals. Flowers small, in little loose corymbs.

Dry, rocky, sunny places from 4000–7200 feet. May to August.

A very variable plant both in size and habit, and with at least two hairy or glandular named varieties.

Distribution.—Western Alps, Switzerland, West Tyrol, Cevennes, Corbières, Pyrenees, Corsica, Spain, Italy, Algeria.

Alsine laricifolia Crantz.

Stem erect or ascending, 3–10 inches high, simple or branched, finely downy like the flower-stalks and calyx, or viscid-glandular above. Leaves linear or subulate, semi-cylindrical, rough at the margin with fine notches, otherwise glabrous. Flowers large, white, like those of *Cerastium arvense*, in 1–3 flowered panicles; flower-stalks erect, spreading. Petals twice as long as calyx, wedge-shaped or obovate, obtuse. Calyx-teeth, lanceolate, obtuse, green, mem-

branous at the margin, 3-nerved. Seeds covered with little dots or excrescences.

Débris and rocks of the granitic Alps, 5000–7500 feet, descending into the valleys along the courses of streams; often abundant. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps.

Alsine liniflora Heg.

Closely allied to the preceding and possibly only a limestone form of it. Rootstock woody as in *laricifolia*. Sepals with nerves slightly beyond the middle (the nerves are longer in *laricifolia*). Capsule longer than the calyx, instead of equalling it. Flowers similar to those of *laricifolia*.

Rocky places and pastures in the calcareous mountains up to 6800 feet. July, August.

It often forms great masses densely covered with milk-white bloom. These two species should be more cultivated in gardens, care being taken to give granite chips in one case and limestone in the other.

Alsine Villarsii Mert. and Koch.

Stem 5–10 inches, 3–7 flowered, slender. Leaves 3-nerved, with intermediate finer nerves, linear, flat. Flowers on very long pedicels. Petals long and narrow, obtuse. Sepals lanceolate-acute, with 3 nerves. Capsule ovoid, about equalling the calyx. Seeds tuberculous.

Rocky places in the Alps, especially on limestone, up to 6000 feet at least; rather rare. July, August.

Distribution.—Western Alps as far south as the Var, Central and Eastern Alps to Carinthia; Spain, Caucasus, Ural Mountains, Siberia. A. W. Bennett recorded this from "Southern Switzerland," and Koch¹ gave a frontier station, actually in Italy. I am unaware of a recent record for it in Switzerland. Bouvier mentions the Dent du Midi.²

Alsine verna Bartl.

Usually pubescent, glandular. Rootstock not woody. Stem forming dense tufts from 2–6 inches high, slender. Leaves green, linear-subulate, stiff; upper leaves shorter and broader. Flowers in loose forked cymes, pedicels usually rather downy. Sepals with 3 prominent nerves, pointed. Petals obovate, spreading beyond the points of the sepals. Capsule 3-valved.

Stony mountain pastures up to 9000 feet (Goléon 9300 feet); common. May to August.

Distribution.—Mountains of Europe, Western Asia, N. Africa, N. America. British.

¹ Koch, *Synopsis Fl. Germ. et Helvet.*, vol. ii. p. 123 (2nd ed. 1843).

² E. Bouvier, *Flore des Alpes de la Suisse et de la Savoie*, 2nd ed. (1882), p. 101.

Alsine stricta Wahl. (*Arenaria uliginosa* Schleich.).

Perennial tufts like those of *A. verna*, but the subulate leaves are rather thicker, somewhat succulent, the stems longer, with few distant pairs of leaves, the pedicels much longer, often an inch or more, and always glabrous, and the sepals are broader. Petals about equalling the calyx. Capsule 3-valved.

Bogs on mountains ; rather rare. July, August.

Distribution.—Jura, not otherwise in Switzerland, Southern Germany, Northern and Arctic Europe and Asia, Greenland. In Britain only known on Widdybank Fell in Teesdale. In Norway it reaches perpetual snow.

ARENARIA L.

Petals 4–5. Stamens 8–10. Styles usually 3. Capsule 6-lobed. Seed without any appendage. Leaves usually roundish-ovate.

About as large a genus as *Alsine* and, like it, spread over the greater part of the globe.

Arenaria grandiflora L.

Stem 3–6 inches high, ascending, branched, softly hairy above. Leaves linear subulate, finely acuminate, thickened at the margin, ciliated with bristles at the base, otherwise glabrous. Stem 1–3 flowered. Flowers half an inch wide, pure white. Petals twice as long as calyx.

Rocky places among débris of the calcareous Alps from 4000–5500 feet ; local. June to August.

Distribution.—Moravia, Eastern Alps, some of the Western Alps, Jura, Salève, but not actually in Switzerland, Pyrenees, Central and Southern Europe ; Algeria.

Arenaria ciliata L.

Stem prostrate, creeping, branches ascending, densely covered with small, nearly round leaves, lower part of stem covered with short hairs. Leaves obovate, shortly acuminate, nearly sessile, glabrous, ciliated towards the base. Flowers terminal or in forks of the branches, solitary, or in a 3-partite cyme, often axillary, flower-stalks erect, filiform, with soft hairs in lower part. Sepals lanceolate, acute, 3-nerved, with narrow membranous margin, glabrous, slightly ciliated towards apex. Petals elliptical, longer than calyx. Capsule nearly globular, longer than calyx, 6-lobed. Seeds kidney-shaped, finely warty.

Damp stony places in the Alpine limestone region up to 9000 feet ; frequent. July, August.

Distribution.—Eastern, Central, and Western Alps ; Carpathians, Pyrenees. Central and Northern Europe as far as Iceland and Spitzbergen. Very rare in the British Isles.

Arenaria gothica Fries.

Sometimes considered a sub-species of *A. ciliata*, from which it differs by the absence of sterile shoots, and by the longer stems, which are many-flowered. Leaves oblong-lanceolate, ciliate at the base. Sepals oblong-lanceolate, acute, 3-nerved, the lateral being sometimes hardly visible.

It grows by the Lac de Joux in Switzerland, in Sweden, and about Ingleborough and Ribbleshead in Yorkshire, where it is spreading fast. It flowers in June. This rare plant was first discovered in England in 1889. Mr. Wm. Whitwell¹ gave a detailed account in *The Naturalist* of its occurrence in several places, and Mr. Arthur Bennett has written on it in the *Journal of Botany*, November, 1892.

Arenaria montana L.

A prostrate, greyish green plant, forming large masses, with its long, barren shoots. Shortly pubescent, but not glandular. Leaves lanceolate, acuminate, 1-nerved. Flowers large, white. Pedicels 2-3 times as long as calyx, finally recurved. Sepals ovate-lanceolate, 1-nerved, petals oboval, twice the length of the sepals. Capsule sub-globular to ovoid, equalling the calyx, with 3 bidentated valves.

Hills, moors, and woods. May to July.

Distribution.—Western and Central France, Cevennes, Pyrenees. Spain and Portugal.

This is a frequent and most useful plant for the rock-garden. Most of the Sandworts (*Arenaria* and *Alsine*) will do in an ordinary soil, and several of them form useful carpeters. Propagation is usually by division.

Arenaria purpurascens Ram.

This small species from the Pyrenees has ovate-lanceolate leaves, with 1 nerve, and 1-4 rosy-purple flowers in a terminal cyme. Flower-stalks hairy, sepals glabrous, lanceolate-acute, 3-5 nerved. Petals obovate, half as long again as the sepals. Capsule large, cylindrical, opening into 6 erect teeth.

Distribution.—Rocks in the Alpine region of the French and Spanish Pyrenees.

It requires plenty of sun, but will grow in ordinary soil and look very attractive, for it has almost the habit of a Saxifrage with star-shaped, purplish flowers. It is propagated from seed or by division.

Arenaria Huteri Kerner.

Stem 2 or 3 inches high. Leaves ovate-lanceolate, acute, covered with grey hairs. Flowers large, white. Petals ovate. Sepals 4-6 without nerves.

—Stony or sandy places in S. Tyrol. June, July.

This charming little plant requires plenty of sand in the loam

¹ "More about *Arenaria gothica*" in *The Naturalist*, September, 1895.

and a south-west aspect. It should be planted in a level part of the rockery, and a top dressing of sand and leaf-mould will help it greatly.

MÆHRINGIA L.

Petals 5, rarely 4, expanded. Stamens 10, rarely 8. Capsule 3-6 valved. Styles usually 3. Leaves nerveless, or 1-3 nerved. Seed with a mantle-like appendage at the base.

A small genus of about 15 species inhabiting Central and Southern Europe.

Mæhringia muscosa L.

Stem fragile, prostrate, or ascending, branched, glabrous like whole plant. Leaves narrowly linear or acicular, acute, nerveless. Flowers in small, white, 1-3 flowered, or forked, loose cymes; flower-stalks elongated after flowering, and standing out horizontally. Calyx teeth 4, ovate-lanceolate, acute, 1-nerved, with membranous margins. Petals 4, longer than calyx. Stamens 8. Styles 2. Capsule 4-valved. Forming large, dense, evergreen patches on damp rocks, banks, and walls and in mossy, shady places of the mountain region up to 6500 feet at least. May to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees; Jura, Erzgebirge, Cevennes. Europe, from Spain to Servia.

A useful evergreen plant for filling up gaps in moist shady places in rock-gardens.

Mæhringia ciliata (Scop.) Dalla Torre (*M. polygonoides* Mert. and Koch.).

Stem 2-6 inches high, very brittle, prostrate, or ascending, branched, glabrous, like the whole plant, except for a few fine hairs on the leaves and flower-stalks. Leaves narrowly linear, rather flat, acute, or obtuse, nerveless, grass-green, somewhat wrinkled, short. Flowers in 1-2 flowered cymes; flower-stalks erect after flowering. Flowers pale white, a little larger than in *muscosa*. Calyx teeth 5, ovate-lanceolate, obtuse, 1-3 nerved, membranous at the margin. Petals 5, larger than calyx. Stamens 10. Styles 3. Capsule 6-lobed. More crowded in structure than the former species and with shorter leaves, but in cultivation it is said to merge into it.

Damp limestone débris in the Alps. July.

Distribution.—Eastern, Central, and Western Alps, Bavaria.

Mæhringia Ponæ Fenzl.

Stems elongated, tufted, 1-2 inches high. Leaves linear, obtuse, shortly mucronate, nerveless, fleshy, glabrous, sea-green, all cylindrical, or the upper ones flat on the upper side. Flower-stalks

terminal, usually 2-flowered; flowers white, like those of the last species. Sepals ovate-lanceolate, obtuse, 3-nerved.

Steep rocks in the lower Alps, descending to the valleys. May.

Distribution.—Eastern Alps.

PARONYCHIA JUSS.

These curious little silvery plants are mostly Mediterranean, but there are two species which attain a considerable height in the Pyrenees and the Alps of Savoy, Dauphiny, and Provence.

Paronychia polygonifolia DC.

Stems spreading from a woody rootstock and forming a dense cushion of small, opposite, lanceolate, glabrous leaves, oval-acuminate stipules and lanceolate, acuminate, silvery bracts. Flowers very small, greenish.

Sandy and rocky places in siliceous mountains up to 7000 feet. June to September.

Distribution.—Western and Southern Alps; Pyrenees, Corsica, Asia Minor.

Paronychia capitata Lamk.

A small plant with woody, twisted rootstock, and ascending stems, which are densely leafy, pubescent. Leaves opposite, oval or lanceolate, obtuse, ciliate. Stipules lanceolate-acute, often longer than the leaves. Flowers in dense heads, silvery white, at the top of the branches. Bracts broad, obtuse or mucronate, scarious and silvery. Sepals equal, linear-obtuse, not membranous at the edges. Stamens 5.

Sandy, rocky places on hills and mountains; local. May to July.

Distribution.—Pyrenees, Western and Southern Alps (not in Switzerland). Southern Europe, Algeria.

Paronychia serpyllifolia DC.

Sometimes considered a variety of *P. capitata* Lamk., from which it differs by its rounded, obovate leaves and more prostrate habit. Its dense heads of silvery white bracts, which are large and broadly obovate, are very beautiful.

It flowers in June, and we have it from 5500 feet on Monte Toraggio in the Ligurian Alps, on which mountains it is not rare. It is a plant to introduce in hot, sandy places on the rockery.

SCLERANTHUS L.

Scleranthus perennis L. Perennial Knawel.

This much resembles *S. annuus* so well known in sandy places in England and in Switzerland, etc., but the root is larger and stems more tufted. The flowering-stems are more rigid, and the flowers

more densely collected in terminal cymes ; and the calyx is rather smaller, though bordered with a more conspicuous white edging.

Sandy and rocky places in the hills and plains, ascending to at least 5000 feet in the Alps.

Distribution.—Europe, especially Central ; Western, and Northern Asia. Rare in England.

Scleranthus uncinatus Schur.

Resembles the last, but the flowers are greener. Sepals lanceolate-acute, very narrowly edged, spreading and much open at maturity, and terminated by a hooked point.

Sandy places in the mountains. June to August.

Distribution.—Pyrenees, Cevennes, Spain, Austria, Roumania, Balkan Peninsula, Western Asia.

HYPERICACEÆ

Herbs or shrubs with opposite or whorled leaves, often marked with pellucid dots (glands). Flowers usually in terminal cymes, regular. Sepals 5, rarely 4. Petals 5, rarely 4, usually twisted in the bud. Stamens indefinite. Ovary usually 3-5 celled, with as many styles ; placentation axillary. Seeds exalbuminous.

Hypericum is the only European genus.

HYPERICUM L. St. John's Wort.

Leaves opposite and entire, and no stipules. Flowers regular, usually yellow. Sepals 5. Petals 5, hypogynous. Stamens indefinite, united at the base into 3 or 5 bundles. Capsule more or less divided into 3 or 5 cells by as many placentæ projecting from the sides to the axis, and usually opening in 3 or 5 valves.

An extensive genus, particularly abundant in Southern Europe, Western Asia, and N. America, but represented also in the tropics and in the southern hemisphere.

Hypericum Coris L.

Glabrous. Stems 6-12 inches high, slender, erect ; leaves in whorls of 3 or 4, linear, with edges recurved, spotted with glands. Flowers yellow, streaked with red, rather large, in a short corymb. Sepals linear-oblong, obtuse, glandular ciliate. Petals 4-5 times longer than sepals. Capsule ovoid, twice as long as calyx.

Dry hills and rocks, especially on limestone up to 5000 feet ; local. June to August.

Distribution.—Maritime Alps, Var, Basses-Alpes, Italy, Tyrol, very rare in Switzerland (as near Stans, etc.).

This beautiful dwarf species is easily cultivated on limestone rocks, and forms a showy mass of gold.

Hypericum nummularium L.

Stem ascending, 6-10 inches high, glabrous like the whole plant. Leaves roundish-cordate, the lower ones shortly petioled, smooth, pale below. Flowers large, usually 3-5 on a stem. Petals round, 3-4 times longer than calyx, crenate, pale yellow. Sepals blunt, serrated, glandular-ciliated. Capsule ovoid, slightly passing the calyx, and with 3 prominent styles.

Stony, damp places in calcareous mountains; rare. June to August.

Distribution.—Alps of Savoy and Piedmont, Northern Spain, Central and Western Pyrenees.

Can be planted in a sunny place on a bank, with plenty of sandy soil for its rampant roots to penetrate.

Hypericum Richeri Vill. (Plate XIII.)

Glabrous. Stem erect, a foot high or more, almost round. Leaves oval or oval-lanceolate, opposite, edged with black spots, slightly clasping the stem. Flowers large, yellow, in a few-flowered corymb. Petals three times longer than the calyx, spotted with black. Sepals oblong-lanceolate, acuminate, finely but strongly toothed at the edge. Capsule ovoid, slightly longer than the calyx. A handsome species.

Pastures and mountain woods up to 6000 feet, as at Lautaret, in Dauphiny, and above Argentière in Haute Savoie; very local. June to August.

Distribution.—Jura, Savoy, rare in Switzerland, Pyrenees, Central and Southern Europe.

Hypericum quadrangulum L. (*H. maculatum* Crantz). (Plate XIII.)

Readily known by the 4 prominent angles of the stem. Leaves ovate, about an inch long, clasping the stem at the base, with many pellucid nerves and dots, and a few black spots round the margin. Sepals lanceolate, pointed. Petals usually without any black dots.

Pastures and waste places in mountainous regions up to the sub-alpine zone. June to August.

Distribution.—Central and Northern Europe, Pyrenees, Alps, Western Siberia. British.

In Britain it grows mostly in damp meadows.

In the Alps, and especially in the granitic Alps, the flowers of this species are sometimes pale yellow, as in the plate. The figure was drawn from a specimen obtained from Le Planet, above Argentière, at the head of the Chamonix valley, at about 4600 feet.

Schinz and Keller give an Alpine sub-species, *eumaculatum* Schinz et Thellung, with rounded sepals, and *erosum* Schinz, with sepals toothed or irregularly lacinate, but sometimes acute. The later sub-species frequents the Swiss plains, and the mountain region.

LINACEÆ

Herbs or under-shrubs with entire, alternate leaves, no stipules, and regular flowers. Sepals 5, rarely fewer, distinct or united at the base. Petals 4 or 5, twisted in the bud. Stamens usually 10, usually free. Styles 5, rarely fewer. Ovary with as many cells as styles. Ovules 1 or 2 in each cell.

A small family widely spread over the globe.

LINUM L. Flax.

Sepals, petals, and stamens 5. Cells of the capsule 5, though apparently 10, each being divided into two by a nearly complete partition.

A rather large genus, particularly abundant in the Mediterranean region and Western Asia.

Linum alpinum Jacq.

Rootstock woody. Stem glabrous like the whole plant, few-flowered. Leaves linear-lanceolate. Flowers large; petals azure blue, obovate. Sepals ovate, shortly mucronate, shorter than the capsule.

Stony places in calcareous Alps. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, and in many parts of hilly France; Western Asia.

Linum tenuifolium L. (Plate III.)

Rootstock rather woody. Stem a foot high, downy below. Leaves linear, acute, rough at the edges. Sepals lanceolate, acuminate, subulate, glandular-ciliate, longer than the capsule. Petals lilac or rose, obovate, shortly acuminate.

Dry stony places in the hills and sub-alps. May to July.

Distribution.—Central and Southern Europe; Western Asia; Algeria.

Linum viscosum L.

A downy, glandular flax, with thick root. Stems 1-2 feet high, erect. Leaves velvety, oblong-lanceolate, entire, with 3-5 nerves. Flowers rose or rose-lilac, large and handsome, in long corymbs, sub-sessile. Sepals oval-acuminate, ciliate, glandular, 3-nerved. Petals 3 times longer than the sepals, veined with violet. Capsule globular-apiculate.

Meadows and pastures in the hills and sub-Alps. May to July.

Distribution.—Maritime Alps, Liguria, Pyrenees, N. Italy, Spain, Portugal, Austria, Southern Germany.

Linum salsoloides Lamk.

Woody stock, stems about a foot high, downy above. Leaves very close together below, linear, stiff, 1-nerved. Flowers rose or flesh-coloured, pedicelled. Sepals oval-lanceolate, acuminate,

ciliate, glandular, 3-nerved. Petals oboval, quite round at the top, veined darker, 3-4 times longer than the sepals. Capsule ovoid.

Dry pastures and limestone hills in the south. June, July.

Distribution.—Liguria, e.g. on Monte Toraggio, South-central France, Northern Spain.

Linum catharticum L. Cathartic Flax.

This small, but well-known annual, with small white flowers and oblong, opposite leaves, is often found in the Alps and sub-Alps.

Distribution.—Europe, Western Asia, Canary Isles.

TAMARICACEÆ

A very small European, North African, and Central Asiatic family, with one Mexican genus. Mostly shrubs, with alternate leaves, and ovules and seeds inserted on 3 distinct placentas, arising from the base of the cavity of the ovary. Seeds plumose.

Myricaria germanica Desv. (Plate XIII.) (*Tamarix germanica* L.)

A cypress-like shrub, 1-1½ yard high, with slender branches in bundles. Leaves very small, close together, in the form of needle-shaped scales. Flowers pale pink, in a long terminal spike. Sepals and petals 5, rarely 4, free, surrounding the ripe fruit. Stamens 10, welded into a tube at the base. Capsule many seeded. Seeds with a shortly stalked plume.

River beds and sandy sides of torrents; local. June, July.

In the Alps it ascends to about 5000 feet, generally in the débris of glacier streams, as in the Val Ferret above Pras de Fort, the Trient Valley below Trient village, and the bed of the Arve about Argentière.

Distribution.—Alps, Pyrenees, Corbières, Alsace, East and South of France, Switzerland, Europe, Western Asia.

Very probably it has the faculty of preventing the sand and gravel of rivers being washed away, like *Hippophaë Rhamnoides*, with which it sometimes grows.

GERANIACEÆ

Annual or perennial herbs, or rarely low shrubs, with opposite or rarely alternate leaves, usually stipulate, divided, and compound. Flowers regular in the chief European genera. Sepals 5. Petals usually 5, twisted in the bud. Stamens 5 or 10, often united at the base. Ovary 3-5 celled, with 1 or more seed in each, all attached to the central axis. Styles 5. About 750 species.

GERANIUM L.

Herbs with forked stems, often swollen at the nodes, opposite, palmately divided leaves and purplish or pink flowers, solitary or

two together, on axillary peduncles. Stamens 10, of which 5 are shorter. Ovary 5-lobed, terminating in a short beak, with 5 long stigmas at the top. Capsule separating into 5 one-seeded carpels, which curl upwards, and with a long elastic awn, detached from the beak.

A genus of about 150 species spread over the northern hemisphere, with a few species in the southern (extra tropical).

Geranium macrorrhizum L.

Rootstock oblique or horizontal, thick, and covered with the tufts of withered leaves. Stem about a foot high, erect, branching dichotomously. Leaves shiny, palmately 7-fid, cut and serrated. Flower-stalks 2-flowered; pedicels erect after flowering. Petals somewhat spatulate, bright reddish purple. Stamens curved downwards. Capsule glabrous, wrinkled transversely. A strongly scented plant.

Stony places, especially in river beds in the lower Alps up to 5000 feet; very local. June, July.

Distribution.—Carpathians, Eastern Alps, Maritime Alps, N. Italy, Balkan Provinces, Greece.

This handsome plant should be cultivated in English rock-gardens. Place it between stones in a sunny aspect, give it plenty of water at first, and after getting well established it must not be allowed to get rampant.

Geranium sylvaticum L. (Plate XXX.)

Slightly pubescent, and somewhat glandular in the upper portion. Stem erect, 1 to 2 feet high, robust. Radical leaves on long stalks, palmately and deeply divided with 5 or 7 pointed lobes, more or less cut and serrated. Stem-leaves few, on much shorter stalks. Upper part of stem repeatedly forked, forming a rather dense panicle of handsome purplish flowers. Peduncles short, each with 2 flowers, on short pedicels, remaining erect when the fruit is ripe. Sepals sharply mucronate. Petals obovate, slightly notched, nearly twice the length of the calyx.

Meadows and bushy places in the mountains up to 7000 feet, and rarely in the south extending to 8000 feet (Col du Galibier). Before the meadows are mown in June or July this geranium often covers large areas and gives quite a purple haze to the landscape. To a certain extent it takes the place of our *G. pratense*, which is rare in Switzerland.

In Britain *sylvaticum* is more confined to some of the woods in the west and north, and is not often seen in meadows.

Distribution.—Throughout Europe and Russian Asia, extending to the Arctic regions. In Norway to above the birch limit.

Geranium phæum L. Dusky Geranium.

Rootstock thick, knotted, oblique or horizontal. Stems 1-2 feet high, erect, simple or branched, covered like the whole plant with woolly hairs. Leaves roundish cordate in outline, palmately 5-7 lobed, lower leaves stalked, upper sessile; lobes 3-cleft, coarsely cut and serrated. Flowers dark purple, in loose racemose cymes; flower-stalk 2-flowered, pedicel erect or horizontal after flowering. Petals patent during flowering, roundish ovate, shortly apiculate. Carpels with 3 or 4 wrinkles in the upper part; beak finely downy, not glandular.

Thickets, ravines, and meadows of the lower Alps up to 5300 feet; local. May, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Central Europe; from Scotland to Bulgaria and Thrace.

In Switzerland rather rare; but a pale violet variety seems frequent in several places at about 5000 feet, as at the Col de la Forclaz between Chamonix and Martigny.

Geranium nodosum L.

Closely allied to *G. striatum* L., about 1½ feet high, covered with a fine pubescence. Stems less downy and strongly inflated at the nodes. Leaves 3-5 lobed, lobes ovate-acuminate, serrate. Petals pale violet or pink, obcordate. Peduncles 2-flowered. Sepals terminating in a long point, pubescent. Carpels finely downy.

Woods and by streams in the mountains; rare. June to August.

Distribution.—Alps, rare in Switzerland (Jura, Valais), Cevennes, Pyrenees, Central France, Corsica, Spain, Italy, Dalmatia, Montenegro. Occasionally in England, but probably not native.

RHAMNACEÆ

A large family, widely spread throughout the globe, but with very few European genera.

RHAMNUS L. Buckthorn

Shrubs with alternate, entire leaves, and small green flowers on short pedicels, usually clustered in the axils of the leaves. Petals none or very small. Calyx with 4 or 5 short deciduous teeth. Stamens 4 or 5, alternating with the teeth of the calyx, and inserted on a disk. Ovary free, 3 or 4-celled. Style very short. Fruit a small berry (or drupe), enclosing 3 or 4 small nuts. A rather large genus, spread over the northern hemisphere of both Old and New World, and penetrating into the tropics.

Rhamnus pumila Turra.

A small under-shrub, with prostrate branches, clinging to the rocks. Leaves entire, finely toothed, with 4-7 somewhat curved lateral parallel veins on each side of the midrib. Flowers in small

axillary cymes, unisexual, greenish, very small. Petals narrow or wanting. Sepals with 4 lanceolate lobes.

Calcareous rocks of the Alps and lower Alps up to about 7200 feet, and occasionally higher in Savoie. June, July.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Corbières, Bavaria.

Rhamnus alpina L. Alpine Buckthorn.

A much larger (erect) shrub, 1-3 yards high. Leaves large, oval, suddenly contracted into a triangular apex, or sometimes obtuse, lateral veins, 8-14. Flowers similar. Lobes of the calyx triangular.

Dry, rocky places, and among débris up to 5500 feet. May, June.

Distribution.—Western Europe, Jura, Alps, Cevennes, Corbières, Pyrenees, Italy, Switzerland, Sardinia, Spain; Morocco, Algeria, Western Asia.

LEGUMINOSÆ

Herbs, shrubs, or trees, with alternate and generally compound leaves, usually furnished with stipules. Flowers very irregular, consisting of 5 petals, the upper one, called the *standard*, usually the broadest, the two lateral ones called *wings* are between the standard and the two lower ones which are inside of all and united more or less by their outer edges into a single one called the *keel*. Stamens 10, the filaments united into a sheath or the upper one distinct. Ovary 1-celled, with 1-2 or more ovules arranged in 1 or 2 rows on the ventral suture. Fruit a legume or pod, usually opening in two valves. Seeds with two large cotyledons.

A very large family of some 7000 species, widely spread over the globe. An enormous number of species are found in Southern Europe.

GENISTA L.

Low branching shrubs or under-shrubs, with usually simple or rarely trifoliolate leaves and yellow flowers. Calyx with 5 teeth, the 2 upper much longer. Standard oblong. Keel usually reflexed after flowering. Stamens all united in a sheath. Pod longer than the calyx.

A large genus, chiefly Mediterranean and from Western Asia. Some species are not easily separated from *Cytisus* and other allied genera.

Genista sagittalis L. (Plate XV.) (*Cytisus sagittalis* Koch.)

A small green under-shrub. Stem rampant, with ascending branches which are herbaceous and have 3 leafy wings compressed at each node. Leaves few, simple, sessile, lanceolate, no stipules. Flowers numerous, in dense, terminal heads. Calyx hairy, with unequal lobes. Standard glabrous, equalling the keel. Pod 15-20 mm. by 5, compressed, pointed, hairy, with 3-6 seeds.

Hillsides, woods, and pastures from the plains to the sub-Alps ; common. May to July.

Distribution.—Most of Continental Europe except the North.

CYTISUS L.

Herbs, small trees, or shrubs. Leaves usually 3-lobed, rarely simple. Upper lip of calyx truncate or bidentate. Flowers yellow. Other characters as in *Genista*.

Many species inhabiting Europe, Asia, and Africa.

Cytisus alpinus L. "Alpine Laburnum."

A small glabrous tree, 6–20 feet high. Leaves trifoliate, on long stalks ; leaflets large, entire, pointed, shortly stalked, green on both sides, glabrous or hairy only at the margin. Flowers rather smaller than in *C. Laburnum*, in a large, pendent, downy raceme. Legume glabrous, shining, with a winged keel to the upper suture.

Mountain woods and bushy places up to 5000 feet ; local. June, July.

Distribution.—Jura, Eastern, Central, and Western Alps.

Cytisus Laburnum L. Laburnum.

A rather taller tree than the last. Leaves glaucous below, instead of being green on both sides. Pod downy and then nearly glabrous instead of being always glabrous.

Mountain woods. May, June.

Distribution.—Switzerland, Eastern France ; Alpes-Maritimes ; naturalised elsewhere in France. Central and Southern Europe.

Cytisus radiatus Koch.

A small under-shrub about a foot high and much branched. Branches opposite or radiate, slender, truncate. Leaves shortly petioled, trifoliate ; leaflets linear, spreading. Inflorescence terminal, in a 3–10 flowered head. Calyx silky, with almost equal segments. Standard and keel downy. Pod small, 5 mm. by 3, oval, with curved point.

Dry hills, rocks, pastures, and mountain woods ; local. June, July.

Distribution.—Switzerland, only in Grisons and Valais (Montana), Hautes-Alpes and Basses-Alpes in France. Central and Southern Europe, as far east as Thessaly.

Cytisus hirsutus L.

A dwarf under-shrub, 1–2 feet high, and of stiff habit. Leaves 3-lobed, petioled, downy on both sides, turning black on being dried. Leaflets oboval. Flowers lateral, in leafy clusters on the old branches. Calyx tubular, with stellate hairs.

Hot hills, thickets, and rocky slopes. May to July.

Distribution.—Central and Southern Europe; Maritime Alps, Liguria, Tessin only in Switzerland. W. Asia.

It also turns rather black on being dried.

Several more species grow in the southern hills and lower mountains, e.g. *C. sessilifolius* L. (not Swiss), *C. nigricans* L., *C. supinus* L., and *C. elongatus* Waldst. et Kit. (not Swiss).

ONONIS L. Rest-harrow.

Herbs or low undershrubs, with pinnately trifoliolate or rarely simple leaves; leaflets generally toothed, stipules leafy; the flowers solitary on axillary peduncles, often forming leafy racemes. Calyx with 5 narrow segments. Standard large and striate. Keel ending in a pointed beak. Pod inflated, with few seeds.

A numerous genus chiefly from the Mediterranean region.

Ononis rotundifolia L.

Pubescent-glandular. Stem about a foot high, erect or ascending. Leaves large, trifoliolate, petioled, with orbicular or oval toothed leaflets. Flowers rose-coloured, large, 2-3 on axillary peduncles, terminated by a mucro. Corolla twice as long as the calyx. Pod 25-30 mm. by 6-7, drooping, glandular, hairy, with 5-9 seeds.

Stony places in limestone mountains up to 5700 feet. May to August.

Distribution.—Eastern, Central, and Western Alps from France to Carinthia. Pyrenees and Spain.

Ononis Natrix L. (Plate XVI.)

A robust very viscous plant, 1-2 feet high. Stem-leaves trifoliolate, petioled; leaflets oboval or oblong, slightly toothed. Stipules oval-lanceolate. Flowers lemon-yellow streaked with red, large, in dense leafy heads. Lobes of calyx much longer than the tube. Pod 15-20 mm. by 2-4 mm., broadly linear, hairy.

Stony or sandy places from the plains up to about 5000 feet in the Swiss Alps; and sometimes, as in the Rhone Valley, so plentiful as to be mown for fodder.

It flowers from May to July, according to situation.

Distribution.—Central and Southern Europe, including most of France (Eastern Pyrenees at about 3000 feet), Western Asia, N. Africa.

TRIFOLIUM L. Clover.

Herbs with stipules adhering to the leaf-stalks. Leaves trifoliolate; leaflets often toothed. Flowers in dense capitate heads. Calyx 5-toothed. Petals narrow, usually remaining round the pod after fading. Stamens diadelphous, the upper ones entirely free. Pod scarcely protruding beyond the calyx, containing from 1-4 seeds.

A numerous and widely spread genus, particularly in the northern hemisphere.

ANTHYLLIS L.

Rather dwarf herbs, with pinnate leaves and yellow, red, or purple flowers, in crowded heads, with a deeply divided bract close underneath. Stipules small or 0. Calyx inflated, with 5 small teeth. Stamens united in an entire sheath. Pod enclosed in the calyx.

A small genus, chiefly from the Mediterranean region.

Anthyllis montana L.

Stem woody at the base, ascending, 6–12 inches high, tufted, covered with silky wool like the whole plant. Leaflets in 8–20 pairs, all the same size. Bracts shorter than the head of flowers, which is about 1 inch in diameter. Flowers 15–16 mm. long, rose-coloured. Calyx with plumose, unequal teeth, suddenly spreading. Occasionally the flowers are a deep carmine.

Rocks and hot stony places on limestone from 4500–6500 feet. May to July.

Distribution.—Jura, Central and Western Alps, Cevennes. Pyrenees, Algeria. Very rare in Switzerland (Salève).

In cultivation it is best planted between blocks of limestone in a well-drained, sunny position.

Anthyllis Vulneraria L. Lady's-fingers. (Plate XVII.)

Radical leaves with 1–4 leaflets; stem-leaves with 4–10 small leaflets, the terminal one being large. Calyx greatly swollen, with oblique mouth and short triangular teeth. Petals golden yellow or, in the Alps, nearly white (var. *alpestris* Heg.) [Plate XVII.], or partly blood-red (var. *rubriflora* Koch = *A. Dillenii* Schultz). A polymorphic species.

Pastures and dry hillsides, sometimes very abundant and covering large areas. May to August.

Distribution.—Europe, Western Asia, N. Africa. In Norway it almost reaches the birch limit.

LOTUS L.

Leaves pinnately or palmately 4–5 fid. Stipules minute or 0. Calyx not inflated, 2-lipped or with 5 nearly equal teeth. Flowers usually yellow, in capitate or umbellate, axillary cymes. Legume septate between the seeds. About 50 species widely distributed over the world.

Lotus corniculatus L. Bird's-foot Trefoil.

A small glabrous plant, 3–8 inches high, tufted, but very variable in habit. Leaves very shortly petioled. Flowers very shortly pedicelled, bright yellow, often streaked with crimson and turning green when dry, 5–10 flowers in a decumbent umbel or head about an

inch across, on long peduncles; 2 upper calyx teeth triangular. Pods about an inch long.

Pastures from the plains to 9000 feet (var. *alpinus* Schl.) in the Alps. May to July.

Distribution.—Europe, to the Arctic regions, N. Africa, N. and W. Asia, India.

ASTRAGALUS L.

Herbs with pinnate leaves and flowers in axillary cymes or spikes, without leafy bracts. Stipules entire at the base. Calyx with 5 teeth. Petals usually narrow. Keel obtuse. Stamens diadelphous. Pod cylindrical or inflated, usually divided lengthwise by a complete or partial partition proceeding from the side of the keel.

One of the largest genera known (about 900 species), distributed all over Europe, Central and Northern Asia, N. America, and down the Andes of S. America. Some penetrate far into the Arctic.

Astragalus alpinus L. (*Phaca astragalina* DC.).

Stem procumbent, then ascending, 3–8 inches high, slender, covered like the leaves with an adpressed down. Leaves pinnate, with 8–12 pairs of lanceolate or oval leaflets. Spike compact, corymbose; flowers shortly stalked. Standard blue. Wings white. Keel violet at apex, nearly as long as standard. Legume pendent, elongated, covered with rough, black hairs. Fruit-stalk longer than calyx.

Stony or grassy places and pastures in the Alps, especially on the primary formations, 5000–8200 feet. July, August.

Distribution.—Alps and Pyrenees. High mountains of Europe as far north as Lapland. In Norway it extends above the birch. Very rare in Britain.

Astragalus glycyphyllus L.

Glabrous, bright green in colour, with strong zigzag stems, spreading several feet along the ground. Stipules free. Leaflets about a dozen, ovate, 1–1½ inches long, on a common leaf-stalk 6 or 7 inches long. Flowers dingy yellow, in racemes rather shorter than the leaves. Pods erect, curved, glabrous, 1½ inches long, divided into 2 cells by a thin double partition.

Open woods, grassy and uncultivated places. June to August.

Distribution.—Europe, especially Central; Western Asia. British. A frequent plant in sub-alpine regions of Switzerland.

Astragalus Cicer L.

Differs from the last in its more erect habit, and in having pale yellow flowers, narrower oblong leaflets, and a hispid, globular pod, which turns black when ripe. Grassy and bushy places in the hills; local. June, July.

Distribution.—Western Alps, Pyrenees, Ardennes, Central and Southern Europe, rare in Switzerland ; Western Asia.

Astragalus hypoglottis L.

A small, hairy, diffuse plant. Leaflets oblong, 8–12 pairs. Flowers violet, erect, 10–20 in a dense, sub-globular head. Peduncles longer than the leaves. Calyx hairy, tubular, with short, linear teeth. Standard oval, emarginate. Pods 10 mm. by 4, erect, oval, heart-shaped at base, with long, white hairs, divided longitudinally into 2 cells.

Dry Alpine pastures. June to August.

Distribution.—Central and Western Alps (not in Switzerland), Northern Europe, and Russian Asia. British.

Likes a well-drained soil, plenty of lime, and a sunny aspect.

Astragalus purpureus Lamk.

Stem spreading, prostrate or ascending, hairy like the whole plant. Leaflets ovate-lanceolate, in 10–12 pairs. Petals bright purple. Calyx hairy, tubular, with irregular linear teeth, standard oblong, emarginate. Pods 10 or 12 mm. by 5 mm., erect, oval, heart-shaped at base, hairy.

Limestone hills, 3500–6500 feet. May to July.

Distribution.—Southern and Western Alps, Piedmont, Tyrol, Montenegro.

Astragalus Onobrychis L.

Very similar to the last, but with 6–12 pairs of leaflets, and covered with whitish hairs. Calyx-teeth lanceolate, about $\frac{1}{2}$ length of the tube. Standard linear-oblong, truncate. Pod 10 or 12 mm. by 5 mm., erect, oval, hairy. A handsome plant, well worth cultivating.

Mountains in hot districts up to 5000 feet. June to August.

Distribution.—Western Alps, Southern Europe and Western Asia.

Likes sun and prefers limestone, under which conditions it spreads rapidly, and throws up plenty of long-stalked crimson-purple spikes.

Astragalus monspessulanus L.

Almost glabrous, green. Stems 0, the flower and leaf-stalks springing from the roots; 10–20 pairs of elliptic leaflets, stipules linear-lanceolate. Flowers purple, in oval heads elongated at maturity. Peduncles equalling the leaves. Calyx glabrescent, tubular, with teeth about half length of tube. Pods very long, 25–35 mm. by 3 mm., sub-cylindrical, curved, almost glabrous.

Limestone hills in hot places. April to June.

This species has a wide range, both in altitude and longitude, and it is really a southern plant, as its name implies. We have seen it at Beaulieu, on the Mediterranean, at Pigna, in the Ligurian Alps (1200 feet), and as high as 6300 feet on the plateau of Mt. Cenis.

Distribution.—Central and Southern Europe, very local in Switzerland, Caucasus, Tunis, Algeria.

Astragalus aristatus L'Hérit.

Woody at the base, and forming great mats of spiny shoots. Stem very short, whitish pubescent. Leaves with 6–10 pairs of linear-oblong leaflets. Stipules linear-acuminate. Flowers white or washed with lilac, erect, 3–8 in short, loose clusters, slightly peduncled. Bracts lanceolate. Calyx very woolly with setaceous teeth equalling the tube.

This very marked species is the only one of the spiny kinds which can be considered Alpine or sub-alpine. We have seen it, near the top of the Col di Tenda, and on the Aiguille du Goléon in Dauphiné, at the remarkable height of 8500 feet or 2590 m. It prefers limestone or shale.

Distribution.—Western Alps (not in Switzerland), Pyrenees, Greece, Sicily, Italy.

Should be planted in a limy soil with plenty of stones, and where it can have room to spread and form a big mat.

PHACA L.

Leaves pinnate. Flowers in axillary racemes. Style subulate, not bearded; ovules more than 2. Pod or legume more or less inflated and membranous, 1-celled.

Phaca alpina Jacq.

Stem 1–2 feet high, glabrescent. Leaflets in 9–12 pairs, ovate-lanceolate, stipules linear-lanceolate. Flower-stalks blackish. Flowers brownish yellow. Calyx-teeth linear-lanceolate. Legume half-ovate, when young covered with rough hairs, nearly glabrous when older, stalk of legume nearly as long as calyx.

Stony places and pastures, 4000–6500 feet. July, August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Bavaria, Sweden.

OXYTROPIS DC.

Low, tufted perennials, only differing from *Astragalus* in the keel, which has a small point at its extremity, either erect or slightly recurved, and in the pod, which has an incomplete longitudinal partition projecting into the cavity from the angle next the vexillum, not from the angle next the keel.

Another large genus, of about 200 species, but not so widely spread as *Astragalus*, and chiefly confined to mountain stations in Europe, Asia, and N. America.

Oxytropis campestris DC.

Stock short and tufted, covered with old leaf-stalks and stipules. Plant covered with scattered hairs or rather shaggy. Leaflets

usually in 12 pairs, lanceolate, acute. Peduncle longer than the leaves, and hairy like the calyx. Spikes capitate, ovate. Bracts nearly or quite as long as calyx. Flowers lemon-yellow, occasionally with brownish claws or white, or blue (var. *cærulea* Koch). Legume erect, sessile within the calyx, ovate, acuminate, inflated, semi-bilobular, slightly hairy.

Stony places and pastures in the Alps up to 9500 feet, and descending into the plains. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees; Scandinavia, Britain (very rare). Found on most of the high mountains of Europe.

Oxytropis pilosa DC.

Stem erect or ascending, 4–12 inches high, softly woolly, like the whole plant. Leaves pinnate, with 7–13 pairs of lanceolate or linear, entire, mucronate leaflets. Stipules lanceolate, sessile at base of leaf-stalk. Flowers ochre-yellow, in dense ovate heads, at length elongated spikes. Pod erect, linear-lanceolate, nearly cylindrical, woolly, nearly sessile within the calyx.

Sunny hills and stony pastures in the Alps. May to July.

Distribution.—Jura, Eastern, Central, and Western Alps, Western and Central Asia as far as China.

COLUTEA L.

Colutea arborescens L. Bladder Senna.

A shrub 6–8 feet high, not spiny. Leaves pinnate, with 7–11 oval leaflets, finely pubescent. Flowers yellow, rather large, standard streaked with brown. Pods much inflated, 5 cm. by 2–3, pendent, membranous, veined and glabrous, closed at the top, while *C. orientalis*, which resembles it, has pods open at the top.

Hills and sunny places in the plains, extending in Switzerland rarely into the sub-alpine zone, as near Stalden, and in the Maritime Alps to 2000 feet only. May to July.

Distribution.—East and West of France, Eastern Pyrenees, Switzerland, Central and Southern Europe, Western Asia, Algeria. Often cultivated and frequently sub-spontaneous.

HEDYSARUM L.

Hedysarum obscurum L.

Stem 6–12 inches high, erect, simple, glabrous or with scattered hairs. Raceme usually long-stalked, terminal, with sometimes a secondary axillary raceme. Leaves pinnate; leaflets ovate or lanceolate, entire, obtuse or acute. Stipules membranous, opposite the leaf, 2-cleft. Calyx, peduncle, and pedicels shortly hairy. Flowers large, bright reddish purple, somewhat crowded, pendent. Legume 1–4 chambered, finely downy or glabrous, pendent.

Stony pastures and steep mountain sides and ravines on limestone or schist; often somewhat solitary; 4000–8000 feet. July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees; Arctic Europe; Nova Zembla; Caucasus.

CORONILLA L.

Small shrubs with yellow flowers in axillary umbels. Calyx shortly campanulate. Petals with long claws. Keel acuminate. Legume nearly straight, cylindrical, or 4-angled. Leaflets often with white margins.

A small genus of about 20 species, inhabiting Europe, W. Asia, and N. Africa.

Coronilla vaginalis Lamk.

A low shrub, with leaflets in 3–7 pairs. Flowers small, in umbels of 4–10 on a peduncle once or twice the length of the leaf. Stipules in the form of a bifid sheath. Pods pendant, 20–30 mm., straight, divided horizontally into 3–6 oval chambers, with 6 angles.

Rocky places in limestone mountains, from the plains up to 6500 feet, June to August.

Distribution.—Mountains of Central and Southern Europe, extending North to Bohemia and the Harz mountains.

Coronilla Emerus L.

A shrub 1–2 yards high. Leaflets oboval, truncate, in 2–4 pairs. Flowers large, 2–4 on a peduncle. Legume long, straight, and divided into 7–10 chambers.

Woods and hills, especially on limestone, up to 6000 feet. April to June. On the Riviera it flowers much earlier.

Distribution.—Central and Southern Europe; Norway.

Coronilla minima L.

Stem woody and spreading. Leaflets in 3–5 pairs, oblong, the lowest pair close to the stem, and occupying the base of the petiole. Flowers yellow, in elegant heads of 5–8 florets. A small dwarf species.

Sunny limestone hills and rocky places. June, July.

Distribution.—France, Spain, Valais, Italy, N. Africa.

Coronilla varia L.

Readily known by its pretty pinkish white flowers, or, to be exact, the standard is pink, the wings white, and the keel white with dark purple at the tip. Stems recumbent or ascending, and often forming large masses extending several feet. Leaves with 6–11 pairs of leaflets, which are oblong to linear, glabrous.

Pastures, borders of woods, and waste places. Common in many parts of Europe and sometimes seen in the Alps up to 5000 or 6000 feet. May to August.

Distribution.—Central and Southern Europe, Western Asia as far as Persia.

In cultivation this rampant, quick growing plant must be kept in check, or it will "swamp" more delicate things.

ONOBRYCHIS Miller. Sainfoin.

Leaves pinnate, with a terminal leaflet, leaflets entire. Stipules scarious. Flowers red, purple or white in axillary spikes or racemes. Calyx-lobes subulate. Wings short. Keel obliquely truncate. Pod compressed, not jointed, often spiny, winged, or crested.

About 70 species, inhabiting Europe, temperate Asia, and Africa.

Onobrychis montana DC.

This is probably an Alpine variety of the Common Sainfoin, *O. viciæfolia* Scop. (*O. sativa* Lamk.), with beautifully veined crimson flowers, but the blossoms vary considerably in colour. The stems are sub-decumbent, and the leaflets shorter and broader than in the other, and they are usually in 5 to 7 pairs.

Alpine and sub-alpine pastures up to 6500 feet; common. June to August.

Distribution.—Eastern, Central, and Western Alps, Jura, and most of mountainous Europe.

Onobrychis arenaria DC. (*O. Gaudiniana* Jordan).

Leaflets oblong-elliptic, 13–20 pairs. Stem more or less prostrate. Flowers white, streaked with red. Pod pubescent, spiny, keeled, and strongly veined on both sides.

Sandy hills. Local. May, June.

Distribution.—Southern Switzerland (Tessin, Grisons, Valais), Pyrenees.

HIPPOCREPIS L.

Hippocrepis comosa L. Horse-shoe Vetch.

Stock with numerous stems branching at the base, short and tufted or spreading along the ground. Leaflets 9 to 15, rarely less, small, obovate, oblong, and glabrous, the lowest pair at a distance from the stem. Flowers yellow, 5–8 in an umbel, like those of *Lotus corniculatus*, but rather smaller and never tinged with red as the Lotus is, particularly in the mountains. Pod about an inch long, finely pointed, the notches of the inner edge broad and deep, and giving it an almost zigzag appearance.

Banks, pastures, and rocky places, especially on limestone, from the plains to the Alps. June, July.

Distribution.—Central, Southern, and Western Europe. British.

VICIA L. Vetch.

Mostly annuals, and either climbing or procumbent. Leaves with many entire or emarginate leaflets, usually ending in a tendril.

Stipules half sagittate. Flowers in axillary racemes. Wing-petals adnate to the keel. Style inflexed, cylindrical, or flattened; ovules usually many. Legume compressed, two-valved.

A large genus of about 120 species inhabiting the northern hemisphere and S. America. The nomenclature of certain groups is obscure and vague, and the genus should be monographed.

Vicia pyrenaica Pourr.

A small perennial species about 4-6 inches high. Stem ascending. Lower leaves have 1-2 pairs of obcordate leaflets, upper have 4-6 pairs of wedge-shaped leaflets, truncate. Stipules entire. Flowers rich violet, large, axillary, solitary, sessile. Calyx glabrescent, with almost equal teeth shorter than the tube. Standard very large. Pod broadly linear, glabrous, blackish when ripe. Seeds brown.

Pastures up to 6500 feet. June, July.

Distribution.—Pyrenees, Spain, Hautes-Alpes and Basses-Alpes. Quite suitable for planting in sunny, open positions on the rockery.

Vicia sepium L.

Stems 1-2 feet high. Stipules small and entire or larger and toothed. Leaflets in 4-6 pairs, ovate or oblong; leaf-stalk often ending in a branched tendril. Flowers pale reddish purple, forming a sessile cluster or very short raceme. Pod glabrous, about an inch long.

Bushy places and woods, from the plains up to 5000 feet in Switzerland. May to September.

Distribution.—Europe and Russian Asia. From the Mediterranean to the Arctic Circle, reaching the birch limit in Norway. British.

Vicia dumetorum L.

A tall, climbing, glabrous species. Leaflets in 4-5 pairs, oval-obtuse. Stipules toothed. Flowers purplish and then dirty yellow-red, rather small, 3-8 in a loose spike, often longer than the leaves. Pod 35-40 mm. long by about 8 broad, pointed, glabrous, fawn-coloured at maturity.

Woods in the mountains. June to September.

Distribution.—Jura, Eastern France, Switzerland, Central and Eastern Europe from Sweden to Turkey.

Vicia pisiiformis L.

A large climber with big oval leaflets in pairs of 4 or 5, and rather small greenish yellow flowers. It grows in limestone woods, but is rare in the Alps, though widely spread in Central and Eastern Europe.



PLATE X

17 NATURAL SIZE.

1. TROLLIUS EUROPEUS.
3. VINCE TOXICUM OFFICINALE
5. CYCLAMEN EUROPEUM.

2. CUSCUTA EPITHYMUM.
4. CAREX FERRUGINEA
6. JASIONE MONTANA.

Vicia sylvatica L. Wood Vetch.

This British Vetch is occasionally met with as high as 6500 feet in Switzerland, as, e.g. below the Trübsee, near Engelberg, where it assumes a dwarf, tufted habit and grows with *Hedysarum obscurum* and *Lilium Martagon* on a steep, stony slope. Flowers white, veined with blue or violet. Mountain woods in North, Central and Eastern Europe.

Vicia onobrychioides L. (Plate IX.)

A very handsome Vetch, 1½–3 feet long, almost glabrous and climbing. Leaves with 5–8 pairs of linear leaflets. Flowers a beautiful rich violet with paler keel, large, 6–12 in a loose cluster. Calyx-teeth very unequal, the two upper short and connivent. Pods about 30 by 5 mm., glabrous, fawn-coloured at maturity.

Cultivated and waste places in the hills, up to about 4000 feet in Valais and the Eastern Pyrenees (e.g. Montlouis). May to July.

Distribution.—S. and S.E. France, Valais (Orsières, etc.), S. Europe, N. Africa. This is a plant to introduce into our gardens.

LATHYRUS L. Pea.

Herbs with weak stems, sometimes climbing, and sagittate or half-sagittate stipules. Leaves usually pinnate, with fewer and larger leaflets than in *Vicia*, the common leaf-stalk often ending in a tendril. Flowers solitary or in racemes, on axillary peduncles, purple, red, white, or yellow. Style, flattened below the stigma, quite glabrous on outer side. Pods cylindrical or flattened. Seeds several, usually globular.

A large genus with nearly as wide a geographical range as *Vicia*.

Lathyrus luteus Peterm. (*Orobus luteus* L.). (Plate IX.)

Stem angular, 1–3½ feet high, erect, often branched. Stipules half-sagittate or entire or feebly toothed at the base only. Leaves usually with 4 pairs of leaflets, which are elliptic and rather acute, almost glaucous beneath. Flowers yellowish, large, afterwards yellow-brown. Style linear, bearded at the apex.

Pastures and mountain woods up to 6000 feet; local. June, July.

Distribution.—Jura, Alps, Corbières, Pyrenees, Central and Southern Europe. Siberia.

Lathyrus niger Bernh.

A glabrous plant, 1–2 feet high, turning black on being dried. Stems angular, erect. Leaves with 4–6 pairs of oval or elliptic leaflets, glaucous above. Stipules linear. Flowers reddish purple, then bluish, rather small, 4–8 in a loose cluster, longer than the leaves. Calyx-teeth very unequal. Pods linear, about 1½ inches longer, black when ripe.

Mountain woods, especially on limestone. May to July.

Distribution.—Most of hilly Europe, Caucasus, Algeria.

Lathyrus montanus Bernh.

A glabrous species about a foot high, with winged stem and inflated nodes on the underground stolons. (Linnæus called it *Orobus tuberosus*.) Stipules more or less arrow-shaped. Leaves with 2-3 pairs of linear-lanceolate leaflets, glaucous beneath. Sometimes the leaflets are quite linear (var. *angustifolia*) and occasionally broadly oval. Inflorescence 4-6 flowered, equalling or longer than the leaves. Corolla at first purple-red, afterwards turning a dull blue.

Woods and thickets—common in the plains, hills, and sub-Alps. April to June.

Distribution.—Europe, especially Western and Central. British.

Lathyrus vernus Bernh.

A glabrous plant about 1-1½ feet high. Stem angular. Leaves with 2-4 pairs of oval-lanceolate leaflets, very pointed, bright green and shining. Flowers reddish violet, then bluish, larger than the last. Pods linear, glabrous, brown when ripe. Seeds yellow.

Mountain woods, especially on limestone. April to June.

Distribution.—Most of hilly Europe from the Pyrenees to the Caucasus, Western Asia.

Lathyrus heterophyllus L.

A climbing species about 3 feet long, glabrous. Stems and leaf petioles broadly winged. Lower leaves with one pair of leaflets, upper leaves with 2-3 pairs; leaflets oval or lanceolate. Corolla purple; inflorescence longer than the leaves.

Mountain woods and pastures up to 6000 feet; local. June, July.

Distribution.—Alps, Jura; Central Europe from Portugal to Sweden and Russia.

ROSACEÆ

Herbs, shrubs, or trees, with mostly alternate leaves, usually toothed or divided, the stipules seldom wanting and often leaf-like. Flowers in cymes, or solitary at the end of the year's shoots, or more rarely in lateral bunches. Sepals 4 or 5, united at the base into a lobed calyx. Petals 4 or 5 or rarely none. Stamens numerous, inserted with the petals on the calyx below its lobes. Ovary of one, two, or more carpels. As the fruit enlarges the carpels either remain free or are combined with each other or with the calyx. Often only 1 or 2 seeds in each carpel.

A numerous family widely spread over the globe, but more in the northern hemisphere than in the tropics.

SPIRÆA L.

Herbs or shrubs with much diversity in the foliage. Flowers usually small and numerous, in terminal cymes or panicles. Calyx free, 5-lobed. Petals 5. Stamens numerous. Carpels 3, or more frequently 5, quite free from the calyx, forming as many dry capsules, opening along the inner edge. A genus spread over the northern hemisphere, but barely extending to the tropics.

Spiræa Aruncus L.

A handsome plant of about 3 feet, with very feathery white inflorescence. Leaves very large, often a foot long, triangular in general outline, 2-3 pinnatisect, with opposite petioled segments, with doubly-toothed margins. No stipules. Flowers white, very small, usually dioecious, sessile, in elongated spikes forming a large panicle. Stamens longer than the oblong petals. Carpels 3 or 4, recurved on maturity.

Mountain woods, gorges, etc., 2000 to 4000 feet. June, July.

Distribution.—Alps, Jura, Pyrenees, Vosges; Central Europe, Northern and Western Asia, N. America.

Spiræa Ulmaria L. Meadowsweet.

This well-known plant is often seen in Switzerland extending from the plains to about 5000 feet in some of the southern valleys. Its habitat is more variable than in England, for in that country it is very rarely seen in the mountains. It is found in Europe, Asia Minor and Northern Asia.

ALCHEMILLA L. Lady's Mantle.

Tufted herbs, annual or with a perennial almost woody root-stock and annual flowering stems, palmately lobed or divided leaves, and small green flowers in loose panicles or in small sessile heads. Calyx free, double, i.e. of 8 divisions, of which 4 alternate ones are outside and smaller. No petals. Stamens four or less. Carpels 1 or 2, 1-seeded.

A small genus, widely spread over the northern hemisphere, chiefly in mountainous districts.

Alchemilla alpina L.

Stem prostrate or ascending, branched, covered like the leaves with adpressed hairs. Leaves palmate, 5-9 partite, dark green on the upper side, silver-grey with shining silky hairs on under side; segments wedge-shaped, obtuse, serrated. Greenish-yellow flowers in a terminal, branched, often racemose, cyme.

Pastures and rocky places in the siliceous mountains up to 9000 feet. July, August.

Distribution.—Central and Western Europe, Norway. British.

A characteristic plant of the sub-Alps in granitic districts.

Alchemilla vulgaris L. Common Lady's Mantle.

Rootstock nearly black, stout. Stem 6-18 inches, ascending. Root-leaves reniform, 6-9 lobed, serrate, 2-6 inches across, green on both sides; stem-leaves smaller. Stipules connate, toothed. Flowers very small, yellow-green, rarely perfect, in irregular racemes or cymes. Pedicels short. A variable plant, and in the mountains usually dwarf, with pubescent or silky leaves and petioles.

Moist pastures in hilly and sub-alpine districts. May, June.

Distribution.—Central, Northern, and Arctic Europe, N. and W. Asia, Kashmir, Greenland, Labrador.

Alchemilla Hoppeana Büser.

Plant 4-10 inches high, forming compact tufts. Stems 1-1½ times as long as the radical leaves. Leaves glabrous, dull green above, silky and silvery beneath, with 7-9 leaflets, some of which are free and others irregularly cut to the base, oblong-lanceolate, finely serrated at the top. Flowers in clusters forming a rather loose spike.

Limestone slopes and rocky pastures in the Alps and sub-Alps. June, July.

Distribution. Pyrenees, Spain, Italy, French, Swiss, and Tyrolese Alps.

Various other species of this little understood genus are found in the sub-Alps, e.g. *Alchemilla glaberrima*, *A. flabellata*, *A. pubescens*, *A. hybrida*, and *A. alpestris*.

POTENTILLA L.

Herbs with perennial tufted stock and often creeping runners. Flowering stems usually annual. Leaves of 3 or more digitate, distinct, segments. Peduncles 1-flowered, solitary or forming a dichotomous cyme. Calyx free, double, i.e. of twice as many divisions as there are petals. Petals 5, or rarely 4. Stamens numerous. Carpels numerous, small, 1-seeded, crowded on a receptacle, which never becomes succulent.

A large genus extending over the whole of the northern hemisphere without the tropics, penetrating the arctic regions, and descending the Andes to their extremity.

Potentilla caulescens L.

Stem weak, prostrate, ascending or erect, many-leaved, cymosely branched at the apex, many-flowered, covered with patent hairs like the leaf-stalks. Root-leaves and lower stem-leaves palmately 5-partite, the root-leaves shorter than those of the stem; upper stem-leaves tripartite, passing into bracts. Segments elongated or wedge-shaped, serrated above the middle, silky-villous below

and at the margin. Petals narrow, wedge-shaped, white. Stamens and carpels hairy.

Calcareous Alpine and sub-alpine rocks up to 8000 feet. July, August. Carpathians, Jura, Alps, Pyrenees.

Potentilla rupestris L.

Flower-stems 10–18 inches high, springing from an almost woody base. Leaves chiefly radical, pinnate, the common stalk rather long; leaflets 5 or 7, ovate, toothed, green; stem-leaves few and smaller, often with only three leaflets. Flowers few, rather large, milk-white, forming a loose corymb.

Rocks and hilly places in the sub-Alps; local. May, June.

Distribution.—Alps, Jura, Pyrenees, Cevennes, Auvergne, Corsica, most of mountainous Europe as far north as Sweden. Western Asia. Rare in Britain.

Potentilla fruticosa L.

This handsome shrub, with silky, sub-digitately pinnate leaves and bright yellow flowers, grows in the Pyrenees and many districts in N. and mid-Europe, but not in Switzerland. This is strange, for it is widely spread elsewhere, and appears in N. and W. Asia, Himalaya, N. America, and in N. England and Ireland.

Potentilla valderia L.

Densely tomentose. Crown of root covered with silky hairs. Leaflets 5–7, obovate, wedge-shaped, serrated, velvety on both sides. Corymb compact. Petals obcordate, white, shorter than calyx. Filaments hairy. Calyx-teeth lanceolate, acute.

Rocky places and pastures in the Maritime Alps and Balkan provinces; rare. July, August.

Potentilla Clusiana Jacq.

Rootstock woody, with thick fibres, many-headed. Stem filiform, ascending, 1–3 leaved, 1–5 flowered, covered with patent hairs. Root-leaves palmately 5-cleft, shortly stalked, shorter than stem; stem-leaves 3–5 cleft, smaller, segments lanceolate or wedge-shaped, entire or with 3–5 teeth near the apex, nearly glabrous on both sides or silky on lower side and margin. Flowers handsome, milk-white. Petals obovate, longer than calyx-teeth. Filaments glabrous. Capsule villous. Stem and calyx usually tinged with purple.

Clefts of rock and débris in the Eastern Alps. Generally on limestone and rather rare; 5200–6500 feet. July, August.

Potentilla Tormentilla Scop. Common Tormentil.

Rootstock stout, almost woody. Stems and leaves more or less silky. Lower leaves shortly stalked, upper ones sessile, consisting of 3 or 5 deeply toothed leaflets. Flowers small, yellow, on long,

slender peduncles, springing from the forks of the stem on the axils of the upper leaves. A variable plant.

Heaths, moors, and pastures, and open woods in the plains and Alps.

Distribution.—Europe, Arctic Asia, Azores.

Potentilla argentea L. Hoary Cinquefoil. (Plate XI.)

Stem ascending, branched above, covered with white silky hairs. Leaflets usually 5, incised, very white beneath, oboval, wedge-shaped; lower leaves stalked; upper leaves nearly sessile. Flowers small, yellow, in a loose, leafy corymb or panicle.

Dry pastures and waste, gravelly places in the plains and lower mountains. May to July.

Distribution.—Northern and Central Europe, including the British Isles. Rarely in the Mediterranean district; Western Asia, Himalaya, N. America.

Potentilla multifida L.

Stem ascending, 6–12 inches high, branched above. Leaves pinnate, covered on under side with silvery, silky hairs, pinnæ few, deeply pinnatifid, lobes linear. Flowers rather small, yellow, 2–7 in a terminal cyme. Petals obovate, wedge-shaped, emarginate.

Stony places on the Alps and lower Alps on primary rocks. June to August.

Distribution.—Western Alps; rare in Switzerland, Caucasus, Russia, Siberia, Lapland, Thibet.

Potentilla aurea L. (Plate XI.)

Rootstock woody and tufted. Stem erect or ascending, covered with adpressed hairs like the whole plant, branched above, several-flowered. Leaves few, palmately 5-partite, or the upper one tripartite; segments obovate or wedge-shaped, deeply veined above, grass-green and shining, with pale, long silky hairs on the under side, and deeply serrated. Flowers large, bright yellow, with an orange streak at the base. Achenes glabrous.

Abundant in Alpine and sub-alpine pastures up to 9000 feet (Aig. du Goléon). June to September.

Distribution.—Jura, Carpathians, Eastern, Central, and Western Alps; Cevennes, Corbières, Pyrenees; Norway.

Potentilla grandiflora L. (Plate XVI.)

All the leaves trifoliate. Stem erect, 4–12 inches high, branched, 2–5 flowered, covered with long patent hairs. Leaves trifoliate; leaflets obovate, coarsely serrate, woolly beneath. Flowers large, yellow (considerably larger than in *P. aurea*). But the drawing is of the variety *minor*.

Rocky places and pasture in the Alps, 5000–9000 feet; rather rare. July, August.



PLATE XI.

4/7 NATURAL SIZE.

- | | |
|--------------------------|--------------------------|
| 1. POTENTILLA ARGENTEA. | 2. SENECIO SYLVATICUS. |
| 3. POTENTILLA AUREA. | 4. SOLIDAGO VIRGA-AUREA. |
| 5. HELIANTHEMUM VULGARE. | |

Distribution.—Eastern, Central, and Western Alps, Eastern Pyrenees.

Potentilla verna L. Spring Cinquefoil.

Stems short and tufted, sometimes procumbent at the base. Lower leaves on long stalks with 5 or 7 oblong, toothed leaflets; upper leaves nearly sessile or shortly stalked, with 5 or rarely 3 leaflets, covered with silky hairs. Flowers small, yellow, in irregular panicles at the ends of the short stems. Petals broad, longer than the calyx. A very variable plant, especially in being sometimes almost glabrous, and at other times densely coated with silky hairs.

Dry pastures and rocks in hilly districts, especially on limestone. April to July.

Distribution.—Almost all Europe, Western Asia. British.

COMARUM L.

Comarum palustre L. Marsh Cinquefoil. (*Potentilla Comarum* Nestl.)

Rootstock almost woody, thick, decumbent. Stem 1 to 2 feet high, often purplish. Leaflets usually 5, shortly pinnate at the end of the stalk, oblong, toothed, hoary beneath, or softly hairy on both sides. Stipules entire. Flowers in a loose, irregular corymb, dingy purple or very dark red. Inner calyx-segments broad, outer ones narrow and much smaller. Petals shorter than the calyx. Carpels many, small, on a rather enlarged receptacle.

Marshes, peat bogs, etc., from the plains to 5000 feet; not common in Switzerland. June, July.

Distribution.—Central and Northern Europe (Norway), Arctic Asia and N. America. British.

FRAGARIA L. Strawberry.

The habit, foliage, and flowers are those of *Potentilla*, but the fruit is succulent, formed of the enlarged receptacle, studded with numerous 1-seeded carpels, looking like seeds.

A small genus, widely spread over the northern hemisphere, with one or two species in S. America.

In Switzerland, in addition to the Oriental *Fragaria indica*, which is sub-spontaneous in Tessin, there are 3 indigenous species:

Fragaria viridis Duchesne (*F. collina* Ehrh.).

Calyx erect in fruit. Often without stolons. Stems as long as the leaves, covered with spreading hairs. Flowers often greenish white. Fruit detached with difficulty from the calyx.

Hills and woods. Common in sub-alpine regions. May.

Distribution.—Europe, Caucasus, Canaries, Siberia.

Fragaria vesca L. Common Strawberry.

Calyx spreading or reflexed in fruit. Usually with slender stolons. Leaves mostly radical, covered with silky hairs like the stems.

Fruit easily detached from the calyx. Flowers white, rather smaller than the last.

Woods and clearings, banks, etc., in the plains and sub-Alps. May.

Distribution.—Europe, including British Isles, Asia, N. Africa, N. and S. America.

Fragaria elatior Ehrh, (*F. moschata* Duchense). Hautboy Strawberry.

Stems longer than the leaves. Flowers quite large. Calyx spreading horizontally. Fruit adhering to the calyx. A larger and more robust plant. Woods and banks. April to June.

Distribution.—Central and Eastern Europe; Northern Asia, Japan.

GEUM L.

Herbs with a short perennial stock and annual erect stems. Leaves pinnate, with few unequal segments, and yellow, red, or white flowers, growing singly on long peduncles at the ends of the stem or branches. Calyx of 5 equal divisions, with 5 very small outer ones alternating. Petals 5. Stamens numerous. Carpels numerous, 1-seeded, ending in a hairy awn, which is hooked at the tip.

A small genus, spread over the temperate and colder regions of Europe, Asia, and North America, and descending along the Andes.

Geum montanum L. (Plate XVI.)

Rootstock more or less horizontal, and with long fibres. Stem erect, about 6 or 8 inches high, villous like the leaves, 1-flowered. Root-leaves lyrate-pinnatifid; segments ovate or roundish, obtuse, unequally crenate, the lower ones much smaller, the terminal one very large, obscurely lobed; stem-leaves small, 3-cleft, dentate. Flowers very handsome, golden yellow. Achenes forming a nearly globular head, villous. Regarded by the inhabitants of the Alps as having wonderful properties in healing various diseases.

Pastures and rocky places of the Alps, from 4500–9500 feet. Much commoner than *G. reptans*, which is purely Alpine. June, July.

Distribution.—Carpathians, Balkans, Eastern, Central, and Western Alps; Pyrenees, Corsica.

Geum rivale L. Water Avens.

Stems erect or ascending about a foot high. Leaves mostly radical, with a large, orbicular terminal segment, coarsely toothed or lobed, or sometimes divided into 3, and a few very small segments lower down the stalk. Flowers few, drooping, dull purplish red, with a tinge of orange. Carpels very hairy, in a globular head.

Damp places near rivers, etc., especially in the mountain districts. May to July.

Distribution.—Europe, Western and Northern Asia, N. America. British.

DRYAS L.

Dryas octopetala L.

Stem somewhat shrubby and woody, branched, prostrate, forming flat cushions, extending sometimes a couple or more feet from one root. Leaves evergreen, cordate-ovate, crenate, blunt, glabrous and shining on the upper surface, white and hoary beneath. Stipules lanceolate-subulate, more or less hairy like the leaf-stalk and flower-stalk. Calyx and upper part of flower-stalk with short, glandular hairs. Flowers solitary, large, white, terminal. Seed-vessel feathery in fruit. Petals 8-9. Calyx 8-9 lobed.

Rocky places and high pastures, especially on limestone, from 4300 to 9000 feet, and occasionally descending to the plains; frequent. June to August.

Distribution.—Mountain ranges of Europe from the Pyrenees to the Caucasus, Arctic Europe, Siberia, N. America; Scotland.

There are only 2, or possibly 3, species of this genus; the present one is found fossilized in parts of Europe.

RUBUS L.

Except for the Wild Raspberry (*Rubus idæus*), and the Stone Bramble (*R. saxatilis*) very few of this large genus are ever seen in the sub-alpine region of Switzerland.

Rubus saxatilis L. Stone Bramble.

Rootstock woody but slender, with a few creeping runners rooting at the nodes, and erect or ascending simple stems, 5-10 inches high, slender and either unarmed or with a few small prickles. Stipules lanceolate. Leaflets usually 3, pale green and thin in texture. Flowers on slender pedicels, 2-3 in the axils of the upper leaves, forming very short racemes. Petals very narrow, dirty white or greenish yellow. Fruit red, shining, with only 2 or 3 large drupes.

Open woods and steep mountain sides. Flowers in June; fruit in August.

Distribution.—Spread over the mountain regions of Europe, Central and Northern Asia, and descending to lower elevations in more northern latitudes. British.

ROSA L.

This well-known and well-marked genus is widely diffused over the northern hemisphere, in the new world as well as the old.

In the sub-alpine region of Switzerland and the Jura, the chief species are the following:

R. alpina L., *R. pomifera* Herrm. (with very large fruits); *R. spinosissima* L. (fairly common in the Jura); *R. tomentosa* Lin.,

R. agrestis Savi, *R. elliptica* Tausch, *R. eglantheria* L., *R. abietina* Gren. and *R. glauca* Vill.

Rosa alpina L. *R. pendulina* L. (Plate XII.)

Stem 1-4 feet high, according to position. Prickles straight, horizontal or pointing downwards, crowded on the barren shoots, usually wanting on the flowering stems. Leaflets in 3-5 pairs, elliptical, serrate, glabrous or hairy beneath, dark green on upper, lighter on under side. Flowers solitary, deep rose-red, fragrant, the size of an ordinary dog-rose. Calyx-teeth entire, broader near the apex, as long or longer than petals. Hip scarlet, elliptical, but narrowed to a neck at the top, or rarely globular, and sometimes flask-shaped, fleshy, drooping, crowned by the erect calyx-teeth.

Margins of woods, stony pastures, and bushy places from 3000 to 8000 feet, but not often above 6000 feet. June, July.

Distribution.—Vosges, Jura, Cevennes, Corbières, Pyrenees. Alpine chain from east to west. Dalmatia, Croatia, Transylvania.

Rosa pomifera Herrm. (Plate XII.)

Leaflets 5-7, lanceolate or elliptical, greyish green beneath, or sometimes purplish, usually glandular-pubescent on both sides. Sepals glandular-ciliate, usually all pinnatifid, as long as the petals. Fruit globular, large, often covered with bristles, but very variable. A rather low, tufted bush.

Roadsides and mountain slopes up to 5000 feet. June, July.

Distribution.—Eastern, Central, and Western Alps; rare in the Jura; Central Europe; Western Asia.

SORBUS L.

Sorbus Aria Crantz. White Beam-tree. (Plate XVIII.)

Sometimes a mere shrub, but growing into a moderate-sized tree. Leaves ovate or elliptic, green and glabrous on upper side, covered with a soft white cotton on the under side, doubly toothed, or occasionally slightly lobed, the lobes decreasing towards the base. Flowers white, in corymbs at the ends of the short leafy branches. Styles 2. Fruit an orange-red globular berry, with mealy pulp and slightly acid taste.

Woods and rocks among the mountains, extending at least to 4500 feet, as on the Col des Montets and the Col des Aravis in Haute Savoie. On the latter Col there is a fine tree above the village of La Giétaz. It flowers in May, and the fruit is ripe in September.

Distribution.—Central and Southern Europe, extending northward into Scandinavia and the British Isles, Central Asia, Altai and Himalaya; N. Africa.

N.B.—See p. 261 for the closely allied *S. scandica*, etc.



PLATE XII.

4/7 NATURAL SIZE.

1. ROSA ALPINA.

2. ROSA POMIFERA.

3. VACCINIUM VITIS-IDÆA.

4. ARCTOSTAPHYLOS UVA URSI.

AMELANCHIER Medicus.

Amelanchier vulgaris Moench. (*Aronia rotundifolia* Pers.). (Plate XVIII.)

A shrub of from 3 to 6 feet high. Leaves ovate, obtuse, finely toothed, white tomentose beneath, but finally glabrous and leathery, blade twice the length of the petiole. Flowers white, in small corymbs. Petals 5, rather long and narrow. Styles 5, united at the base. Ovary inferior. Fruit globular, pulpy, sweet, as large as a large pea, bluish black at maturity.

Rocks, dry hillsides, and stony places in the lower mountains, especially in the south. The bit figured came from above Argentière, in Savoy, at about 4500 feet. Flowers, April, May; fruit, August, September.

Distribution.—Central and Southern Europe, Western Asia, N. Africa. It seems to prefer limestone hills.

ONAGRACEÆ

Herbs with opposite or alternate leaves, and often showy flowers, which are usually regular, 4-merous or 2-merous. Calyx-lobes 2 or 4, valvate in bud. Petals 2 or 4. Stamens 2-8. Ovary 2-6 celled, when many-seeded with axillary placentation.

A considerable family, ranging over the whole world, but in the greatest variety in N. America.

EPILOBIUM L. Willow-herb.

Herbs mostly erect, with annual flowering stems and creeping stolons. Flowers axillary or in terminal spikes. Calyx-tube long, slender, with 4-partite limb. Petals 4. Stamens 8. Ovary 4-celled. Stigma 4-lobed. Seeds tipped with a tuft of long hairs.

This genus is diffused over nearly the whole world, from the extreme Arctic regions to the tropics.

Epilobium alpinum L.

Allied to *E. alsinefolium*, but much smaller in its leaves, flowers and stature. Stem 2-6 inches high, erect, or ascending from a creeping base, simple, 2-sided from 2 downy lines running down from the margins of the leaves, otherwise glabrous, like the leaves. Leaves obtuse, entire, or with a few small teeth. Upper leaves lanceolate, alternate. Flowers small, rose-coloured in the axils of the uppermost leaves. Stigma club-shaped. Capsule glabrous, with a few scattered hairs.

Damp, sandy places by springs and streams in the Alps and lower Alps up to 8600 feet. July, August.

Distribution.—Mountains of Europe, including the Arctic regions, N. America, Central and Northern Asia. British.

Epilobium angustifolium L. Rose-bay. (Plate XXIII.)

A handsome plant, 2-4 feet high, simple or slightly branched, glabrous or somewhat hoary. Rootstock creeping, and hence and also to the numerous light seeds carried by the wind, this plant is rapidly increasing in Europe. Leaves lanceolate, very shortly stalked, finely toothed or entire. Flowers large, purplish rose, or very rarely pale pink or flesh-coloured, in long terminal racemes. Pod 1-2 inches long, slightly hoary. Stigma deeply 4-lobed.

Banks, woods and hillsides from the plains up to 5000 feet in Switzerland. June, July.

Distribution.—Mountains of Central Europe and Asia, and the plains of Northern Europe, and in Norway nearly to the birch limit; Northern Asia and N. America. British. It appears frequently in waste places, and has lately established itself on waste ground in central London.

Epilobium Fleischeri Hochst. (Plate XXIII.)

Sometimes considered a dwarf Alpine variety of *E. rosmarinifolium* Haenke = *E. Dodonai* Vill. Stem ascending from a creeping and woody base. Leaves linear or narrowly lanceolate, the same colour on both sides, glabrous, not veined. Flowers large and handsome, bright rose-purple. Style hairy up to above the middle, half as long as stamens. A cymose panicle of few flowers. Somewhat variable. Calyx usually dark carmine.

Moraines and sandy, stony places by mountain torrents in the Alps and sub-Alps, especially on primary formations and siliceous rocks; local, and not often seen above 7000 feet. July, August.

Distribution.—Eastern, Central and Western Alps; rare in the Jura. Transylvania.

CIRCÆA L.

Circæa alpina L.

A small, delicate green and glabrous plant resembling the common Enchanter's Night-shade, but smaller in all its parts. Seldom more than 6 inches high. Leaves very thin, and often glossy; the capsules smaller, less hairy, and much narrower than in the common species.

Damp, shady, and stony places and mountain woods, up to 6000 feet. June to August.

Distribution.—Jura, Alps, Vosges, Cevennes, Pyrenees, Corsica; Europe from Scandinavia to the Caucasus; Northern Asia, N. America. British.

CRASSULACEÆ

Herbs or shrubs with succulent leaves, mostly alternate; no stipules, and flowers in terminal racemes or cymes. Sepals 3 or more, usually 5. Petals as many, sometimes united in a single corolla.



PLATE XIII.

4/7 NATURAL SIZE.

1. ANTENNARIA DIOICA.

3. PYROLA UNIFLORA.

5. HYPERICUM MACULATUM.

2. HYPERICUM RICHERI.

4. PYROLA SECUNDA.

6. MYRICARIA GERMANICA.

Stamens as many or twice as many, inserted with the petals at base of calyx. Ovary superior. Carpels 3-5 or more, usually quite distinct. Ovules numerous, attached to the ventral suture.

A large family spread over the greater part of the globe.

SEDUM L.

Succulent herbs, sometimes woody at the base, with scattered leaves, sometimes opposite or whorled, especially at the base or on barren stems. Sepals 4-6, usually 5. Petals as many. Stamens twice as many. Carpels as many as the petals, each with an entire or emarginate scale at the base, and with several seeds.

A large and widely spread genus, especially in Central and Southern Europe and Central Asia.

Sedum album L. White Stonecrop. (Plate XVI.)

Stock creeping and procumbent, with short, barren stems, and erect, flowering branches, 4-6 inches high, glabrous. Leaves oblong or cylindrical. Flowers usually pure white, but sometimes pale pink, numerous, in beautiful terminal cymes. Sepals short, oval, obtuse. Petals oblong and obtuse.

Rocks, walls, etc., very common from the plains to the sub-alpine region. July, August.

Distribution.—Europe, Western Asia and Siberia, N. Africa. British.

Sedum villosum L. Hairy Sedum.

An annual, with erect, simple stems, 4 to 5 inches high. The upper portion of the plant more or less covered with short, viscid hairs. Leaves alternate or scattered, oblong or cylindrical. Flowers few, pale rose-colour, in a loose terminal cyme. Sepals green, ovate. Petals ovate, twice as long as the sepals.

Marshes and turf bogs, and by rivulets in the mountains. Extends in Switzerland up to the Alpine region, but is local. June, July.

Distribution.—Central and Northern Europe, Greenland, Algeria. British.

Sedum atratum L. (*S. rubens* Wulf.).

Stem 1-3 inches high, ascending or erect, simple or branched at the base, glabrous like the whole plant, often dotted or streaked with red. Leaves club-shaped, fleshy, obtuse, somewhat flat on upper side. Flowers yellowish or greenish white, in a terminal, often unilateral, cyme. Calyx reddish brown; capsule dusky purple, and the whole plant reddish when older. Annual or biennial.

Alpine rocks and dry pastures, 4300-9000 feet, or higher. July, August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Pyrenees, Balkan provinces.

Sedum annuum L.

Annual. Quite glabrous and very small. Leaves slender, linear or sometimes cylindrical, green. Flowers in elongated cymes, yellow. Sepals obtuse.

Dry, stony places and rocks of primary formation up to 8200 feet. July, August.

Distribution.—Nearly all Europe, Western Asia, Greenland.

Sedum roseum Scop. (*Rhodiola rosea* L.). Rose-root.

Robust, 6–12 inches high. Rootstock tuberous and thick, with scent of roses. Buds scaly. Stem simple, erect, very leafy. Leaves ovate-elliptical, serrate towards the apex, densely crowded. Flowers small, greenish yellow or reddish, unisexual and dioecious.

Primary rocks, 4000–8000 feet ; local. July, August.

Distribution.—Central and Northern Europe, Siberia, Himalaya, N. America. British. Canadian Rockies, 7000 feet. (E. Whymper.)

SEMPERVIVUM L.

Robust fleshy herbs, with perfect flowers in paniced or corymbose cymes. Petals and calyx-teeth 6 or more, the petals being distinct or connate. Stamens generally twice as many as petals. Carpels free or connate, adnate to calyx-tube, many-seeded.

About 50 species, inhabiting Europe, Asia, and Africa.

Sempervivum tectorum L. House-leek.

Rosettes large, and whole plant robust and often a foot or more high. Rosette leaves suddenly narrowed into a mucro ; stem-leaves broadly linear, spreading. Petals lanceolate or linear, twice as long as calyx-teeth, pink.

Rocks, especially limestone, up to 8200 feet. June to August.

Distribution.—Europe, especially central ; Caucasus, Persia.

Naturalised in Britain, and generally in Europe, except in the Alps. It was formerly planted on roofs and walls as a supposed protection against lightning.

Sempervivum arachnoideum L.

Rosettes with lanceolate or obovate leaves, abruptly acute, covered with short glandular hairs, stiffly ciliated, bearded at the apex, with radiating, spider's web-like hairs, uniting the ends of the leaves. Petals narrowly lanceolate, acuminate, 3 times as long as the calyx, rose-red, sometimes with a darker streak. The stem and stem-leaves often reddish.

Rocks of the Alps and sub-Alps, 4000–9500 feet ; widely spread but local, and much rarer on limestone than siliceous rock, e.g. it has not been recorded from the whole range of the Jura, where its place is taken on the Reculet, etc., by a somewhat similar species, *S. Fauconneti* Reuter, intermediate (though not a hybrid) between this and *S. montanum*.

S. arachnoideum sometimes covers the rocks in immense masses, and the rosettes are often quite white with 'spiders' webs.'

Distribution.—Carpathians, Eastern, Central, and Western Alps, Pyrenees, Central Plateau of France, Cevennes, Corbières, Apennines.

Sempervivum montanum L.

Rosettes with lanceolate-wedge-shaped, shortly acuminate leaves, glandular-villous on both sides, obscurely ciliated with longish hairs. Stem-leaves lanceolate, somewhat broader towards apex. Petals lanceolate-subulate, very acute, 3 or 4 times as long as the calyx, deep lilac, with a darker streak.

A taller and more robust plant than the last, and less common, though widely spread on primary rocks, and especially on the isolated blocks of rock called 'Befen.' It reaches 9600 feet, and rarely descends into the valleys.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Pyrenees, Corsica.

Sempervivums are most attractive plants for walls and rockeries, and they are readily increased by division of the offshoots. They are all of very easy culture in any light soil in hot aspects, and may be grown on almost any kind of rock. They can be attached to rock by means of fairly moist clay and the plant dibbled in, and they will soon grow and make a good clump.

SAXIFRAGACEÆ

Herbs (in Europe) with alternate or opposite leaves, and no stipules. Calyx free, or more or less adherent to the ovary, with 4 or 5 lobes or segments. Petals as many, perigynous, or none. Stamens as many, or twice as many, perigynous. Ovary 1-3 celled. Ovules numerous, on axillary placentæ. Fruit a 2-4 celled capsule. Seeds usually many.

An extensive family, ranging over nearly the whole world.

SAXIFRAGA L.

Herbs, mostly with a perennial tufted stock, with radical or alternate or sometimes opposite leaves, no stipules. Flowers terminal, solitary, or in cymes or panicles. Calyx free or partly adnate to the ovary. Ovary 2-lobed, 2-celled. Styles 2. Capsule 2-valved, 2-beaked.

A large genus of about 200 species and many varieties, chiefly mountain or rock plants, found in all the great mountain chains of the northern hemisphere, some extending to the further Arctic stations, and thus along the Andes to the Antarctic circle, and a few descend to the hot limestone rocks of the Mediterranean region.

Saxifraga petræa L.

Stem solitary, decumbent, leafy, paniculate. Flower-stalks 1-flowered, with 2 bracts. Leaves pinnately 3-cleft, inciso-dentate lower leaves, nearly reniform; uppermost wedge-shaped at base, entire or 3-cleft, the lobes acuminate; leaf-stalk of lower leaves elongated, furrowed. Petals white, obovate, twice as long as calyx.

Damp rocky places on limestone, often descending to a low elevation; 2000–5300 feet. May to July.

Distribution.—Carpathians, Eastern Alps; rare.

Saxifraga paradoxa Sternb. (*Zahlbrucknera paradoxa* Rchb.).

Stem prostrate. Leaves distant, lower ones long-stalked, cordate-reniform, 5–7 lobed, lobes obtuse or shortly acuminate; upper leaves 3-lobed. Flowers solitary, at length long-stalked. Petals green, shorter than the sepals. Calyx half-inferior; the small calyx-teeth narrowly lanceolate, acute.

Damp rocks, especially overhanging slabs of gneiss, preferring the darkest corners of the hollows; 3300–6000; rare.

Distribution.—Only in Western Styria, Carinthia, Southern Tyrol, and on the border between Tyrol and Lombardy.

Saxifraga rotundifolia L. Round-leaved Saxifrage. (Plate XIV.)

Stem erect or ascending, leafy, terminating in a loose, paniculate, glandular-downy cyme. Leaves hairy, cordate, roundish or reniform; root-leaves and lower stem-leaves long-stalked, coarsely dentate, uppermost sessile, broadly wedge-shaped, and unequally cut. Calyx-teeth spreading. Flowers star-like, milk-white, spotted with red above and yellow below the middle. Petals narrowly lanceolate.

Damp Alpine and sub-alpine woods and shady places from 3000–7000 feet. June to August.

Distribution.—Alps, Pyrenees, Central and Southern Europe, Corsica, Caucasus, Asia Minor, Armenia.

Saxifraga Hirculus L.

Perennial stock often reduced to a mere tuft. Leaves alternate, almost linear, entire. Flowering-stems ascending to about 6 inches, leafy, and terminating in a large, single yellow flower, with narrow-obovate or oblong petals. Capsule rather large. Calyx-segments reflexed, not half the length of the petals.

Sphagnum bogs and wet mountain moors. July, August.

Distribution.—Jura, rare in Switzerland, Central, Northern, and Arctic Europe; Caucasus, Thibet, Himalaya; North and Arctic America; rare in Britain.

Saxifraga tridactylites L.

A small annual, 2–5 inches high, usually branched and more or less covered with glandular down. Leaves very small, entire or



PLATE XIV.

4/7 NATURAL SIZE.

1. SAXIFRAGA ROTUNDIFOLIA. 2. S. STELLARIS.
 3. S. CUNEIFOLIA. 4. S. AIZOIDES (WITH RED VARIETY).
 5. S. AIZOON.

3-lobed. Flowers small, white, single, on longish pedicels. Calyx-segments barely half as long as the petals.

Rocks, walls, and stony hillsides; common. Seen as high as 7000 feet in Switzerland. April to July.

Distribution.—Europe from the Mediterranean to the Arctic Circle, Russian Asia. British.

Saxifraga stellaris L. (Plate XIV.)

Stem erect, 1–4 inches high, leafless, with exception of the bracts, bearing a 3 or more-flowered cymose corymb, covered, like the whole plant, with scattered glandular hairs. Leaves forming a loose rosette, grass-green, wedge-shaped or obovate, coarsely serrate near the apex. Calyx with revolute teeth. Petals lanceolate, rather acute and small, expanded like a star, white, with 2 yellow spots at the base; anthers vermilion-red.

Damp shady rocks, and exposed mountain tops and cols near the snow; 4000–8500 feet; common on primary rocks. July, August. It grows at the extreme summit of Ben Nevis, the highest point in the British Isles.

Distribution.—Mountains of Central and Northern Europe as far as the Arctic Circle; Alps, Pyrenees, Vosges, Cevennes, Siberia, N. America, British Isles.

S. stellaris var. *robusta* Engler (*S. Engleri* Dalla Torre) appears to be a strong form of *S. stellaris* with unequal petals, found in Switzerland and Tyrol. We have such a form also from Norway, with very thick and large leaves.

Saxifraga cuneifolia L. (Plate XIV.)

Stem 4 inches to a foot high, very brittle. Shoots in a series of rosettes one above the other. Leaves roundish-obovate, wedge-shaped or spatulate, very obtuse, wavy-crenate, quite glabrous, with cartilaginous margin. Leaf-stalk flat, wedge-shaped, glabrous. Inflorescence paniculate. Calyx-teeth recurved. Petals milk-white, with 2 coalescent yellow spots. Filaments broader upwards.

Damp, shady woods and rocks, and steep rocky declivities of the lower Alps; 3000–6500 feet; local; but sometimes covering rocks and banks in woods with enormous mats. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Cevennes, Pyrenees, Corbières, Spain, Apennines.

A very useful plant for covering rocks or unsightly banks or old walls in the shadier parts of the rock-garden.

Saxifraga aspera L.

Stem with prostrate, tufted branches. Leaves on fertile stem, and barren shoots spreading, stem-leaves rigid, linear-lanceolate, with stiff cilia, entire. Stem 3–7 flowered, about 6 inches high. Flowers pale yellow. Calyx patent. Anthers yellow.

Rather moist, stony places on the primary rocks ; 3300-8000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps ; Pyrenees, Spain.

Saxifraga mutata L.

Stem erect, springing from a rosette of large leaves. Stem ends in a racemose cyme, covered with viscous hairs, like the bracts, flower-stalks, and calyx ; ultimate branches 1-many flowered. Rosette-leaves thick, stiff, glabrous, tongue-shaped, or obovate-lanceolate, flat, obtuse, with a cartilaginous white margin, densely fringed below, inconspicuously serrate towards apex or entire, with distant, inconspicuous dots which are encrusted with lime when young. Stem-leaves smaller and passing into bracts. Petals linear-lanceolate, acute, orange-yellow. Sepals oval, obtuse, much broader than the petals.

Damp, rocky places and among débris in limestone mountains, descending into the valleys. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps. Not found in the Jura or high Swiss Alps, but occasionally in the plains.

Saxifraga aizoon Jacq. (Plate XIV.)

Root putting out naked runners bearing half-closed rosettes of leaves. Stem erect, 3-10 inches high, bearing a loose racemose cyme, glandular-hairy like the bracts, flower-stalks, and calyx, or calyx and lower part of stems glabrous. Branches 1-3 flowered. Rosette-leaves thick, stiff, glabrous, with cartilaginous teeth, and depressed dots near the margin ; teeth sharp, covered like the dots with a white, at length deciduous, calcareous incrustation. Stem-leaves much smaller and more wedge-shaped, passing into the bracts. Petals obovate, obtuse, snow-white or sometimes cream-coloured, and often dotted with red. Very variable in size, colour, and habit, but nurserymen are too apt to give names to so-called varieties which are not always constant in their characters.

Common in rocky places in calcareous mountains up to 8500 feet. June to August.

Distribution.—Carpathians, Silesia, Bohemia, Eastern, Central, and Western Alps ; Jura, Vosges, Black Forest, Corbières, Pyrenees, Caucasus, Siberia ; North America.

Saxifraga Cotyledon L.

Stem 10-16 inches high, forming a many-flowered, loose, somewhat pyramidal panicle, branched from the base, glandular-hairy ; the middle branches 5-15 flowered. Leaves of radical rosettes tongue-shaped, entire, pointed or mucronate, dotted near the serrated margin with an incrustation of lime, serratures carti-

laginous at the apex. Stem-leaves smaller, passing into bracts. Petals white, often spotted with red, or more rarely with purple, wedge-shaped.

Primary rocks, especially granite, from 3500–6500 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, abundant on Italian side of Simplon Pass; Pyrenees, Scandinavia, Iceland.

Saxifraga lingulata Bellardi.

Stem 6–18 inches long, glabrous, rather slender, and often drooping, branching from the middle or sometimes lower, with several small linear and sometimes indented leaves. Rosette-leaves linear-oblong, elongated, channelled above, rather pointed at apex, thick, entire, with an encrusted indentation at the curved-in margin. Rosettes somewhat loose and erect. Flowers milk-white, in long and rather unilateral panicles, with branches of 2–6 flowers. Calyx glabrous, but slightly rugged, with lanceolate-obtuse lobes. Petals ovate, wedge-shaped. Stamens subulate.

Limestone rocks from 3000–5300 feet; very local. June, July.

Distribution.—French and Italian Maritime Alps and Ligurian Alps, with the Col di Tenda as a centre; Hautes-Alpes, Basses-Alpes, Var, Sardinia, Sicily.

It forms exquisite drooping plumes of blossom on the rocks about Tenda in company with the rather smaller *S. cochlearis*.

Saxifraga lantoscana Boiss. et Reut.

Stem usually shorter than in *S. lingulata*, of which it is sometimes considered a variety. Rosette-leaves linear-spathulate, broader towards the apex, with white calcareous patches, obtuse and shorter than in *lingulata* and not channelled. Flowers milk-white, with fine lines of red dots. Inflorescence more or less unilateral. Calyx campanulate, with lanceolate-obtuse teeth.

Limestone rocks in the district round St. Martin Lantosque in the Maritime Alps, at Mont de la Chen in the Var, and possibly in Liguria.

The long discussion upon the last two Saxifrages alluded to in *Alpine Plants of Europe* was summed up by Mr. T. A. Sprague, B.Sc., in a paper entitled *Saxifraga lingulata and S. lantoscana*.¹

Saxifraga cochlearis Reichb.

Stem 4–12 inches long, glandular except at the summit, slender, reddish brown, branching above the middle into a rather dense, usually short and sometimes glandular panicle, with usually 3 flowers on each branch. The panicle in exceptionally large specimens from Tenda, which the writer measured, was 7 inches in length. Rosette-leaves quite short, broadly linear at the base and suddenly

¹ *Kew Bulletin* (1911), No. 3. See also *Gardener's Chronicle*, March 16th, 1912, and December, 1874.

dilated into a sub-orbicular limb or rounded, spoon-shaped apex, coriaceous and rugged in texture, encrusted at the margins with lime. Stem-leaves narrowly oboval, very small and slightly glandular. Flowers milk-white. Petals obovate, wedge-shaped. Calyx glandular with obtuse lobes.

Sub-alpine limestone rocks in the French and Italian Maritime Alps, particularly about the Tenda road, and also abundantly on some of the adjoining mountains of Liguria further east, where it descends to about 1300 feet at Buggio in the Nervia Valley, and ascends to 5500 feet. Endemic in this district. June, July.

Saxifraga crustata Vest.

Stem 2-4 inches high, erect, racemose above, glandular-hairy, branches naked, few-flowered at the head of the stems. Rosette-leaves broadly linear, obtuse, entire, the cartilaginous margin strongly encrusted. Petals white, obtuse, obovate or wedge-shaped.

High calcareous Alps, but descending below the Alpine region as, e.g. in the deep and narrow valley at Weitenstein; 3000-7200 feet. June to August.

Distribution.—Carpathians, Tyrol to Carinthia.

Saxifraga cæsia L.

A small grey species, a few inches high, with cylindrical tufts of densely imbricate leaves. Stem ascending from a hemispherical rosette of leaves, and bearing a 1-6 flowered corymbose cyme. Stem-leaves and calyx glabrous and glaucous, or with a few glandular hairs. Lower leaves with recurved margins, hard, thick, linear-lanceolate, nearly triquetrous, acute, entire, dotted with pores at the margin, fringed at the base, when young encrusted. Stem-leaves smaller, linear. Petals obovate, obtuse, white; twice as long as the sepals.

Limestone rocks and screes from the snow-line downwards, and sometimes descending into valleys with the débris of streams. June to August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Apennines. Plentiful near the top of the Gemmi Pass.

Saxifraga aizoides L. *S. autumnalis* L. is the earlier name, Linnæus having given two names to the same plant. (Plate XIV.)

Stem erect or ascending, leafy, bearing a numerous-flowered, racemose cyme, but often only 2-3 flowered, hairy, especially at the summit. The root sends out numerous tufts of leafy shoots. Leaves glabrous, grass-green, nerveless, entire, linear or linear-lanceolate, more or less ciliate, apiculate, alternate, crowded at the apex of the shoots. Calyx hairy at base. Petals linear-lanceolate, as broad as the calyx-teeth, yellow or orange, or indeed any shade from pale yellow to deep orange-red. Stamens orange-yellow.

Common in damp places by streams, etc., in the Alps; 3000–8000 feet, and occasionally seen at even 10,000 feet. June to September.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Southern Jura, Pyrenees, Apennines, Central and Arctic Europe, Ural Mountains, North America. British. It is brought down by streams to rocks on the Ayrshire coast.

S. atrorubens Bertol. is merely a variety with deep red flowers and leaves with stiff cilia at the margin. It is recorded from Tyrol, and we have seen it in the sand of a mountain torrent near Engelberg in Switzerland and occasionally in Savoy, as above Argentière. Probably it is by no means rare.

Saxifraga tenella Wulf.

Shoots prostrate or erect. Stem with buds in the leaf-axils, ascending, glabrous, branched. Leaves linear-subulate, cuspidate (or awned), stiffly ciliate or glabrous, with one dot on upper side near the apex. Calyx-teeth cuspidate. Flowers whitish, small. A slender, green plant, 4 inches high.

Rocky places from 3300–6000 feet in Styrian and Julian Alps. July.

MUSCARIA GROUP

Most of these are high Alpine plants, but a few descend lower.

Saxifraga moschata Wulf. (*S. varians* Sieb.).

A most variable and perplexing plant, whose synonymy appears little understood, and has sometimes been confused with *S. muscoides* All. It is one of the commonest and most variable of high Alpine Saxifrages. A small, usually hairy-glandular species, 1–4 inches high, forming dense and often large tufts. Stem slender, with a few small leaves, and branched at the top into a loose cyme with 2–6 flowers, though sometimes single-flowered. Leaves more or less glabrous, linear, and entire, or more frequently wedge-shaped and 2–5 cleft, nerves showing when dry only. Flowers pale or bright yellow, or rarely purple-brown, with dull yellow anthers, star-shaped. Petals rounded and slightly longer than the sepals.

Rocks, belts of turf and mould and Alpine pastures from 4000–14,000 feet. (At 4000 feet on the Salève.) June to August.

Distribution.—Eastern, Central, and Western Alps; Southern Jura, Carpathians, Pyrenees; Central and Southern Europe, Caucasus, Altai.

Saxifraga exarata Vill.

A very viscid, glandular, cæspitose species, and variable like the last. Stems slender, with 1–3 small entire or trifid leaves, 4–10 flowered. Lower leaves imbricate, in dense tufts, bright green, viscous, strongly nerved, linear-oblong or oblong wedge-shaped,

entire or more frequently 2-3 fid at the apex. The older leaves are reddish brown. Petals yellowish white, small, more or less oboval, once or twice as long as the sepals, which are oblong-lanceolate and sub-obtuse.

Damp rocks and Alpine pastures; 5000-10,800 feet. June to August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Caucasus, Arctic regions.

This species is found as far south as the mountains of the Var, the highest ridge, called La Chens, being 1713 metres. There also appear *S. Aizoon*, *S. lingulata*, *S. hypnoides*, and *S. cuneifolia*.

Saxifraga obscura G. et G., *S. nervosa* Lapeyr, *S. iratiana* Schultz, *S. pentadactylis* Lapeyr., and the handsome *S. geranioides* L. are Pyrenean species belonging to this section.

Saxifraga geranioides L.

A hairy-glandular, robust plant, 6-12 inches high. Flowers large, white, tubular, with very narrow petals. Sepals lanceolate-acute. Rosette-leaves on a winged petiole with 1 nerve, sub-orbicular in outline, with 3-5 almost oval divisions which are entire or toothed.

Distribution.—Rocky places in the Pyrenees and Corbières.

Saxifraga pedemontana All.

A viscous, glandular plant, about 6 inches high, with 3-9 large, white, tubular flowers. Stem branched, and forming a loose corymb. Leaves cuneate or fan-shaped, 3-5 cleft, with each lobe 3-cleft again; upper leaves simple. Petals 3-nerved, linear-lanceolate, at least twice as long as the very acute sepals, and suddenly contracted into a claw.

Granitic rocks in shady and rather moist places, from 5000-7800 feet; very rare. July.

Distribution.—Piedmont and Liguria; Maritime Alps, Transylvania, and rarely in Switzerland in the Binn and Monte Rosa districts. In habit and size of flowers, but not in the leaves, this resembles the Pyrenean *S. geranioides*.

Saxifraga hypnoides L.

Leaves of shoots entire and 3-cleft, narrow, linear, and pointed, those of rosettes 3-5 cleft, glabrous or more or less ciliate. Stems 3-6 inches long, with very few linear leaves, and from 1-6 rather large white flowers. Calyx-segments pointed and not one-third as long as the petals.

Rather moist, rocky places in the limestone mountains of Western Europe, descending sometimes to low, hilly districts. Abundant in Scotland, Wales, Ireland, and Northern England, but very local in the south, as e.g. at Cheddar Cliffs. May to July.

Saxifraga cæspitosa L.

Much stouter than the last and covered with short, glandular hairs, and never with the procumbent, barren shoots of that species; the leaves are broader, more obtuse, and more frequently lobed (3-5 segments), and the calyx-lobes are obtuse. The leaves form very dense green tufts, closely packed together. Flowering-stems 2-3 inches high, usually covered with short, glandular, downy hair, and bearing 1 or 2 white flowers, or occasionally more, in a loose terminal cluster. Flowers smaller than in *hypnoides*, being about twice as long as the obtuse sepals.

Rocks and stony mountains in Northern and Arctic Europe, and in very small quantity on one or two high Scotch summits. May to July.

Saxifraga sponhemica Gmel.

A very protean species, with the habit and lower leaves of *S. hypnoides*, and like it in sending out long sterile runners. Stem-leaves often trifid; root-leaves with a narrow petiole, flat, with 3-5 linear-lanceolate divisions, mucronate. Flowers 2-9 in a loose panicle. Sepals lanceolate. Petals oboval, with 3 greenish veins, twice as long as sepals or longer.

Rocky hills in North-Western and Central Europe, and possibly in Britain, as on Snowdon. June to August.

PARNASSIA L.

Parnassia palustris L. Grass of Parnassus. (Plate VI.)

Stem 6-12 inches high with a single perfoliate leaf below the middle, with a solitary terminal flower. Root-leaves rather long-stalked, broadly heart-shaped, acuminate, entire, glabrous. Flowers white, large. Petals obovate, beautifully veined, spreading, twice the length of the sepals, which are ovate and spreading. Imperfect stamens at base of each petal, with a tuft of 10-12 white filaments, each bearing a small, yellow, globular gland. Capsule globular, 3-4 valved.

Damp heaths and bogs and wet places from sea-level in England to 8000 feet in the Alps. But mostly sub-alpine. August, September.

Distribution.—Central and Northern Europe, W. Asia, Thibet, Japan, N. America. Common in Norway to above the birch limit.

This very beautiful and hardy plant might be much more cultivated in bogs with heaths, etc., below the rockery. It has disappeared from several places in the south of England, but can still be seen within seven miles of the centre of Birmingham. It is very common in Switzerland.

One simple leaf, an emerald heart,

Closes around its slender stem;

Not all the witchery of art

Could fashion such a faultless gem.—ALFRED HAYES.

CHRYSOSPENIUM L. Golden Saxifrage.

Small, fleshy, but delicate herbs, creeping at the base, with golden yellow flowering stems, orbicular leaves and small yellow flowers in short, leafy terminal cymes. Petals 0. Stamens 8-10. Ovary inferior, 1-celled. Capsule 2-lobed.

A small genus found in the temperate and colder regions of both hemispheres.

Chrysosplenium oppositifolium L.

In loose, leafy tufts spreading over a considerable area. Stems 4 or 5 inches high, usually forked at the top. Leaves all opposite, slightly crenate, with a few stiff hairs on the upper surface. Flowers small, sessile, in little compact yellowish green cymes, surrounded by similar leaves to the others, but smaller and golden yellow.

Wet, shady places in the sub-Alps and plains. May.

Distribution.—Most of Europe and Russian Asia, British Isles.

Chrysosplenium alternifolium L.

A more slender and rather taller species than the last. Leaves always alternate, and the lower ones on longer stalks and more kidney-shaped. Often growing with the other species.

Similar situations to the last, but rarer in Switzerland. May.

Distribution.—Europe, Northern and Central Asia, N. America, extending to the Arctic regions. Britain.

RIBES L. Currant.

Sometimes given a separate family (RIBESACEÆ). Shrubs with alternate leaves, no stipules and small, axillary flowers in racemes or rarely solitary. Styles 2. Stamens, petals, and sepals 4 or 5. Ovary inferior, 1-celled. Fruit a berry, the seeds being surrounded by pulpy juice.

A genus spread over the temperate regions of the northern hemisphere, with a small number of species in the Andes.

Ribes Grossularia L. Gooseberry.

A small, much-branched, prickly shrub, 2-4 feet high, the prickles being single or in twos and threes. Leaves orbicular, palmately divided into 3 or 5 crenated lobes. Flowers green, hanging on short pedicels. Berry small and yellowish, often covered with stiff hairs, but in the mountains frequently glabrous.

Stony, bushy places and roadsides in the plains and sub-Alps. It flowers in April, and the fruit ripens about August. In some Swiss valleys it ascends to 4500 feet, as for example in Val d'Anniviers.

Distribution.—Central and Southern Europe and Western Asia. N. Africa. Introduced into Britain.

Ribes rubrum L. Red Currant.

A branching shrub 3-5 feet high, without prickles. Leaves stalked, larger than in the Gooseberry, more or less glabrous above, downy beneath. Flowers small, greenish white, in axillary, pendulous racemes at the base of the year's shoots. Pedicels short. Berries red when ripe, or rarely yellowish.

Sub-spontaneous in rocky woods here and there in Switzerland. April, May.

Distribution.—Central and Northern Europe, N. and W. Asia, doubtfully indigenous in Britain. N. America.

Ribes petraeum. Wulfen.

About the height of the last and of *R. alpinum*. Leaves 3-5 lobed, lobes triangular, acute, doubly serrated, heart-shaped at the base, pubescent beneath. Inflorescence erect, pendulous after fertilisation. Sepals roundly oboval, reddish. Berries red, globular, acid.

Shady, rocky places in mountain and sub-alpine woods and glens. May, June.

Distribution.—Alps, Jura, Vosges, Corbières, Pyrenees, Central Europe, Caucasus, Armenia, Siberia, Algeria.

Ribes alpinum L.

Flowers small, yellowish green, always dioecious or unisexual; the males in little erect racemes about an inch long, with slender pedicels, the females, on separate shrubs, fewer together, in short racemes, often almost sessile. Berries small, red, tasteless.

Rocky mountain woods. May, June.

Distribution.—Central and Northern Europe, Caucasus, Siberia. British. N. America.

The Black Currant (*Ribes nigrum* L.), known by its scent and black berries, is rarely found wild in Switzerland.

UMBELLIFERÆ

Herbs with alternate leaves, often much cut and divided. Flowers small, regular, in terminal or lateral umbels (simple or compound). At the base of the umbel are often a few bracts constituting the involucre. Calyx-lobes 5, small or usually entirely wanting. Petals 5. Stamens 5. Ovary 2-celled, 2-seeded. Styles 2. Fruit separating when ripe into 2 one-seeded, indehiscent carpels. Leaf-stalk usually sheathing.

A large family, more or less represented nearly all over the globe, particularly numerous in Mediterranean districts and Western Asia.

HACQUETIA DC.

Hacquetia Epipactis DC.

Stem simple, leafless, about 4 inches high, bearing a single simple umbel with short rays and a large involucre 3 times the size of the umbel. Flowers small, greenish yellow. Calyx-limbs toothed. Leaves all radical, 3-5 lobed, glabrous.

Bushy places up to 5000 feet in the Eastern Alps, from Carinthia to Carniola. April, May.

ASTRANTIA L.

Herbs with mostly radical, palmately divided leaves. Umbels simple or compound; involucre large, membranous, and often purplish in colour. Flowers polygamous. Petals notched, with a long inflexed point. Calyx-limb with 5 long teeth. Carpels with 5 inflated crimped ribs.

A small genus extending over Central and Southern Europe to Western Asia.

Astrantia major L. (Plate XV.)

Stem 1-2 feet high or sometimes higher, erect, furrowed, glabrous like the entire plant, simple or more usually divided above into 2 or 3 branches. Leaves palmately 5-fid, lobes lanceolate or obovate-lanceolate, acute, undivided or 2-3 cleft, unequally doubly serrate; radical and lower stem-leaves long-stalked, upper ones mostly sessile. Secondary umbels many-rayed, collected into 1, 2, or 3 irregular umbellate cymes. Bracts of general involucre net-veined, coloured white and red like the petals, 2-3 cleft or toothed, upper ones usually entire; bracts of partial involucre lanceolate, entire, coloured, radiating, rather longer than the secondary umbel. Mountain pastures and damp, shady, woody places in the Alps, descending to the plains. June to September.

Distribution.—Carpathians, Sudenic Mountains, Eastern, Central, and Western Alps, Jura, Black Forest, Corbières, Pyrenees. Sometimes naturalised but not native in Britain.

Astrantia minor L. (Plate XV.)

Stem 6-10 inches high, weak. All the leaves digitate, with 7-9 lanceolate, cut and serrated segments. Calyx-teeth ovate-lanceolate, acuminate. Flowers small, greenish white. Involucral bracts white with green apex.

Pastures and damp rocks in the granitic Alps, 4000-8000 feet.

Distribution.—Tyrol, Switzerland, Western Alps, Pyrenees, Spain.

This plant will probably not thrive on a limestone or chalky soil, for it is a great hater of lime. It should have plenty of water in summer and shade. However, it is a poor species compared with *major*.



PLATE XV.

4/7 NATURAL SIZE.

- | | |
|------------------------|-----------------------------|
| 1. GENISTA SAGITTALIS. | 2. GYPSOPHILA REPENS. |
| 3. ASTRANTIA MINOR. | 4. ALLIUM SCHENOPRASUM. |
| 5. SILENE RUPESTRIS. | 6. HIERACIUM STATICIFOLIUM. |
| 7. ASTRANTIA MAJOR. | |

ERYNGIUM L.

Eryngium alpinum L.

The Alpine "Sea-holly" or Reine des Alpes. A thistle-like plant, with erect, striated stem 1-2½ feet high, bluish, like the upper involucre bracts. Leaves ciliate-spiny; root-leaves entire, cordate-lanceolate, dark green; stem-leaves amplexicaul, deeply incised, and the uppermost almost palmate. Involucre blue, multi-digitate, somewhat longer than the cylindrical umbel, and with stiff, bristly teeth.

Meadows and pastures in the limestone Alps, 5000-6000 feet. July, August. Local.

Distribution.—Switzerland, Jura, Western Alps, Carinthia, Carniola, Bosnia, Montenegro.

BUPLEURUM L.

Leaves entire, simple, usually glabrous. General and partial involucre various; in Alpine species the partial involucre is large. Flowers small, yellow or green. Petals hooded, with an inflexed point. Styles short, reflexed.

Bupleurum stellatum L.

Stem erect, simple, with only one linear-lanceolate leaf embracing the stem, or leafless. Root-leaves broadly linear, with one longitudinal nerve, and reticulate lateral nerves. Involucre of 1-3 bracts; partial involucre of 9-10 yellow bracts, connate to their middle, the apices only free. Principal ridges of fruit with membranous wings.

Dry, rocky places in the Alps 5000-7500 feet. July, August.

Distribution.—Tyrol, Carinthia, Switzerland, Western Alps.

Bupleurum longifolium L.

Stem erect, simple or somewhat branched above, round, finely furrowed, glabrous like the whole plant. Leaves with longitudinal veins, acute, elliptical, and running down into a long leaf-stalk, the upper leaves lanceolate or ovate, acute sessile with a cordate amplexicaul base. Umbel 5-6 branched, general involucre 3-5 leaved, partial involucre 5-7 leaved; bracts ovate or elliptical, shortly apiculate. Ridges of the fruit narrow and furrows small.

Rocks and stony places in the Alps and sub-Alps up to 5000 feet.

Distribution.—Eastern, Central, and Western Europe.

Bupleurum ranunculoides L.

An extremely variable species, subdivided into several subspecies and varieties and varying in height from 2 inches to a foot. Stem leafy and more or less branched. Radical leaves ovate or cordate; other leaves linear or linear-lanceolate. Partial involucre often twice as long as umbel, but very variable.

The commonest species, and growing in hot, sub-alpine valleys, such as the Rhone Valley, up to rocky pastures and cols at an elevation of over 8500 feet.

Distribution.—Eastern, Central, and Western Alps; Pyrenees; Central Europe from Spain to Bosnia.

ATHAMANTA L.

Athamanta cretensis L.

Stem erect or ascending, terete, furrowed, simple, or branched, either downy or glabrous, there being two distinct forms of this plant which Dr. Briquet has distinguished. Leaves tri- to multi-pinnate; lobes linear or linear-lanceolate. Umbels 1-5 rayed; general involucre few-leaved, deciduous, or wanting; partial involucre many-leaved; bracts lanceolate, apiculate, membranous with an herbaceous centre. Flowers white, often tinged with red. Cremocarp densely covered with short, spreading hairs. Variable in size and pubescence according to situation.

Rocky and stony places in limestone mountains. June to August. Seen by writer up to 8500 feet in Savoy.

Distribution.—Carpathians, Jura, Eastern, Central, and Western Alps. It extends from S. Germany to the Var and from Bosnia to Spain.

MEUM Miller.

Leaves very finely dissected. Umbels compound, with partial involucre of several bracts. Petals entire, white or pinkish. Fruit oblong, with 5 prominent, acute ribs. A genus of very few European species, and with not many distinctive characters.

Meum athamanticum Jacq.

Stem erect, terete, furrowed, glabrous like the entire plant, few-leaved, usually branched. Leaves bi- to ter-pinnate; lobes divided many times into capillary, almost whorled segments. General involucre many-leaved, often unilateral. Bracts linear-subulate, about as long as the secondary umbels. Flowers whitish, small. A good forage plant.

Alpine and sub-alpine pastures; 3000-6600 feet; rare in Switzerland. June to August.

Distribution.—Western and Central Europe, as far north as Norway, occasionally in Britain.

Meum Mutellina Gaertn. (*Ligusticum Mutellina* Crantz).

Stem 12-18 inches high, erect, round, furrowed, glabrous like the whole plant, sometimes branching above into 2 or 3 branches, and in that case 1-2 leaved. Leaves bi- or ter-pinnate, segments pinnatifid, with linear-lanceolate teeth. General involucre of a single bract or wanting; partial involucre of 3 or more lanceolate-

membranous bracts, as long as the secondary umbel, or longer, often divided into two halves. Flowers pinkish white.

Alpine and sub-alpine pastures up to 7600 feet ; common. June to August. Chamois feed largely on this plant.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Vosges, Black Forest, etc.

LASERPITIUM L.

Leaves decomposed. Umbels large, many-rayed. General involucre many or few-leaved, or 0. Calyx-limb 5-toothed. Fruit with 4 or 8 broad wings.

About 20 species inhabiting Europe, Western and Northern Asia, and N. Africa.

Laserpitium Panax Gouan.

A rather bristly plant 1-2½ feet high. Stems usually slightly branched and nearly glabrous, striated. Lower leaves shortly petioled, with pinnatifid segments divided into small linear lobes ; upper leaves sessile, with a sheath at the base. Umbels large, of 30-40 rays, white. Involucre large, with lanceolate-acuminate, ciliate-reflexed leaflets. Styles spreading. Fruit ovoid, glabrous, emarginate at both ends.

Alpine meadows, pastures, and outskirts of pine-woods on granite soil ; local. July, August.

Distribution.—Switzerland, Savoy, Dauphiny, Provence, N. Italy, Tyrol.

Laserpitium Siler L.

A glabrous and glaucous plant from 1-3 feet high ; with strong disagreeable scent. Stem stout. Lower leaves very large, petioled, ter-pinnate ; leaflets undivided, entire, lanceolate ; upper leaves sessile on a rounded sheath. Umbels large, of 20-40 white rays. Involucral segments linear-lanceolate. Style recurved upon the fruit, which is linear, elliptical, and glabrous.

Rocks and warm, stony scree in the calcareous mountains up to about 5300 feet. July, August.

Distribution.—Jura, Alps, Cevennes, Corbières, Pyrenees, South and East of France, Central and Southern Europe. Many other species of Umbelliferae are found in the lower Alps, but want of space precludes further description.

CAPRIFOLIACEÆ.

Trees, shrubs, or herbs with opposite leaves and no stipules. Flowers usually in terminal heads, corymbs or panicles, more rarely axillary. Corolla regular or irregular, 5-lobed. Stamens 4-10. Ovary 1-6 celled. Fruit a berry or drupe. Leaves simple or pinnate. About 230 species more or less spread over the globe.

LONICERA L. Honeysuckle.

Lonicera alpigena L.

An erect shrub, 2-5 feet high. Leaves opposite, stalked, elliptical ovate or lanceolate, acuminate, nearly glabrous, entire; paler on the under side. Flower-stalk solitary, axillary, glabrous, 2-flowered, usually about an inch long and pendent. Flowers bright red, 2-lipped, saccate above. Ovaries 2, connate nearly to the calyx-limb, finally coalescing into an ovate-orbicular red double berry.

Calcareous lower Alps, up to 5700 feet. May, June.

Distribution.—Eastern, Central, and Western Alps, Jura, Cevennes, Corbières, Pyrenees.

Lonicera cærulea L.

A shrub barely a yard high, with oval obtuse leaves very shortly petioled. Flower-stalk much shorter than the yellowish white petals. Berries blue-black, globular.

Bushy places and damp Alpine pastures up to 6500 feet, especially on limestone. May, June. Once, above Saas Fee in Switzerland, this was growing as high as 8000 feet.

Distribution.—Central and Northern Europe, Alps and Pyrenees, Caucasus, Siberia, N. America.

SAMBUCUS L. Elder.

Trees, shrubs, or tall herbs, with opposite pinnate leaves, and large corymbs or cymes of numerous small, white, or nearly white, flowers. Calyx with a border of 5 small teeth. Corolla rotate, with 5 spreading divisions. Stamens 5. Stigmas 3, sessile. Berries small, globular, with 3 stones, each containing one seed. About 12 species in temperate and tropical regions of the globe.

Sambucus racemosus L. Alpine Elder. (Plate XVIII.)

Flowers pale greenish yellow, in a dense oval panicle. Fruit scarlet or deep coral red. A small tree, 8-12 feet high. Branches rather soft, with yellowish pith. Leaf-segments elliptic, longly acuminate, with sharp teeth. Stipules small, green, falling. Inflorescence erect. Flowers pedicelled. Anthers yellow. A very handsome object when covered with scarlet berries in autumn.

Mountain woods and shady gorges, to at least 5000 feet; but commonest in the Beech and Fir zones. April, May. Fruiting from July to September.

Distribution.—Switzerland (common), Europe, especially Central, Siberia, N. America.

The Common Elder (*Sambucus nigra*) and the Dwarf Elder (*S. Ebulus*) are widely spread in Switzerland. The latter is found in pastures and waste places, and near villages in many Alpine valleys.

LINNÆA GRONOV.

Linnæa borealis L.

Root creeping, throwing up barren shoots and flowering stems 3 or 4 inches high, naked, glandular, and bearing on slender pedicels 2 or rarely 3 pendent, white, campanulate, sweet-scented flowers with pink veins. Leaves opposite, shortly stalked, ovate orbicular, slightly crenate, evergreen, rather coriaceous. Capsule berry-like, glandular-hairy, inferior.

Creeping in moss and over rocks in damp, shady places in Alpine woods up to 6600 feet; local. June to August.

Distribution.—Carpathians, Riesengebirge, Harz Mountains, N. German Plain, Haute-Savoie, near the Swiss frontier (rare), Eastern Switzerland (Engadine, etc.) and locally, in the southern valleys of Valais from Bagnes to Saas; Norway, Scotland, Northern Asia, and N. America.

RUBIACEÆ

Slender herbs (in Europe) with angular stems and entire leaves, in whorls of 4, 6, or 8, the buds and branches always opposite. Flowers small, in terminal or rarely axillary heads or panicles. Calyx more or less combined with the ovary. Corolla monopetalous, with 4 or 5 spreading lobes. Stamens as many, inserted in the tube. Ovary inferior. Style 2-cleft at the top, with a capitate stigma to each branch. Fruit of 2 1-seeded, indehiscent lobes.

One of the largest families, with perhaps 4500 species, but particularly numerous in the tropics, where it includes trees and shrubs as well as herbs.

GALIUM L. Bedstraw.

Herbs with weak, quadrangular stems, sessile leaves in whorls of 4, 6, or 8, and small white, yellow, or reddish flowers in axillary or terminal cymes or panicles. Calyx combined with the ovary without any visible border. Corolla rotate, the tube scarcely perceptible, with 4 spreading lobes. Fruit small, dry, 2-lobed.

A large genus of about 200 species, spread over the whole of the temperate regions, and especially abundant in Europe and Northern Asia, and penetrating into the tropics.

Galium vernum Scop.

A slender, green species, 6–10 inches high, with stoloniferous, creeping branches and ascending stems, with short internodes. Leaves in fours, oval-elliptic, obtuse or rarely mucronate, with 3 principal nerves. Flowers yellow, on glabrous pedicels, disposed in axillary cymes. Fruit glabrous and shining, becoming blackish. It somewhat resembles the common *G. Cruciatum*, which is also seen

in sub-alpine woods and clearings, but *vernum* is smaller and the leaves broader, and it is much less hairy.

Stony, shady places in sub-alpine woods. April to June.

Distribution.—Pyrenees, Corbières, Cevennes, Alps, Italian Switzerland, and near Brienz, Corsica, Central and Southern Europe, Siberia.

Galium rotundifolium L.

A slender, branched plant, 8–12 inches high. Leaves oval, the inferior often nearly round, delicate, glabrescent, in whorls of 4, feebly 3-nerved. Flowers white, very small, in a trichotomous panicle, loose and spreading, few-flowered, and almost naked. Pedicels divaricate, rather long. Corolla-lobes oval, sub-obtuse. Fruit covered with hooked hairs.

Mountain woods (especially coniferous) and moors. May to July.

Distribution.—Pyrenees, Corbières, Vosges, Jura, Alps, Cevennes, Corsica. Europe from Scandinavia to the Caucasus, and Asia Minor.

Galium verum L. Yellow Bedstraw.

Rootstock woody. Plant glabrous and smooth, except for a slight roughness at edge of leaves. Stems 1–2 feet high, branched, ending in a long panicle of numerous small yellow flowers. Leaves linear, numerous, in whorls of 6–8. Fruit small, glabrous.

Dry hillsides and pastures from the plains up to the lower Alps, where it is sometimes very robust. June, July.

Distribution.—Europe, Central and Russian Asia, except in the extreme north. British.

Galium boreale L.

Rootstock creeping. Stems firm and erect, 6–18 inches high, not much branched. Leaves 4, in a whorl, lanceolate or linear-lanceolate, with 3 prominent ribs, slightly rough at the edges. Flowers numerous, pure white, in oblong panicles. Corolla-lobes with very short inflected points. Fruit covered with hooked bristles.

Mountain pastures, meadows, and clearings in woods, especially on limestone soil. A variable species.

Distribution.—Most of Europe to the Arctic regions, Caucasus, Armenia, Northern Asia, and N. America. British.

Galium rubrum L.

Rootstock slender, creeping, with stems about a foot high, glabrous, shining, or more or less downy below. Leaves linear-lanceolate, acuminate, the lower ones usually broadened at the apex, nearly glabrous, ciliate at the borders. Flowers in a loose panicle, very small, red or pink. Lobes of the corolla oval, ending in a recurved point. Fruit becoming black.



PLATE XVI.

4/7 NATURAL SIZE.

1. GEUM MONTANUM.
3. VERONICA SAXATILIS.
6. SEDUM ALBUM.

2. POTENTILLA GRANDIFLORA VAR. MINOR.
5. VERONICA URTICIFOLIA.
7. RUMEX SCUTATUS.

Dry, stony places in the southern hills and mountains. July, August.

Distribution.—Alps of Dauphiny, Savoie, and all Provence, Southern France, Corsica, Sardinia, Italy, Tyrol, Balearic Isles.

Galium purpureum L.

Rootstock almost woody, with erect stems, 8-18 inches high, much branched, finely pubescent, with short internodes. Leaves in whorls of 8-10, linear, green, with one dorsal vein, finely ciliate. Flowers very small, dark, blood-red. Lobes of corolla oval-acuminate. Fruit glabrous, rugose, becoming black.

Stony hills and dry places in the southern mountains. June to August.

Distribution.—S.E. France from the Var to Basses-Alpes, Maritime Alps, Southern Tessin (not elsewhere in Switzerland), Southern Europe, eastward to Turkey.

ASPERULA L.

Differs little from *Galium* except in the shape of the corolla, which is funnel- or bell-shaped, with a long tube, often several times as long as the lobes.

Asperula odorata L. Woodruff.

A small fragrant plant, 6-10 inches high, with creeping rootstock. Leaves 6-8, in a whorl, lanceolate, acuminate, rough at the edges, Flowers small, white, in a loose tricotomous cyme. Fruit hispid. globular.

Woods and shady places in the plains and mountains. May.

Distribution.—Europe and Siberia, except the extreme north. British.

Asperula taurina L.

A rather taller plant, with erect, simple stem, branched at the top. Leaves 4, in a whorl, broadly lanceolate, acuminate, 3-nerved, with silky hairs. Flowers white, crowded, subtended by ciliate bracts. Fruit glabrous.

Mountain woods. May, June.

Distribution.—Central and Southern Europe, including Switzerland, Jura, Dauphiny, etc., Western Asia as far as Persia.

Asperula cynanchica L. Squinancy-wort.

Barren stems, more or less prostrate, the others ascending about 6 inches. Leaves narrow-linear, the lower ones 4 in a whorl, the upper ones often in pairs. Flowers pinkish white, or occasionally white, small, funnel-shaped. Fruit small, tubercular or granulated. A most variable plant, with several Alpine varieties, one of which is

Jordani Briq., with pretty deep pink flowers, which variety is found from 4000–7000 feet in Savoy, at Mont Cenis, etc.

Dry, hilly places, especially on limestone. June to August.

Distribution.—Central and Southern Europe to the Caucasus and Armenia. British.

Asperula glauca Besser.

Stems 1–2 feet high, erect. Leaves linear, glaucous, stiff, mucronate, 8 in a whorl. Flowers white, 4-lobed, with limb longer than the tube. Fruit glabrous and glossy.

Stony hills; rare in Switzerland. May to July.

Distribution.—Southern France, Southern and Central Europe, Asia Minor, Caucasus, Armenia.

Asperula hexaphylla All.

A small tufted, glabrous species, with leaves in whorls of 6, rather short, linear. Stem branched. Flowers pink, in dense terminal heads, with involucre of small linear bracts beneath; the corolla-tube being 2–3 times as long as the limb. Fruit glabrous.

Sunny rocks, usually limestone, in the lower mountain region; rare. June, July.

Distribution.—Maritime Alps (e.g. Tenda), Northern Italy, Transylvania, Bosnia, Moldavia.

VALERIANACEÆ

Herbs with annual or perennial stock, opposite leaves, and no stipules. Flowers in terminal corymbs or panicles, usually small and numerous. Calyx adherent to the ovary, sometimes toothed, but unrolling later into a feathery pappus. Corolla funnel-shaped, usually gibbous or spurred at the base. Lobes 3–5, unequal. Stamens 1–5. Ovary 3-celled, 2 of the cells being empty. Fruit small, indehiscent, 1-celled.

A family widely diffused over the greater part of the globe.

VALERIANA L.

Stem-leaves opposite or whorled, entire or pinnatifid. Flowers in corymbose paniced cymes, unisexual or bisexual. Calyx-limb annular, developing a feathery pappus. Corolla usually 5-lobed, irregular, usually gibbous at the base. Stamens 3.

A large genus, with the geographical range of the family, but most abundant in mountain regions.

Valeriana tripteris L. (Plate XVII.)

Rootstock with creeping runners. Stem erect, about a foot high, simple, furrowed, glabrous like the whole plant, or less often downy,



PLATE XVII.

4/7 NATURAL SIZE.

1. VALERIANA TRIPTERIS. 2. ANTHYLLIS VULNERARIA VAR. ALPESTRIS.
3. ANTHYLLIS VULNERARIA. 4. MAIANTHEMUM BIFOLIUM.
5. ADENOSTYLES ALBIFRONS.

with 3 or more pairs of leaves. Leaves of barren lateral tufts and lowest stem-leaves stalked, undivided, ovate or ovate-lanceolate, acute or obtuse, wavy or irregularly dentate, usually cordate at the base; upper stem-leaves with shorter stalks or sessile, 3-partite, divisions lanceolate, acute, irregularly toothed, the central one larger. Flowers small, reddish, sweet-scented, arranged in a terminal umbellate cyme.

Rocky places and pastures up to 6000 feet. May, June.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Vosges, Black Forest, Cevennes, Pyrenees, Corsica.

Valeriana montana L.

Stem erect, 1-1½ feet high, glabrous like the entire plant, less often downy. Leaves in 3 or more pairs, all undivided, ovate or ovate-lanceolate, acute or obtuse, entire or unequally toothed; those of the barren shoots and the lower stem-leaves stalked, often cordate at the base; upper stem-leaves more shortly stalked or sessile, narrower, the uppermost lanceolate. Flowers usually pink, in a terminal corymbose cyme. The root has a strong odour.

Rocky, damp Alpine and sub-alpine places, descending to a low elevation; 3000-6500 feet; common. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Jura, Corbières, Pyrenees.

DIPSACEÆ

Leaves opposite or whorled. Flowers small, collected into a capitulum surrounded by an involucre of bracts. Calyx-limb cup-shaped, entire or lobed, surrounded by an involucrel. Corolla funnel-shaped, 4-5 lobed. Stamens 4. Ovary 1-celled, with 1 pendulous ovule. Style filiform. Stigma capitate. Fruit indehiscent, 1-seeded.

A rather small family, spread over the 'ancient world.'

SCABIOSA L.

Capitulum hemispherical or depressed, outer flowers generally large and rayed. Involucrel tubular, 4-5 lobed. Calyx-limb cup-shaped, with 4 or 5 stiff bristles or awns. Corolla 4-5 lobed.

Scabiosa lucida Vill.

Stem 6-12 inches high, simple, erect, terminating in a single rose-violet or deep mauve capitulum, with large ray-florets. Lowermost leaves elongated, stalked, crenate, rather shining; upper ones pinnatifid, with linear-lanceolate segments.

Pastures and stony spots in the Alps; 4500-8000 feet. June to September.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Erzgebirge, Vosges, Jura; Pyrenees.

A handsome species and well worth cultivating.

CEPHALARIA Schrader.

Cephalaria alpina Schrad.

A hairy, robust plant, at least a yard high, with an ascending, angular stem and pinnate leaves, with from 9–15 lanceolate leaflets, serrated. Corolla pale yellow in a dense globular head.

Rocky pastures in the Alps and sub-Alps up to 6000 feet; very local. June, July.

Distribution.—Switzerland, Jura, and Western Alps of Savoy, Dauphiné, Provence, and Piedmont.

KNAUTIA Coultter

Differs from *Scabiosa* in having the awns of the calyx deciduous.

Knautia sylvatica Duby.

A large, leafy herb, often 3 feet in height, usually hairy, especially at the base. Leaves lanceolate-elliptic or lanceolate, entire or toothed, not divided, glabrous, or furnished with long hairs, but never velvety, bright green. Calyx with 8 teeth. Corolla usually violet, rarely rose-purple, in hemispherical heads. Somewhat polymorphic.

Woods and meadows and shady places in the mountains, extending to the Alpine pastures. June to September.

Distribution.—Central and Southern Europe.

Knautia longifolia Koch.

Plant 1–1½ feet high, glabrous below, with a usually simple stem. Leaves dark green, shining, glabrous, narrowly lanceolate, acuminate, entire or toothed. Flowers rose, in small hemispherical heads. Involucral bracts oval-lanceolate, acute, almost as long as the flowers. Calyx with sub-sessile limb, and linear, pointed teeth.

Meadows and damp mountain pastures. June to September.

Distribution.—Pyrenees, Alps, Jura, Vosges, Auvergne, Cevennes, Central and Southern Europe.

COMPOSITÆ

Herbs or shrubs with alternate or opposite leaves, without stipules. Flowers or florets collected together into a head, surrounded by an involucre, the whole appearing like a single flower. The receptacle upon which the florets are inserted within the involucre is either naked or bears chaffy scales and hairs between the florets. In each floret the calyx is combined with the ovary, either

completely so or only to appear at its summit as a short border, or more often as a *pappus* (or ring of feathery hairs). Corollas either all tubular or all *ligulate*, or the outer ones ligulate (*ray* florets) and the inner ones tubular (*disk* florets). Stamens 5 or rarely 4, inserted in the tube of the corolla. Anthers linear, and united in a sheath round the style. Ovary inferior, 1-celled, 1-ovuled. Stigmas 2. Fruit a small dry, seed-like nut, called an *achene*, either crowned by the pappus or naked.

The largest family, comprising about 12,000 species, and represented all over the globe, and in every kind of station.

The family is frequently subdivided into 2 sub-families :

TUBULIFLORÆ and LIGULIFLORÆ

SUB-FAMILY : TUBULIFLORÆ

ADENOSTYLES Cass.

Stem leafy. Leaves alternate, stalked. Capitula numerous, forming a leafless corymb. Involucre of a few leaves, arranged in a single row. Flowers all tubular, red or white. Seeds nearly terete, striated.

Adenostyles albifrons Reichb. (Plate XVII.)

Stem 1–2 feet high, erect, striated. Leaves large, stalked, reniform-cordate, coarsely and unequally doubly dentate, slightly tomentose beneath. Leaf-stalks often auriculate at the base. Capitula 3–6 flowered, collected into corymbose umbels. Flowers rose-purple.

Mountain woods and Alpine and sub-alpine pastures ; 3300–5500 feet ; common, especially on limestone. July, August.

Distribution.—Sudetic Mountains, Riesengebirge, Eastern, Central and Western Alps ; Jura, Vosges, Black Forest.

Adenostyles alpina Bluff. and Fing. (*A. glabra* Miller, DC.)

Stem erect, 1–3 feet high, slightly downy above, and often purple like the involucre, ending in a much-branched, umbellate, paniculate, corymbose inflorescence. Leaves nearly round, kidney-shaped, or roundly triangular, regularly dentate, glabrous or with scattered hairs above, the uppermost leaves often lanceolate, dentate, reticulately veined on under side, and the veins thickly coated with hairs. Capitula 2–6 flowered, tufted. Flowers pink or flesh-coloured.

Moist, shady Alpine or sub-alpine places up to 8000 feet, and often descending to the valleys ; limestone in preference. June to September.

Distribution.—Eastern, Central, and Western Alps, Jura ; Corsica.

HOMOGYNE Cass.

Stem nearly leafless. Leaves mostly radical, stalked, round. Capitulum usually solitary; involucre and receptacle as in *Adenostyles*. Seeds furrowed, nearly cylindrical.

Homogyne alpina Cass.

Rootstock creeping. Stem erect or ascending, simple, with a single capitulum, woolly like the leaf-stalks, with 2-4 distant scales. Leaves radical, appearing at same time as the flowers, stalked, cordate-orbicular or reniform, dentate, glabrous on upper side, under side green, not tomentose, hairy on veins beneath. Flowers light purple-red, rarely white.

Damp, shady places on the Alps and lower Alps, and in mountain woods; extending up to 9000 feet. May, June.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Black Forest, Pyrenees.

Homogyne sylvestris Cass.

Scape 10-12 inches high, with 1-3 capitula, downy, leafy below, scaly above. Root-leaves 2 inches broad, on long stalks, cordate-reniform, incised, 7-9 lobed, outer lobes pointed, inner lobes 3-toothed, with soft spines; stem-leaves small, semi-amplexicaul. Capitula up to 1 inch in length. Involucre purple-red. Branches of style warty. Pappus white.

Meadows and pastures up to 5000 feet; local. May, June.

Distribution.—Eastern Alps from Carinthia to Carniola.

ASTER L.

Aster alpinus L.

Stem erect or ascending, covered with short hairs like the leaves, thickened at the summit, and bearing a single capitulum. Leaves wavy, entire, wedge-shaped or spatulate, 3-nerved, obtuse; upper leaves linear-lanceolate, sessile, acute. Ray-flowers ligulate, violet or mauve; disc-flowers yellow. Capitulum handsome, 1½-2 inches across. Bracts of involucre lanceolate, more or less acute, all nearly uniform in height and herbaceous.

Rocks, stony places, and pastures in the Alps and lower Alps; 5000-9000 feet; more frequent on limestone. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Erzgebirge, Jura, Cevennes, Pyrenees.

BELLIDIASTRUM Cass.

Bellidiastrum Micheli Cass. (Plate XXI.)

Stem erect, leafless, simple, ending in a single capitulum, shaggy or covered with short, soft hairs, like the leaves. Leaves all radical,



PLATE XVIII.

4/7 NATURAL SIZE.

1 AMELANCHIER VUGARIS.

2 ALNUS VIRIDIS.

3. SAMBUCUS RACEMOSUS.

4. SORBUS ARIA.

5. VACCINIUM ULIGINOSUM.

lanceolate-obovate, narrowed into a foot-stalk, coarsely serrate, obtuse, dull green. Capitulum rather large. Resembles a large daisy, but distinguished by the hairy pappus. The figure is of a robust specimen.

Damp, shady places, and clearings of woods from the sub-alpine region upwards to 6500 feet, especially on limestone. May to autumn.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Black Forest, Var.

ERIGERON L.

Capitula radiate. Disk yellow. Ray violet or mauve. Involucral bracts in many rows. Receptacle flat, pitted. Ray-flowers in several rows, ligulate. Disk-flowers bi-sexual. Pappus of many rows of hairs, persistent.

Erigeron acris L.

An erect annual or biennial, 6–12 inches high, slightly branched, and covered with short hairs. Leaves linear or lanceolate, entire, the radical ones stalked. Flower-heads rather small, solitary on the upper branches, and forming a loose panicle. Florets numerous, filiform, and short, the outer rows pale purple; the tubular florets very few, pale yellow.

Pastures, stony and waste places from the plains to the lower mountains; common. June to September.

Distribution.—All Europe, Asia Minor, Siberia, N. America. British.

Erigeron canadensis L.

This ubiquitous annual weed is frequently seen in sub-alpine districts and even on the lower glacier moraines. A native of N. America it has now established itself in almost all temperate and hot countries. It is usually taller than the last and glabrous except for a few spreading hairs. The leaves are narrow, entire, or slightly toothed. Flower-heads extremely small, whitish green, very numerous, and forming a long, leafy panicle. Florets minute, the outer ones filiform and slightly tinged with red.

Erigeron Villarsii Bell. (*E. atticus* Vill.).

A robust Alpine species, 10–12 inches high, with erect, branched stem, glandular-pubescent above. Leaves lanceolate, entire, clasping the stem, the root-leaves oblong-lanceolate, all hairy. Involucre glandular-hispid, the bracts often reddish. Flower-heads large and handsome, solitary. Ray-florets rose or bright purple; central florets yellow and tubular.

Moraines, grassy mountain sides, etc.; local. July to September.

Distribution.—Eastern, Central, and Western Alps, Transylvania,

Quite local in Switzerland and more frequent in the French and Italian Alps.

Erigeron alpinus L.

This is a smaller plant than the last and less brightly coloured. It is very polymorphic. Though usually a very high Alpine, occasionally it descends to the sub-Alps.

Distribution.—Alps, Jura, Pyrenees, Carpathians, Arctic Europe, Siberia. British.

SOLIDAGO L.

Tall leafy perennials, with numerous small yellow flowers. Receptacle without scales. Outer florets few, ligulate; inner ones tubular. Achenes cylindrical, with a pappus of many simple hairs.

A large N. American genus with a very few European species.

Solidago Virga-aurea L. Golden-rod. (Plate XI.)

Stems erect, leafy, 6 inches to 2 feet high, nearly glabrous. Root-leaves obovate and stalked; stem-leaves lanceolate, toothed. Flowers in a crowded terminal panicle, bright yellow; each flower-head with a spreading ray of about 10 florets. Alpine forms are sometimes very short.

Woods and rocky places, especially in the mountains. July to September.

Distribution.—Europe, including British Isles, Central and Northern Asia; N. America to the Arctic regions.

BUPHTHALMUM L.

Bupthalmum salicifolium L.

Stem $1\frac{1}{2}$ –2 feet high, branched at the top, and bearing several large yellow capitula about 2 inches across, with narrow, spreading ray flowers. Leaves lanceolate, undivided; upper leaves narrowed at the apex, acute, denticulate. Ray-florets ligulate. Receptacle paleaceous. Pappus-hairs short, rough.

Dry, bushy places in the plains and sub-alpine situations, as, e.g. the banks of the Lake of Lucerne, but ascending to about 6000 feet. Prefers a limestone soil, and is very suitable for cultivation and for gathering. July, August.

Distribution.—Central Europe. In France it extends from the Mediterranean to Savoy.

GNAPHALIUM L.

Flowers often unisexual and sometimes dioecious. Capitula small, usually in fascicled corymbs or cymes. Involucral leaves soft, adpressed, as long as the flowers. Receptacle flat, naked. Ray-flowers very slender, in one or more rows. Disk-flowers bisexual. Pappus-hairs in 1 row, slender.

Gnaphalium norvegicum Gunner.

Perhaps a sub-species of *G. sylvaticum* L. Stem simple, erect, 6–12 inches high, very leafy. Leaves lanceolate, densely tomentose, especially beneath, 3-nerved, lengthened into a petiole; stem-leaves half as long as the lower leaves. Involucral bracts dark brown. Capitula in simple compact spikes.

Alpine pastures and woods between 4000 and 7800 feet. July, August.

Distribution.—Alps, Vosges, Auvergne, Pyrenees, Scandinavia, Scotland.

Gnaphalium sylvaticum L. (Plate IV.)

Stock tufted, with stalked, lanceolate leaves. Stems nearly simple, 3–10 inches high, erect, cottony, and leafy. Leaves linear, cottony. Flower-heads small, ovoid or cylindrical, in little clusters in the axils of the leaves, forming a long, leafy spike. Involucres with brown, shining bracts.

Open woods, moors, and pastures from the plains to the Alps. July to September.

Distribution.—Central and Northern Europe, and all round the Arctic Circle. British.

ANTENNARIA Gaertner.

Antennaria dioica Gaertn. (*Gnaphalium dioicum* L.). (Plate XIII.)

Similar to *A. carpatica*, but whiter, with creeping stolons and oboval, spathulate leaves; the upper ones only are lanceolate. The capitula are *white*, broad, obtuse, and spreading in the male, and *red* and acuminate in the female. Stems 2–8 inches high, leafy.

Mountain pastures and rocks in Central, Southern, and Arctic Europe, descending occasionally to nearly sea-level in the British Isles, and attaining 9400 feet in the Alps. Also found in Russian Asia and North America.

A useful creeping plant for covering rocks and stones; it likes plenty of limestone.

ARTEMISIA L. Worm'wood.

Capitula small, few-flowered in racemes or panicles. Involucral bracts in few rows, margins scarious. Receptacle very narrow. Flowers all tubular, outer female, inner male or perfect. No pappus. Bitter or aromatic herbs, often somewhat shrubby.

A numerous genus extending over nearly the whole of the northern hemisphere from the Arctic regions to the borders of the tropics. Several are high Alpine species, and known collectively as Genippi in France and Switzerland. They do not descend to the sub-Alps, but sometimes in that zone we find *A. vulgaris*, *A. Absinthium*, and *A. campestris* from the plains and also:

Artemisia incanescens Jord.

Plant 1-2½ feet high, smelling like terebinth, covered with white tomentum, especially in the upper portion, the stem being almost glabrous below. Leaves white-felted on both sides, not spotted, divisions of leaflets linear. Flowering heads shortly stalked and forming a long, loose panicle.

Dry, hot, and stony places in the mountains up to about 5000 feet, as near La Grave in Dauphiné; local. September.

Distribution.—Departments of Hautes-Alpes, Basses-Alpes, and the Var in France; Spain, Italy.

ACHILLEA L.

Leaves alternate, much divided or rarely simple. Flower-heads small, in a terminal corymb with white or pink rays and a yellow disk. Involucres ovoid or hemispherical, the bracts imbricated, slightly scarious at the edges. Receptacle small, not convex. Achenes without any pappus.

A considerable European and West Asiatic genus.

Achillea Clavenæ L.

Stem erect, 3-8 inches high, leafy, and, like the leaves, covered with a grey felt of silky hairs, bearing at the summit a cluster of capitula in a corymbose cyme. Leaves obovate-lanceolate or wedge-shaped, simply pinnatifid, with linear teeth. Ray-flowers 6-8, as long as the involucre, or longer. Capitula large; involucre bracts with a black margin; ray white; disk greenish yellow.

On rocks and débris of the calcareous Alps; 5000-7000 feet.

Common (in the Eastern Alps) and sometimes descending the valleys.

Distribution.—Eastern and Central Alps. In Switzerland only on Monte Generoso.

Achillea Ptarmica L. Sneezewort.

Stems 1-2 feet high, erect, glabrous, branched only at the top. Leaves broadly linear, regularly serrate. Flower-heads few, in a loose terminal corymb. Involucres hemispherical, rather cottony, larger than in the Milfoil. Ray-florets from 10-15, short, broad, white; disk-florets numerous, interspersed with linear scales.

Damp, hilly pastures, becoming a mountain plant in Southern Europe, where, e.g. on the Col des Montets on the Franco-Swiss frontier it ascends to 5000 feet. August, September.

Distribution.—Most of Europe, except the Mediterranean region, Russian Asia. Britain.

Achillea Millefolium L. Milfoil or Yarrow.

Leaves rather villous, especially on the back, or sometimes glabrous. Lobes linear-lanceolate. Flowers white or often pink,



PLATE XIX.

4/7 NATURAL SIZE.

- | | |
|-------------------------|---------------------------|
| 1. CREPIS AUREA. | 2. HIERACIUM AURANTIACUM. |
| 3. PRENANTHES PURPUREA. | 4. HIERACIUM INTYBACEUM. |
| 5. SENECIO FUCHSII. | |

especially in the mountains. Very variable and with one or two named varieties. The writer has seen this well-known plant above 8000 feet in the French Alps.

Roadsides and grassy places. June to August.

Distribution.—Europe and Russian Asia to the Arctic Circle, North America. British.

A. setacea W. et K. is an Alpine variety with smaller, dirty white flowers and setaceous leaf-segments. (Dry hills.)

Achillea tanacetifolia All. (*A. stricta* Schleicher.)

A stout plant 1–2½ feet high, with pubescent stems and leaves. Stem-leaves sessile, auricled at the base, oblong-lanceolate, bipinnate, with very numerous segments, which are linear, mucronate. Capitula glabrous and often nodding. Closely allied to the Milfoil and to *A. dentifera* DC., which grows in the Western Alps of France and Italy.

Pastures and woods in the mountains; scarce. July to September.

Distribution.—Western Alps, Switzerland, Italy, Carniola.

Achillea macrophylla L. (Plate VI.)

Stem 2–3 feet high, erect, terete, leafy. Leaves pinnatifid, large, deeply and much divided; the lower leaves ovate-triangular in outline, pinnatifid, with 3–7 segments, the inferior segments being distinct, the upper confluent, sharply toothed; uppermost leaves narrow, lanceolate, not divided, but sharply toothed. Corymbs very compound. Flowers white, small.

Woods and shady places in the Alps and sub-Alps; 3000–6800 feet.

Distribution.—Eastern, Central, and Western Alps; local.

A useful subject for planting in the shade of trees at the back of a rockery, for the foliage is rather handsome.

CHRYSANTHEMUM L.

Capitula solitary, often large. Ray-florets ligulate, white or yellow; disk-florets tubular, perfect, yellow. Receptacle flat or convex, naked. Involucral bracts imbricate, with scarious margins. Fruit of ray-flowers ribbed or winged, of disk-flowers compressed. Leaves toothed or cut. A genus sometimes divided into several small genera.

Chrysanthemum Leucanthemum L. Ox-eye Daisy. (Plate XXI.)

Stems erect, simple, or slightly branched above. Root-leaves obovate and coarsely toothed, on long stalks; stem-leaves narrow, sessile, with fewer teeth. Flower-heads solitary, very large, especially in the Alps, on long, terminal peduncles. Involucral bracts bordered with a brown, scaly edge.

Pastures, banks, and mountain slopes from the plains up to 7000 and rarely 8000 feet. June to August.

Distribution.—Europe, Russian Asia. Britain.

Chrysanthemum alpinum L. (Plate XXI.)

The figure depicts a rather small-flowered specimen. Stem 2–6 inches high, with a single capitulum. Leaves mostly radical, stalked, spatulate, pinnatifid, with 5–7 segments, toothed, the uppermost linear, entire. Flower-heads about $1\frac{1}{2}$ inch across, white, disk yellow.

Pastures and débris on the Alps, particularly on siliceous rocks. July, August; 5000–12,000 feet.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Pyrenees, Transylvania.

Easily grown in a well-drained, southerly position, in a compost of sand and loam. It should be top-dressed each spring.

DORONICUM L.

Root-leaves stalked or 0; stem-leaves amplexicaul. Capitula solitary or in corymbs, rayed. Ray-flowers ligulate, usually female; disk-flowers with free branches of style; receptacle conic. Fruit furrowed. Pappus-hairs rigid.

The nomenclature of the Alpine species of *Doronicum* (or *Aronicum*) appears much confused.

Doronicum Pardalianches L. Leopard's-bane.

Root-stock often woolly at the crown. Root-leaves broadly ovate and deeply cordate at the base. Stem about 2 feet high, with few ovate-lanceolate leaves, the lower ones broader, stalked and embracing the stem in a broadly dilated base. Flower-heads 2–5 on long peduncles; handsome. Yellow ray-florets numerous and narrow.

Woods and mountain pastures. May, June.

Distribution.—Rare in Switzerland. Jura, Vosges, Cevennes, Pyrenees, Central and Northern France, Spain, Italy, Central Europe. British.

Doronicum cordifolium Sternb. (*D. cordatum* Schultz.)

Stem $1\frac{1}{2}$ – $2\frac{1}{2}$ feet high, erect, more or less covered with soft hairs or nearly glabrous. Stem-leaves wavy at the margins or toothed, sessile, lanceolate, acute, lower leaves cordate-ovate, stalked, sharply-toothed, the cymes formed at the cordate base broad and open. Flowers yellow. Capitula handsome, 2 inches across.

Mountain woods and shady Alpine and sub-alpine situations; 3000–6500 feet; local. June to August.

Distribution.—Carpathians, Eastern Alps (not in Switzerland), Sudetic Mountains.

Doronicum Clusii Tausch (*Aronicum Doronicum* Jacq.).

Stem about a foot high, hollow, covered with rough hairs like the leaves, simple, leafy. Leaves lanceolate; root-leaves often ovate, entire, or coarsely dentate, or with a wavy margin; lower stem-leaves stalked, upper ones sessile, with a narrowed or rarely a rounded base. Capitulum solitary, large, and handsome, bright yellow.

Among boulders and on stony pastures and on débris of the Alps (avoiding limestone); 5000–7600 feet. July, August.

More strictly Alpine, a description of this species is given because it is often confused with other plants, and by novices even with *Arnica*.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Spanish Pyrenees. Not in the Jura.

ARNICA L.

Arnica montana L. (Plate XX.)

Stem erect, 1–1½ feet high, glandular villous, bearing 1–3 capitula, and 1 or 2 pairs of small leaves, naked above. Leaves entire, oval-lanceolate or oblong-lanceolate, glabrescent, narrowed into a short foot-stalk, and forming a rosette; stem-leaves opposite, lanceolate, sessile, much smaller. Flowers bright orange-yellow. Capitula 2–2½ inches in diameter, though frequently not perfect. A well-known, bitter, medicinal plant.

Alpine and sub-Alpine pastures and clearings in woods; 3400–8000 feet. Especially on granitic or siliceous soil, where it is sometimes very numerous. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Erzgebirge, Black Forest, Vosges, rare in the Jura, Cevennes, Pyrenees, and the greater part of Europe as far north as Sweden, N. Asia.

Easily grown in deep soil—a mixture of loam and peat or leaf-mould is best. Increased by seed or by division.

SENECIO L.

Leaves alternate, toothed or divided, rarely entire. Flower-heads in terminal corymbs. Disk-florets yellow, and tubular ray-florets yellow, blue, purple, or white, spreading. Involucre cylindrical or nearly hemispherical, with 1 or 2 rows of linear bracts, often tipped with brown. Receptacle without scales. Achenes cylindrical, with a pappus of simple hairs, usually soft and white.

One of the largest genera, if not the largest, in existence, and spread over the whole globe, though most of the species are confined to a small area only. Several species which have not the small outer bracts to the involucre were distinguished by Linnæus

beneath, and golden yellow flowers. Lower leaves triangular, sagittate or cordate, longer than broad, coarsely toothed, stalked; upper leaves lyrate-pinnatifid or pinnate, auricled. Achenes glabrous.

Alpine and sub-alpine pastures. July, August.

Distribution.—Carpathians and Eastern Alps.

Senecio alpinus Scop. (*S. cordifolius* Clairv.). *S. cordatus* Koch.

Stems 1-2 feet high. Leaves undivided, cordate-ovate, serrate, longer than broad, unequally dentate, lowermost webbed; leaf-stalk auricled at the base, often with triangular appendages. Several medium-sized capitula. Flowers yellow.

Alpine and sub-alpine pastures, especially near chalets and borders of woods; 4300-6500 feet. July, August. Very local.

Distribution.—Alps of Central Europe, Haute Savoie, Switzerland, Italy; Vosges.

Senecio Fuchsii Gmelin. (Plate XIX.)

A tall plant, 3-4 feet high, with oblong-lanceolate, toothed leaves, attenuated and sometimes sub-petioled at the base, but never amplexicaul. Stem-leaves lanceolate-acuminate. Numerous capitula in a large, loose corymb. Ligules 3-5 in number, yellow, one being longer than the rest.

Mountain gorges and woods, especially in the sub-alpine regions. July to September.

Distribution.—Central and Western Alps, Switzerland, Jura, and many districts in Central Europe.

We have seen this plant at elevations of from 6000 to 7000 feet above La Grave in Dauphiny, and on the Joch and Surenen Passes in Switzerland, and it is very abundant in the picturesque Gorge of Trient which skirts the Tête Noir.

Senecio nemorensis L. (*S. Jacquiniannus* Reichb.).

Very similar to the last, but the leaves are rather broader and it flowers earlier. Leaves with short hairs on the under side, semi-amplexicaul; upper and middle stem-leaves suddenly narrowed into a broadly-winged leaf-stalk. Involucre campanulate-cylindrical. Pappus as long as the fruit.

Bushy places among boulders and damp gorges, especially in Alpine valleys and in the Jura. June to September.

Distribution.—Eastern, Central, and Western Alps, Jura, Vosges, Germany, Central Europe.

S. aurantiacus DC. (*Cineraria aurantiaca* Hoppe).

Stem 6-18 inches high. Lower leaves ovate or lanceolate, nearly glabrous, grass-green or greyish, flocculent, most of them narrowed into a short, broad leaf-stalk. Capitulum about an inch in dia-

meter. Flowers orange-red or rarely yellow. Involucral bracts tinged with purple entirely or only at the tip, woolly at the base.

Alpine and sub-alpine meadows and pastures; local. June, July.

Distribution.—Carpathians; Eastern, Central, and Western Alps. In Switzerland on some of the southern calcareous Alps.

S. alpestris DC. (*Cineraria alpestris* Hoppe).

Stem erect, 10–18 inches high, umbellate at the summit, with 3 or more capitula, covered like the leaves with long wool and short, thickish hairs. Leaves entire, wavy or toothed, ovate, running into the leaf-stalk, obtuse; upper leaves linear-lanceolate, sessile, acute. Peduncles of the capitula naked. Outer ligulate flowers radiate, yellow, but often wanting. Ovary and achenes glabrous.

Alpine and sub-alpine pastures and meadows; frequent. June, July.

Distribution.—Carpathians, Eastern Alps.

S. campestris DC., *S. integrifolius* Clairv. (*Cineraria campestris* Retz).

Stem erect, simple, 6 inches to 2 feet high. Root-leaves stalked, oblong or ovate; stem-leaves longer and narrower, all entire or slightly crenate, covered with a loose, cottony wool on the under side, like the stems. Flower-heads few, in a small terminal umbel, the peduncles starting from nearly the same point. Achenes downy. Flowers pale yellow.

Dry pastures and meadows, especially on limestone mountains such as those of the Jura; very local. July.

Distribution.—Jura, Maritime Alps, Southern Jura of Vaud only in Switzerland, Prussia, Central and Eastern Europe; rare in England.

S. spathulifolius DC. (*Cineraria spathulifolia* Gmel.).

A taller, cottony plant. Stem erect, simple, hollow, more or less covered with cottony wool like the leaves. Root-leaves oval, almost truncate at the base, or sometimes suddenly contracted into a broad-winged petiole; stem-leaves narrowed into a broad clasping petiole, upper ones lanceolate, sessile, and smaller. Achenes brownish, hispid with snow-white pappus.

This species closely resembles the last, but it grows in marshy places and mountain bogs. June.

Distribution.—In Switzerland widely spread but rather rare, and it is commoner in the central Jura district.¹

¹ Godet, *Flore du Jura* (1853), p. 362.



PLATE XXI.

4/7 NATURAL SIZE.

1. CHRYSANTHEMUM LEUCANTHEMUM. 2. CALAMINTHA ALPINA.
3. CHRYSANTHEMUM ALPINUM. 4. BELLIDIASTRUM MICHELII.
5. LUZULA LUTEA.

INULA L.

Ray-flowers, female or neuter, in one row. Capitula solitary or in corymbs. Receptacle flat. Involucral bracts in several rows.

Inula montana, L.

About a foot high, and resembling *I. britannica*, but with only one terminal capitulum, and leaves almost linear, not amplexicaul. The involucre is imbricate, and the fruit twice as large as in that species. Lower leaves oblong-lanceolate, longly petioled, and whole plant covered with whitish hairs. Capitulum large and handsome. Flowers bright yellow, the linear ligules being much longer than the involucral bracts, which are very unequal.

Dry, arid places on limestone in the Western Alps, Eastern Pyrenees, Spain, and Piedmont. Formerly near Martigny, but now not nearer Switzerland than the Aosta Valley. June, July.

CIRSIUM. Thistle.

Involucre ovoid or globose. Involucral bracts narrow, stiff, acuminate or spiny. Receptacle pitted, bristly. Flowers all tubular. Branches of style united into a tube with a ring of hairs at the base. Pappus feathery. Erect herbs with spiny leaves.

Cirsium eriophorum Scop.

A very stout, handsome thistle, 3 feet high or more, with large and globular flower-heads in clusters of 2 or 3 at the ends of the branches. Leaves green and hairy above, white and cottony beneath, deeply pinnate, with narrow lobes ending in very sharp, stout prickles. Involucres covered with cottony wool, the numerous bracts ending in a narrow prickle. Corolla purple, rarely white.

Waste places and mountain pastures. June to August.

It ascends to about 5000 feet in the Alps, as, for example, about the village of Tour below the Col de Balme, where it is a handsome feature in the landscape.

Distribution.—Central and Southern Europe, as far as the Caucasus. Southern Britain.

Cirsium acaule Scop. Dwarf Thistle.

Stemless, or with very short stem (var. *caulescens* Greml).)

A thick, woody stock bearing a tuft of spreading, prickly, pin-natifid, glabrous leaves, from the centre of which rises one, rarely more, flower-heads. Involucre ovoid, not cottony, with numerous lanceolate, rather obtuse bracts. Florets purple.

Dry mountain pastures, especially on limestone, and extending to a height of 6800 feet.

Distribution.—Eastern, Central, and Western Alps. Temperate Europe and Northern Asia, extending to Southern Scandinavia. British.

Cirsium oleraceum Scop.

An erect, light green glabrous thistle, from 2 to 3 feet high. Stems sometimes slightly branched, and leafy at the top. Leaves soft, embracing the stem with rounded lobes, pinnatifid, more or less lyrate, with large segments edged with cilia, not spiny; the upper leaves undivided. Involucral leaves linear-lanceolate, ending in a short, soft spine. Flower-heads large, few, of a dirty green, close together and with yellowish floral leaves extending beyond them.

Damp meadows and river-sides from the plains to about 4000 feet; common. June to August.

Distribution.—Central and Southern Europe, extending as far north as Paris and Normandy.

Cirsium spinosissimum Scop.

This very spiny species, with conspicuous greenish white involucral bracts, densely leafy stem, and dull yellow flowers, sometimes descends to the sub-Alps, but it more frequently is truly Alpine (up to 9000 feet in Dauphiny), and frequently large areas of damp mountain-sides are covered with it, as, e.g. by the Lognan Inn, above Argentière. It was figured and described in *Alpine Plants of Europe*, p. 164. Flowers, July to September.

Distribution.—Eastern, Central, and Western Alps, Jura.

Cirsium heterophyllum Hill.

Not prickly. Stems 2–3 feet high, with a little cottony wool, and furrowed. Leaves clasping the stem, lanceolate, green and glabrous above, white and cottony beneath, edged with small bristly teeth; root-leaves sometimes lobed. Flower-heads single on long, rather stout peduncles. Involucral bracts glabrous, lanceolate, often purplish.

Mountain pastures in the sub-Alps. June to August. Rather local.

Distribution.—Mountains of Central Europe and Asia, and hills of Northern Europe, including Britain.

CARDUUS L. Thistle.

Differs from *Cirsium* in the threads of the pappus being glabrous and never plumose or feathery.

Carduus personatus Jacq.

Stem 2–3 feet high, erect, branched at the top, cottony, winged and spiny. Leaves soft, whitish beneath, toothed, with spiny cilia, lanceolate or ovate-lanceolate, decurrent; stem-leaves lyrate pinnatifid. Flower-heads sessile in a small, close bunch. Involucre globular, glabrous, the bracts being pointed and mucronate. Flowers purple.

Damp mountain woods and pastures in the Alps and sub-Alps, and occasionally lower. July, August.

Distribution.—Central Europe, Switzerland, Jura, Vosges, Auvergne, Dauphiny, Savoy, Maritime Alps.

Carduus defloratus L.

Perhaps the commonest Thistle in Alpine districts. Stem 12–18 inches high, pubescent and naked for a long distance above, and bearing a single terminal capitulum. Leaves glabrous, glaucous below, lanceolate-acute, pinnatifid and deeply lobed, the segments being distant, ciliate-spinous. Wing of leaves broad at base, and these suddenly narrowed. Involucral bracts ovate, tip of innermost bracts thin, not spiny. Fruit 3 times as long as broad. Capitulum solitary and very longly peduncled. Flowers purple.

Alpine and sub-alpine meadows and pastures (up to 8700 feet on the Col du Galibier), and in clearings of woods. July to September.

Distribution.—Eastern, Central, and Western Alps, Jura, Pyrenees.

CARLINA L. Carline Thistle.

Very prickly and mostly low herbs. Outer involucral bracts very prickly, inner ones shining or coloured, long and spreading like the rays of a star. Chaffy scales between the florets. Achenes silky, with a feathery pappus.

A small European and Asiatic genus, chiefly distinguished by the involucral bracts.

Carlina vulgaris L.

An erect biennial, 6–12 inches high. Leaves toothed or pinnatifid, very prickly; the lower ones narrow and slightly cottony, the upper ones broader and nearly glabrous. Flower-heads hemispherical, 1–1½ inches wide, 2–4 in a terminal corymb. Outer involucral bracts broadly lanceolate, with small prickly teeth or lobes; inner ones linear, entire, smooth and shining, with spreading tips.

Dry, hilly pastures and waste places. July, August.

Distribution.—Europe and Russian Asia; British Isles.

Carlina acaulis L.

Biennial. Stem simple, very short or wanting, or occasionally 6 inches high, in which case it is leafy, bearing a single terminal head. Root-leaves shortly petioled, lanceolate, pinnatifid, glabrous and very spiny, and forming a large rosette. Capitulum large and handsome, sometimes 3 or 4 inches in diameter when expanded. Inner involucral bracts linear and of a beautiful silver white, brownish at the base.

Dry Alpine and sub-alpine pastures (often abundant), up to 8200 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Jura, Spain, Central Europe from Alsace to the Var.

The silvery grey heads of this handsome Carline Thistle are very decorative, and useful to adorn ladies' hats.

CENTAUREA L.

Involucral bracts, imbricate, scarious, fringed or spiny. Receptacle bristly. Flowers all tubular; outer ones usually larger, neuter; inner ones perfect. Fruit compressed.

One of the largest genera, and especially numerous in the Mediterranean and Caucasian regions, with a few American species.

Centaurea montana L. (Plate XXII.)

Stem about a foot high, erect or ascending, simple or slightly branched above, very often covered with cottony webs or wool. Leaves soft, lanceolate, acute or acuminate, entire; lower leaves narrowed into a foot-stalk, slightly webbed; upper stem-leaves decurrent. Involucral bracts ovate or lanceolate, anastomosingly veined, adpressed, with a membranous margin at the apex, fringed or serrate. Pappus one-third as long as the achene. Ray-flowers bluish, rarely white; disk-flowers purple or pink.

Alpine and sub-alpine meadows and pastures, and margins of woods, especially in stony, bushy places; common.

Distribution.—Eastern, Central, and Western Alps, Vosges, Erzgebirge, Jura, Cevennes, Pyrenees.

Centaurea axillaris Willd. (*C. variegata* Lam.).

Very similar to the last, but with pinnatifid lower leaves and oval involucral bracts, which have a brown margin with cartilaginous, silver-white teeth. Flowers blue, rarely red or white.

Dry places and wood clearings up to 5300 feet; local.

Distribution.—Switzerland and Western Alps. July, August.

Centaurea uniflora L. (Plate XXII.)

Stem 8–12 inches high, erect, simple, and always 1-headed, cottony. Leaves white-cottony on both sides, 1-nerved, oblong-lanceolate, entire or obscurely toothed, the lower leaves prolonged into a petiole; upper leaves sessile. Involucre large, sub-globular. Bracts dark brown, with the fringed, linear-subulate apex very long and completely turned back. Cilia of bracts long and plumose. Flowers bright purple. Before they expand the involucral bracts form a curious feathery ball.

Alpine pastures and meadows, 5000–8200 feet. July to September.

Distribution.—Central and Western Alps as far south as the Maritime Alps. Not in Switzerland.



PLATE XXII.

4/7 NATURAL SIZE.

1. BARTSIA ALPINA.

2. CENTAUREA MONTANA.

3. CENTAUREA UNIFLORA.

4. CAREX FLAVA.

5. CAREX LEPORINA (YOUNG STATE).

Centaurea nervosa Willd.

Resembling the last, but more robust and hispid, and of a grey-green colour. The leaves have prominent nerves on the under side, and are irregularly toothed, the stem-leaves being broader and truncate or auricled at the base.

High pastures up to 7700 feet or 2350 metres. July to September.

Distribution.—Eastern, Central, and Western Alps; local.

This occurs in Switzerland, and is considered by the modern Swiss botanists a sub-species of *C. uniflora*, which does not occur in their country.

Centaurea Scabiosa L.

Stems about 2 feet high, much branched at the base. Leaves doubly pinnatifid with more or less lanceolate lobes, often coarsely toothed or lobed. Flower-heads large, with purple florets, the outer ones neuter. Involucral bracts broad, bordered with a black adpressed fringe. Pappus of stiff hairs or bristles, nearly as long as the achene.

Pastures and roadsides from the plains to the Alps. July, August.

Distribution.—Europe and Russian Asia, but not in the extreme north. British Isles.

Centaurea Rhaponticum L. (*Rhaponticum scariosum* Lamk.).

A tall, robust and handsome plant, with erect, simple stem and large leaves which are grey-white cotton-felted beneath, entire; the lower ones broadly lanceolate, subcordate, petioled, usually toothed at the margin. Flower-heads large, solitary, terminal. Outer involucral bracts broadly ovate, scarios, laciniate or strongly ciliate at the margins, slightly woolly. Flowers purple. A very distinct plant.

Rocky mountain-sides from 4000–6000 feet; scarce. July.

Distribution.—Eastern, Central, and Western Alps, from Carniola and Tyrol to the Maritime Alps.

In the Valais this handsome species can be seen in such places as near Lac Champex and Bourg St. Pierre.

SUB-FAMILY: LIGULIFLORÆ

APOSERIS Necker

Aposeris foetida Less.

Stem erect, leafless, glabrous like the leaves, bearing a single capitulum, pendent before flowering. Leaves wedge-shaped in outline, forming a sort of rosette, runcinate-pinnatifid, lateral segments nearly triangular or lozenge-shaped, terminal segment broad, 3-lobed. Flowers lemon-yellow, twice as long as the involucre. Fœtid. Involucre green, herbaceous, with an exterior in-

volucre of small scales. An herbaceous plant not unlike the dandelion in some respects.

Moist, shady Alpine and sub-alpine situations. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps.

HYPOCHÆRIS L.

Capitula on simple or dichotomously-branched leafless scapes. Involucral bracts in several rows. Flowers yellow. Leaves radical. Fruit striate; outer ones with very short beak or none; inner ones with a long beak. Pappus of one row of feathery hairs, and usually an outer row of stiff bristles.

Hypochæris maculata L. Spotted Cat's-ear.

Stems 8–24 inches high, slightly thickened beneath the capitulum. Capitula 1–3 (usually single), golden yellow, fragrant. Leaves usually spotted with dark brown, forming a rosette, oblong or oblong-ovate, almost entire or sinuate-dentate. Outer bracts of involucre lanceolate, the inner ones linear-lanceolate, edged with yellow, otherwise blackish, hairy.

Sub-alpine pastures; rare in Switzerland. June, July.

In France, England, and elsewhere it grows in the plains.

Distribution.—Central and Northern Europe. British.

Hypochæris uniflora Vill.

Stems 8–18 inches high, much thickened beneath the capitulum, which is large and solitary and 2 inches in diameter. Stems erect, scape-like, with 1 or 2 small leaves, hairy. Leaves mostly radical, lanceolate, dentate, hispid. Flowers pale or bright yellow. Involucral bracts blackish, hispid; the outer ovate, the inner lanceolate.

Alpine and sub-alpine meadows and pastures up to 6500 feet. July, August.

Distribution.—Carpathians, Riesengebirge, Eastern, Central, and Western Alps.

TRAGOPOGON L. Goat's-beard.

Capitula solitary. Involucral bracts in one row, narrow, usually longer than the yellow or purple flowers. Leaves entire, amplexicaul. Fruit with a long beak, Pappus-hairs in several rows, rigid, feathery. Very milky plants. Flowers generally closing by midday.

Tragopogon pratensis L.

Involucral bracts not longer than the flowers, narrow-lanceolate. Stem not much thickened below the capitulum. Leaves broadened at the base, insensibly narrowed, linear, usually erect. Flowers yellow. Achenes long and striate, the slender beak as long as the achene. Hairs of pappus long and feathery.

Meadows and rich pastures from the plains to the Alps. Often in great abundance in mowing grass.

Distribution.—Europe and Western Asia, but not in the extreme north. British.

PRENANTHES L.

Prenanthes purpurea L. (Plate XIX.)

A tall purple-flowered woodland plant. Stems much-branched, glabrous like the whole plant. Capitula small, numerous, few-flowered. Involucral bracts in one row, few. Pappus-hairs simple. Leaves cordate-amplexicaul, bluish green beneath.

Mountain woods, especially in the Conifer zone. July, August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Corsica, Vosges, Cevennes. Central and Southern Europe.

The drawing shows merely one small branch, the complete plant being usually 4–5 feet high.

LACTUCA L. Lettuce.

Flowers yellow or blue. Capitula usually small, few-flowered, corymbose. Involucral bracts in several rows. Pappus of many soft feathery hairs. Fruit beaked.

Lactuca perennis L.

Capitula large, blue, on long stalks. Involucral bracts cordate. Stem very thick, 10–18 inches high, glabrous, branched. Leaves pinnatifid, with narrow segments; upper ones lanceolate.

Sunny rocks and hillsides up to 4500 feet, especially on limestone; local. May to July.

Distribution.—Central and Southern Europe.

The four English species, with yellow flowers, are sometimes seen in the lower hills of Switzerland, viz. *Lactuca muralis* Fresn., leaves lyrate-pinnatifid; common in woods and under walls. *L. virosa* L., leaves bristly beneath; waste places. *L. Scariola* L., leaves less prickly, capitula smaller; stony places. *L. saligna* L., leaves scarcely ever bristly, linear, entire, arrow-shaped; capitula sessile, crowded; flowers pale yellow. Occasional in Western Switzerland.

MULGEDIUM Cass.

Capitula corymbose. Involucral bracts in several rows, few. Flowers blue. Fruit beaked, with a crest of bristles. Pappus-hairs soft, slender, silvery. Tall, robust herbs.

Mulgedium alpinum Lessing (*Sonchus alpinus* L.). (Plate XXVII.)

Stem 2–4 feet high, purplish, glandular-hairy at the top, branched and leafy. Inflorescence a dense corymb. Leaves glabrous, except on the dorsal nerve, lyrate-pinnatifid, the last segment

broadly triangular and very large, amplexicaul and acutely auricled. Involucral bracts in several rows, few. Flowers blue or light purplish blue. Fruit beaked with a crest of bristles. Pappus-hairs soft, slender, silvery.

Damp, shady, bushy or rocky places, particularly in the Rhododendron and Alder zone, as shown in the picture. July.

Distribution.—Alps, Pyrenees, Jura, etc. Central and Northern Europe as far north as Scandinavia and the Scotch Highlands.

Mulgedium Plumieri DC.

Stem 2–5 feet high, erect, green, glabrous, branched near the top into a loose umbellate cyme. Leaves glabrous, like the whole plant, lyrate-pinnatifid, with very deep segments, amplexicaul, with broad, rounded auricles. Flowers blue, larger than in *alpinum*. Achenes greyish, elliptic, compressed, with 5 ribs on each face. Capitula few, shortly stalked.

Similar situations, but much less common than the last.

Distribution.—Western Switzerland, Vosges, Black Forest, Western Alps (of Savoy and Dauphiné), Cevennes, Pyrenees, Spain.

CREPIS L.

Capitula small, usually numerous, panicled or corymbose, rarely solitary. Involucral bracts numerous, in several rows, with a few outer scales. Receptacle flat, naked. Flowers yellow, orange, or rarely purplish. Fruit striated. Pappus-hairs in many rows, simple. Branched herbs with few-leaved stems. A numerous genus.

Crepis aurea Cass. (Plate XIX.)

Scape 4–6 inches high, erect, simple, leafless, except for a few leafy bracts, with a solitary terminal capitulum; or rarely divided into 2 or 3 branches, each ending in a capitulum; pubescent and even glandular at the summit, glabrous below. Leaves glabrous, but towards the summit covered, like the involucre, with black, woolly but not glandular hairs. Radical leaves in rosettes, up to 3 inches long, ovate-lanceolate, deeply dentate or pinnatifid, sessile, with base narrowed into a leaf-stalk, persistent. Stem-leaves very small, linear, entire, or altogether wanting. Style yellow, black when dry. Achenes with 20 furrows, narrowed into a beak towards apex. Pappus pure white. Flowers orange-red, darker on the under side.

Abundant in Alpine and sub-alpine pastures, up to 9000 feet. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura; Apennines.

Crepis incarnata Tausch.

Scape 6–12 inches high, leafless, branched at the top into a

corymbose umbel. Leaves all radical, soft, oblanceolate, obtuse, dentate, hairy. Bracts of the general involucre not awned on either side. Flowers flesh-coloured, pink, or rarely white.

Pastures and stony places up to 5600 feet; local. June, July.

Distribution.—Eastern Alps from Tyrol to Carinthia.

Crepis paludosa Moench.

Much like a Hawkweed (*Hieracium*) in habit. Stems erect, branched, 1–2 feet high, nearly glabrous like the leaves. Root-leaves ovate, coarsely toothed, with a few small lobes along the stalk; stem-leaves oblong to lanceolate, pointed, toothed, clasping the stem by large, pointed auricles. Flower-heads rather large, yellow, 8–10 in a corymb. Involucres hairy, blackish. Pappus dirty white, much like that of a Hawkweed, but the achenes are contracted at the top.

Moist woods and Alpine meadows. June to August.

Distribution.—Eastern, Central, and Western Alps. Vosges, Jura, Cevennes, Pyrenees, Central and Northern Europe (becoming a mountain plant in the south), Russia, Scandinavia, British Isles.

HIERACIUM L. Hawkweed.

Herbs with perennial rootstock, entire or toothed leaves, and yellow or rarely orange-red flowers, either on leafless, radical peduncles, or in terminal corymbs or panicles on leafy stems. Involucre more or less imbricated. Receptacle without scales. Achenes angular or striated, not narrowed at the top; with a pappus of simple, generally stiff hairs, of a tawny white or brownish colour.

A large European and north Asiatic genus, with a few American species, nearly allied to *Crepis*, but the achenes are not perceptibly contracted at the top, and the hairs of the pappus are usually stiffer and never so white. The habit is also different. Many species are very variable and difficult to classify.

Sub-Genus PILOSELLA Fries,

Hieracium aurantiacum L. (Plate XIX.)

Rootstock with creeping underground stolons and putting up barren tufts of leaves as well as flower-stems. Stem erect, scape-like, very rough with stellate and long simple hairs, bearing from 1–3 leaves on the lower part, and terminating in from 2 to many capitula arranged in a dense umbel, and rarely only one capitulum. Leaves grass-green, ovate or linear-lanceolate, entire, acute or obtuse, sessile or narrowed into a foot-stalk, more or less rough with long, simple but not stellate hairs. Stalk of capitula and involucre densely covered with stellate hairs, black glandular bristles, and

long black hairs. Flowers a beautiful orange-red, sometimes almost crimson.

Rough Alpine pastures and steep, bushy places up to 7200 feet. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Erzgebirge, Black Forest, Vosges, Jura. Northern Europe as far as Norway. Sometimes naturalized in Britain; and frequently seen in cottage-gardens. It seeds very freely.

Hieracium pilosella L. Mouse-ear Hawkweed.

A small and variable species, with spreading tufts of root-leaves and creeping, leafy, barren shoots. Leaves lanceolate, entire, tapering at the base, and often stalked, green above, hairy, white beneath, with short stellate hairs. Peduncles radical, with a single head of lemon-coloured flowers, sometimes tinged with red on the outside. Involucres more or less covered with close, whitish down and stiff, spreading black hairs. Achenes rather short.

Dry pastures and banks from the plains up to 8200 feet. May to July.

Distribution.—Europe and Russian Asia. Common in Britain. Very variable in Southern Europe and the Alps.

Sub-genus STENO THECA Fries

Hieracium staticifolium Vill. (Plate XV.)

Glaucous and glabrous or sometimes somewhat hairy. Stem simple or slightly branched, usually leafless, with a few bracts at the top. Leaves radical, linear-lanceolate or linear, entire or slightly toothed, attenuated into a foot-stalk, glabrous and glaucous. Capitula 1-3, but usually solitary, large. Flowers pale yellow, turning green on being dried. Involucral bracts mealy, linear-acute.

Moraines and sandy river beds and high stony pastures up to 8000 feet. June to September.

Distribution.—Eastern, Central, and Western Alps, Jura, Provence.

Sub-genus EUHIERACIUM Torr. et Gray.

Hieracium glaucum All. (*H. porrifolium* Vill. non L.).

Closely resembling the last, with which it has sometimes been confused. Glabrous and glaucous. Stem erect, 10-18 inches high, leafy, loosely paniculate. Stalk of capitula with small scaly bracts above, and like the involucre, nearly glabrous or greyish, with a fine mealy down. Involucral bracts obtuse, adpressed. Leaves rather thick, very narrow, bluish green, linear-lanceolate, sessile, entire or slightly toothed. Flowers yellow. Capitula usually solitary.

Sandy Alpine and sub-alpine valleys, among débris and boulders, especially in river beds. July, August.

Distribution.—Eastern, Central, and Western Alps.

Hieracium villosum Jacq.

Densely villous with shaggy hairs. Stem erect, with several leaves, simple or branching above, each bearing a large, handsome capitulum, like the involucre covered with stellate hairs as well as simple, long, white hairs, usually dark at the base. Leaves bluish green, thin, acute or acuminate, entire or slightly dentate, villous or rough on both sides, or the lower leaves glabrescent. Root and lower stem-leaves lanceolate, elliptical, sessile, or narrowed into a foot-stalk; upper stem-leaves ovate or ovate-lanceolate, sessile, with a rounded or heart-shaped amplexicaul base. Limb of the ligulate flowers glabrous or slightly hairy or ciliated. Flowers bright yellow. Involucral bracts very acute, and woolly. A variable species.

Rocks and rocky pastures of the calcareous Alps up to 8500 feet. July, August.

Distribution.—Carpathians; Eastern, Central, and Western Alps. Erzgebirge, Jura, Apennines.

Hieracium lanatum Vill.

Stem erect, about a foot high, covered like the whole plant with a dense, short, grey tomentum, branched above, and bearing several large capitula. Root-leaves ovate, acuminate, entire, or obscurely sinuate, stalked; stem-leaves sessile, lanceolate, acuminate, amplexicaul. Involucral bracts very woolly, lanceolate, acuminate, about as long as the fruit with the pappus. Flowers yellow.

Limestone rocks and cliffs; 3000–6500 feet; local. June to August.

Distribution.—Switzerland (Valais), Western Alps from Haute-Savoie to the Var and Alpes Maritimes; Piedmont, Apennines.

A very distinct plant, well worth cultivating on old walls and limestone rocks in sunny positions.

Hieracium prenanthoides Vill.

Stem-leaves long and lanceolate, and clasping the stem by rounded auricles, entire or toothed. Stems very leafy, rather hairy, and much-branched at the top. Flower-heads or capitula rather small, on slender, glandular peduncles. Involucres sub-cylindrical, with obtuse bracts glandular. Achenes greyish white. Flowers yellow.

Meadows and pastures and stony mountain woods. Often quite common in the sub-Alps from 3000–5000 feet. July to September.

Distribution.—Eastern, Central, and Western Alps, Eastern

Pyrenees, Apennines, Norway. Most of Europe (rare in Britain), Siberia, Persia.

Hieracium intybaceum All. (*H. albidum* Vill.). (Plate XIX.)

A very distinct species, covered with viscid, glandular hairs and smelling of musk. Stem 6–12 inches high, leafy, usually branched. Leaves narrowly lanceolate, with wavy or coarsely-toothed margins, the lowermost narrowed at the base; upper leaves sessile, or more or less amplexicaul. Capitula solitary on each branch. Flowers pale yellow, soon fading. Achenes sometimes brown and sometimes black.

Stony gullies and steep shady places at about 5000 feet, chiefly on granite soil, as near Le Planet above Argentière and higher towards the Col de Balme; very local. August, September.

Distribution.—Eastern, Central, and Western Alps, from the Maritime Alps to Carinthia; Bavaria.

This is a suitable Hawkweed to introduce into English rockworks, and we believe Messrs. R. Wallace and Co. of Colchester will shortly have it established in their nurseries from true seed from Savoy.

It is quite impossible in a book of this character to describe more than a very few of the most important of the many *Hieracia* found in the lower Alps. Nor can there be much advantage in giving a bare list of the innumerable species, many of them difficult to distinguish, which frequent the Alpine and sub-alpine regions. An up-to-date arrangement of those found in Switzerland alone can be found in the *Flore de la Suisse*, by Schinz and Keller, while Gremli's *Swiss Flora* (at present out of print in the English edition) also gives a good account of them.

CAMPANULACEÆ

Leaves alternate, entire or toothed, without stipules. Flowers usually blue or white, either distinct or collected into heads with a general involucre. Calyx with a free border of 5 teeth or lobes, sometimes merely bristles. Corolla regular or irregular, with 5 lobes. Stamens 5, inserted at base of corolla. Anthers distinct, or rarely cohering in a ring round the style. Style single. Ovary and capsule inferior, divided into 2–5 cells.

A rather large family spread over temperate regions, and crossing the tropics in mountainous districts.

JASIONE L.

Flowers blue, in terminal, hemispherical heads, surrounded by an involucre of several bracts. Calyx reduced to 5 very narrow lobes. Corolla regular, deeply divided into 5 narrow segments. Anthers united at the base into a ring round the long, club-shaped style. Capsules many-seeded.

About 12 species inhabiting temperate Europe and the Mediterranean region.

Jasione montana L. Sheep's-bit. (Plate X.)

An annual or biennial. Stems sometimes short and decumbent, but more often erect, a foot high, with a few spreading branches. Leaves linear-lanceolate, with wavy margin, more or less hairy. Flower-heads variable in size, on long terminal peduncles. Involucral bracts broadly ovate. Florets small, rather pale blue, on very short pedicels.

Dry, sandy, and heathy places on siliceous soil in the plains and mountains; often in large colonies. June to September.

Distribution.—Europe, except the extreme north, and eastward to Asia Minor and the Caucasus; North Africa. British Isles.

PHYTEUMA L. Rampion.

Flowers in dense heads or spikes, surrounded by an involucre of bracts, usually blue. Corolla curved in bud, with 5 linear segments. Anthers free and distinct. Style cleft at the top into 2 or 3 stigmas. Capsule dehiscent below the middle, and crowned by the spreading teeth of the calyx.

A small genus spread over Europe and Western Asia, but chiefly in mountain districts.

Phyteuma comosum L.

Stem about 8 inches high, somewhat prostrate, leafy. Flowers on short stalks, forming a large terminal umbel, violet and handsome, the tip being darker than the rest of the corolla. Root-leaves reniform, bright green, sharply serrated like the petioled stem-leaves. Very distinct from all the other species.

Clefts of Alpine and sub-alpine rocks; 2300–5000 ft. May–July.

Distribution.—Carpathians, Tyrol, Carinthia, and Carniola.

Phyteuma Scheuchzeri All.

Stem simple, 1–1½ feet high, striated. Leaves crenate, serrate, the lower ones long-stalked, lanceolate, acuminate, those of the barren shoots cordate, upper stem-leaves linear. Heads globular, many-flowered; outermost bracts linear, usually longer than the capitulum. Flowers dark blue.

Stony Alpine and sub-alpine pastures, descending to a low elevation. May to July. 3000–7000 feet.

Distribution.—Eastern and Central Alps, including Southern Switzerland. Not in France.

Phyteuma betonicæfolium Vill. (Plate IV.)¹

Very similar to the last in habit and shape of leaves, but the

¹ The pale blue spike figured is probably *P. spicatum*.

spikes are at first ovoid and then cylindrical. Stigmas 3. Stamens glabrous. Stem leafy in lower portion. Flowers dark blue.

Pastures on siliceous soil up to 8000 feet. July, August.

Distribution.—Southern Germany, Southern Austria, Central and Western Alps; Pyrenees, Spain.

Phyteuma spicatum L. (Plate IV.)

Stems 1–2 feet high, rather stout, usually glabrous, leafy below. Root-leaves longly petioled, ovate heart-shaped, crenate-dentate; upper leaves narrower, sessile, usually entire. Flowers dirty greenish white or pale blue, in an ovoid head which lengthens into a spike 2 inches or more in length.

Woods and meadows, especially in the sub-Alps. June to August.

Distribution.—Central and South-Central Europe, extending northwards into Britain (Sussex) and Norway.

Phyteuma orbiculare L. Round-headed Rampion. (Plate IV.)

Stem 6–18 inches high, erect, often hollow. Lower leaves lanceolate, with a truncate or almost cordate base, stalked, crenate-serrate; upper stem-leaves narrower, sessile. Involucral bracts lanceolate, somewhat serrate. Flowers deepest blue, or sometimes deep blue-violet, in globular heads an inch in diameter. Stigmas 3. Very variable in size.

Meadows and pastures from the plains to about 8600 feet; often very abundant, especially on limestone soil from 4000–5000 feet. June, July.

Distribution.—Central and Southern Europe, extending to the chalk downs of Southern England.

Phyteuma Halleri All.

The tallest and stoutest species. Stem 2–3 feet high, thick, hollow, leafy at the top. Radical leaves with very long petioles, broadly heart-shaped, and irregularly or coarsely toothed; upper leaves sessile. Flowers dark violet, in dense oblong-cylindric heads. Inferior bracts of involucre leafy, toothed, lanceolate, longer than the flowers. Stamens woolly, 2 stigmas.

Woods and pastures; 4300–6500 feet; local.

Distribution.—Carpathians, Servia, Eastern, Central, and Western Alps; Pyrenees, Spain.

CAMPANULA L.

Flowers in panicles, racemes, or spikes, or rarely solitary, and occasionally in short, leafy heads. Corolla regular, bell-shaped, broadly tubular or rotate, with 5 broad lanceolate lobes. Anthers distinct. Stigmas 2, 3, or 5. Capsule crowned by the lobes of the calyx and dehiscing laterally or at the top. A numerous genus, widely spread over the globe, chiefly in the northern hemisphere or in mountain ranges of the hotter regions.



PLATE XXIII.

4/7 NATURAL SIZE.

- | | |
|--------------------------|-----------------------------|
| 1. TOFIELDIA CALYCVLATA. | 2. CAMPANULA PERSICIFOLIA. |
| 3. EPILOBIUM FLEISCHERI. | 4. EPILOBIUM ANGVSTIFOLIUM. |
| 5. LUZULA NIVEA. | |

Campanula barbata L. (Plate XXIV.)

Root very long and tapering. Stem erect, obtusely angled, rough-haired like the whole plant. Leaves entire or slightly crenate, wavy, lowermost linear-lanceolate, narrowed into a foot-stalk; upper leaves lanceolate, obtuse, sessile. Flowers shortly stalked, in a single or compound raceme, usually unilateral, large and handsome, bell-shaped, porcelain-blue, occasionally darker or white. Corolla lobes bearded within and without. Calyx-teeth lanceolate, acute; appendages to calyx nearly as long as calyx-tube. Capsule nodding. Plant 10–18 inches high.

Alpine and sub-alpine meadows and pastures; 3000–8500 feet; widely spread. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Germany, Norway, Italy.

One of the most beautiful of the common Alpine plants, and it should be more frequently cultivated in England. It is more easily grown from seed than by getting the long tap-roots, and the only precaution to take is that it must not be allowed to damp off in winter by an excess of moisture.

var. *strictopedunculata* Thomas.

This is a much-branched variety, with lateral peduncles 15 or 20 cms. long, bearing 2 or 3 flowers on each branch. It is occasionally seen in the Western Alps, as at Mont Cenis, and in Savoy.

Campanula thyrsoidea L.

Biennial. Root turnip-shaped. Stem erect, 6–12 inches high, angular, leafy, very hairy like the leaves, viscid below, ending in a long dense spike of pale yellow, rather small flowers. Stem-leaves linear-lanceolate, sessile; root-leaves elongated, wedge-shaped, and prolonged into a leaf-stalk, finely serrate or entire.

Pastures and steep mountain-sides up to 8000 feet. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura.

Campanula spicata L.

A biennial, 2–3 feet high, covered with grey hispid hairs. Stem erect, thick, leafy. Leaves close together, lanceolate, acute, crenate, sessile, getting shorter towards the long, spiky inflorescence. Flowers blue, in a dense, very long spike, erect, rather small for the plant. Lobes lanceolate. Calyx hispid, with linear lobes, about one-third length of corolla.

Pastures and hot, stony, bushy places in the Alps and lower Alps. July, August, up to 6500 feet; local.

Distribution.—Eastern, Central, and Western Alps as far south as Liguria (e.g. on Monte Toraggio), Sardinia.

Campanula glomerata L.

Stem erect, stout, 1-2 feet high, hairy. Root and lower leaves stalked; upper leaves sessile, broadly lanceolate, clasping the stem by their cordate base, densely hairy. Flowers sessile, in small clusters in the upper leaves, the top ones forming a dense, leafy head. Corolla blue. Capsule short and broad. Calyx lobes linear-lanceolate, acuminate. Very variable.

Pastures and sides of woods from the plains up to 5000 feet. In England it grows both on dry, limestone hillsides and on damp alluvial soil, such as on Clifton Ings, near York. June, July.

Distribution.—Continental Europe, Russian Asia excepting the extreme north. British Isles.

Campanula pusilla Haenke. (Plate XXIV.)

Cæspitose, with numerous tufts of leaves and slender flowering stems. Stems 2-4 inches high, leafy at base, bearing a slender raceme of 1-5 flowers, but more frequently the flowers are solitary. Leaves of barren shoots roundish, coarsely serrate, slightly cordate, much shorter than leaf-stalk, other leaves lanceolate or linear-lanceolate. Usually glabrous. Corolla pale blue, very rarely white, campanulate. Calyx-teeth linear, not one-third length of corolla.

Gravelly, moist places and shifting scree and banks of slaty detritus, especially fond of limestone, up to 9000 feet, but descending beds of streams to the plains; very common. June to September.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps, Vosges, Jura, Pyrenees.

C. pusilla is a very useful plant for the garden, and is grown in borders or rockeries, or even on old walls. It prefers a light, porous, and yet finely divided soil.

Campanula rotundifolia L. Harebell.

Radical leaves orbicular or heart-shaped, but they mostly die away at or before flowering-time; stem-leaves linear or narrow-lanceolate, entire. Stems 6-12 or more inches high, slender, often branched, with a few elegant drooping blue flowers in a loose panicle, or rarely solitary. Corolla-lobes broad and rather short. Capsule ovoid or globular, pendulous. Sepals subulate.

Meadows, walls, rocks, and hilly pastures; common. June, July. It ascends to well above the sub-Alpine region.

Distribution.—Europe, Russian Asia. From the Mediterranean to the Arctic Circle. British Isles.

Campanula linifolia Scop. (non Lamk.).

Very similar to the Harebell and differing chiefly in its long, reflexed calyx-teeth, and the stems are usually 1-flowered.

Clefts of rock from 5000 to 6000 feet in Carniola and Carinthia. June, July.



PLATE XXIV.

4/7 NATURAL SIZE.

1. *CAMPANULA BARBATA.*

2. *C. RHOMBOIDALIS.*

3. *C. PUSILLA.*

Campanula Scheuchzeri Vill.

Like a large and robust harebell, whose cordate root-leaves also die down early. Flowers larger and often a deeper blue, and usually solitary. Calyx-segments linear-lanceolate or sometimes subulate, erect or spreading. Very variable in size, pubescence, shape, and size of flowers. Some specimens found on the Col de Balme in August, 1911, had flowers $1\frac{1}{2}$ inches across and almost saucer-shaped, the corolla-lobes being very broad and shallow.

Alpine pastures and stony, grassy places up to 9300 feet, and not often seen below about 5500 feet. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Pyrenees, Apennines, Sudetic Mountains, Arctic Russia.

Campanula persicifolia L. (Plate XXIII.)

A glabrous plant 2–3 feet high, with erect, wiry, simple stem, 1–6 flowered. Leaves serrated, upper ones linear; lower leaves lanceolate, with long petiole. Flowers blue, rarely white, large, broadly campanulate. Calyx-lobes lanceolate, half the length of the corolla. Capsule erect.

Mountain woods and hillside thickets. May to August.

Distribution.—Most of Europe; Western and Northern Asia.

Though widely spread, this species is not often found in large numbers.

Campanula pulla L.

Stem erect or ascending, obtusely angled, glabrous or with a few scattered hairs like the leaves, leafy below, 1-flowered. Leaves crenate; root-leaves and lower stem-leaves ovate or elliptical, shortly stalked, longer than the leaf-stalk; median stem-leaves narrower, acute, sessile; uppermost lanceolate, small. Corolla terminal, bell-shaped, large, dark violet-blue. Calyx-teeth linear, one-third length of corolla.

Pastures, woods, bushy and stony places in the calcareous Alps; 4000–6500 feet.

Distribution.—Eastern Alps.

Easily grown in an open, sunny spot, but is apt to die off in winter.

Campanula excisa Schleicher.

Segments of corolla incised at the base, and separated by a rounded sinus. Calyx-teeth reflexed. Rootstock slender, rampant; stem ascending; leaves lanceolate or linear-lanceolate, occasionally toothed or with cilia. Flowers blue, 1–3.

Granitic Alps; local and rare; 6500–9000 feet.

Distribution.—Switzerland (S. Tessin and Valais, above the Valley of Münster, at Berisal, and between Saas and Binn), Aosta Valley in Piedmont.

Grows rapidly in gritty loam, but hates lime. Sometimes a little peat will improve the growth.

Campanula bononiensis L.

A tall spiky species with usually simple stem, which is very leafy and almost tomentose. Leaves green, downy beneath; lower leaves shortly petioled, cordate; upper ones sessile and becoming narrower and narrower. Flowers small, blue-violet, very shortly stalked, in clusters at the junction of the bracts and stem and forming a long spike. Sepals linear-lanceolate, spreading. Capsule pendent.

Mountain woods in the sub-Alps; very local. June, July. A frequent plant in the Chestnut zone of the Italian Maritime Alps.

Distribution.—Southern Switzerland; Western, Central (?), and Eastern Alps, Caucasus, Siberia.

Campanula rhomboidalis L. (Plate XXIV.)

Stem erect, slender, leafy above, 1-1½ feet high. Raceme more or less unilateral, 3-5 flowered. Leaves all sessile, ovate-lanceolate, dentate, glabrous or slightly hairy. Flowers blue, pendent. Calyx-teeth linear or subulate, two-thirds length of corolla.

Meadows, borders of woods in the Alps and sub-Alps; abundant and often in great masses. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Pyrenees, Spain.

Campanula rapunculoides L.

Erect stems, 1-3 feet high. Lower leaves heart-shaped, on long stalks; upper ones small, ovate-lanceolate. Flowers drooping, blue, varying in size, single in the axils of the leaves, and forming long, terminal, simple and more or less unilateral racemes. Capsules nearly globular. Calyx-lobes narrow-lanceolate.

Open woods, borders of roads, etc., from the plains to at least 5000 feet. June, July.

Distribution.—Most of Europe, except the Mediterranean region, Caucasus, Asia Minor. British.

Campanula Trachelium L. Nettle-leaved Bell-flower.

Very variable, sometimes approaching smaller specimens of *C. latifolia*, and sometimes with the upper flowers clustered to resemble *C. glomerata*. Lower leaves broadly heart-shaped, on long stalks, coarsely toothed; upper ones small, ovate-lanceolate. Flowers large, 2 or 3 together in short, leafy racemes, or sometimes solitary. Calyx-teeth broadly lanceolate, hairy.

Woods, ravines, and roadsides from the plains to the lower Alps. June to September.

Distribution.—Europe, Western Asia, and right across Siberia, N. Africa. But most common in Western Europe. British.

Campanula latifolia L.

The tallest and most handsome species, often in England 3-4 feet high, usually shorter in Switzerland. The stems are rarely branched, though leafy. Leaves ovate-lanceolate, acuminate, narrow at the base and lower ones stalked, pubescent, coarsely biserrate. Calyx-teeth lanceolate. Flowers large, blue, deeply cleft into 5 lanceolate, acute lobes.

Woods, ravines, by streams in the plains and sub-alpine region ; rare in Switzerland. July, August.

Distribution.—Alps, Pyrenees, Vosges, Jura ; woods of Northern Europe, Northern and Central Asia to the Arctic regions, but becoming a mountain plant in Southern Europe. Occasional in England and Scotland.

VACCINIACEÆ

Calyx 4-5 fid ; teeth often minute. Corolla regular, 4-5 cleft. Stamens 8-10 ; anthers opening by terminal pores or slits. Ovary 4-5 celled. Fruit a berry. Seeds albuminous.

Small woody shrubs, often with shiny evergreen leaves.

A small family allied to *Ericaceæ*, represented in northern and temperate regions, and in the mountains of the tropics.

VACCINIUM L.

Small woody shrubs, often with shiny, evergreen leaves. Corolla regular, campanulate or rotate, 4-5 cleft. Stamens 8-10. Style filiform. Calyx 4-5 fid. Ovary 4-5 celled. Fruit a berry. Flowers solitary or in racemes.

A numerous genus in mountain districts and heaths, represented over the greater part of the globe.

Vaccinium Myrtillus L. Bilberry, Whortleberry.

A small, glabrous shrub, 6-18 inches high, with many erect or spreading green branches. Leaves deciduous, ovate, barely an inch long, finely toothed and very shortly stalked. Flowers globular, greenish white or pinkish. Berry globular, bluish black, with a glaucous bloom.

Mountain woods, heaths and stony pastures (avoiding limestone) up to 9000 feet in the Maritime Alps and perhaps in Switzerland. May to July. Fruit : August, September.

The fruit is often larger than in England, and in autumn sometimes mountain-sides are ablaze with the autumnal tints of this plant.

Distribution.—Mountain ranges of Southern Europe. At lower elevations in Northern and Central Europe and Russian Asia. British.

Vaccinium uliginosum L. Bog Whortleberry. (Plate XVIII.)

Differs from the last by its entire, obovate, or oblong, thin leaves, which are glaucous beneath and have a strong network of veins above; its rather smaller and more numerous flowers and berries are not pleasant to the taste.

Bogs, Alpine moors and heaths up to 9300 feet in Switzerland and the French Alps, not descending so low as the last. May to June. Fruit: August, September.

Distribution.—Northern and Central Europe, Russian Asia, N. America. British.

Vaccinium Vitis-idaea L. Cowberry. (Plate XII.)

Stems much branched, procumbent and straggling. Leaves numerous, evergreen, obovate or oblong, coriaceous, rolled at the margins, entire or slightly toothed at the apex. Flowers waxy, flesh-coloured, campanulate, drooping, with spreading lobes, forming dense terminal, drooping racemes. Berries bright scarlet, the size of peas; they are eaten by Snow Partridges and other birds.

Mountain woods, turf-moors and Alpine heaths, and rocky pastures up to 9300 feet in Switzerland. May to July. Fruit: August, September.

Distribution.—Northern and Central Europe, Russian Asia, and N. America, becoming a mountain plant in Central Europe. The plant is often attacked by a fungus called *Exobasidium Vaccinii*.

Vaccinium Oxycoccus L. *Oxycoccus palustris* Pers. Cranberry.

A small and very delicate, wiry-stemmed, creeping plant. Leaves small, evergreen, ovate-lanceolate, with edges rolled back, 1-nerved, very glaucous beneath. Flowers drooping and fugitive, on long, slender peduncles with a pair of minute bracts below the middle. Corolla rose, deeply divided into 4 lobes which are quite reflexed, exposing the 8 stamens. Berries globular, reddish yellow, then darker. Flowers June, July. Fruit: July to September.

Only in sphagnum bogs, where it is difficult to find, the flowers being so fugitive. Up to 5600 feet in Switzerland.

Distribution.—Northern Europe, Asia, and America as far as Iceland. High mountain ranges of Central Europe, but apparently not in the French Alps (Coste). British.

ERICACEÆ

Herbs or woody shrubs, often evergreen. Flowers regular, campanulate, 4-5 lobed. Calyx 4-5 fid. Stamens 4-10. Ovary 4-5 celled. Style terminal. Fruit a berry or capsule.

A family of over 1000 species, spread over the whole globe, but particularly on siliceous soil.

RHODODENDRON L.

Shrubs with alternate and often large leaves. Flowers large, handsome, and usually red, often irregular. Sepals and corolla-lobes usually 5. Stamens usually 10.

About 200 species in Europe, Central Asia, Malay, and North America.

Rhododendron hirsutum L.

An erect, branched shrub. Leaves elliptical, ovate or obovate, finely crenate, more or less ciliate, otherwise glabrous, evergreen, shining and bright green above, dotted on under side with scattered, resinous, at first yellowish, finally rusty brown glands. Flowers in terminal corymbs, nodding on erect flower-stalks. Corolla funnel-shaped, a beautiful rose colour, rather paler than in the next, dotted on the outside with resinous glands like the flower-stalk, calyx, and ovary.

Rocky places and steep mountain-sides in the limestone Alps and sub-Alps up to over 7000 feet, and descending occasionally to the valleys, as, e.g. St. Margrethen in the Rhine Valley, and the banks of Lago Maggiore. Not found in the Jura. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps. But only on Mont Chauffé in the French Alps, where it was discovered in 1904. Southern Germany.

Rhododendron ferrugineum L. Alpen-rose. (Plate III.)

A similar-sized shrub. Leaves lanceolate to elliptical, entire, or sometimes finely crenate, glabrous, dark green and shiny above, somewhat revolute at the margin, coriaceous, evergreen, covered on under side when young with densely packed yellowish resinous, finally coalescent glands, turning rusty brown when older. Flowers in terminal corymbs, more or less erect on longer flower-stalks than in the last. Corolla rose-coloured (very rarely white), dotted on the outside with resinous glands like the glabrous flower-stalk, calyx and ovary. Leaves of the previous year cinnamon-brown in colour. Leaves more crowded than in *hirsutum*.

Similar habitats, but usually, though not always, on primary rocks. June, July. It ascends to 8800 feet in Valais, and descends to the plain in Tessin, and is occasionally found as a glacier relic in turbaries in woods of the Swiss plateau.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Pyrenees, Apennines, Spain, Transylvania.

The white-flowered variety is very rare; the specimen figured was found by Mr. Flemwell near the Planet above Argentière in Haute-Savoie.

This *Rhododendron* can be grown in the garden in a mixture of

sand and peat, from well-established plants, in a sheltered and somewhat cool position.

Rhododendron Chamæcistus L.

A small, prostrate, under-shrub, not exceeding 6 inches in height, with ascending branches. Leaves very small, elliptic-lanceolate, more or less serrate, ciliated, otherwise glabrous, coriaceous, evergreen, grass-green on both sides, shining, not dotted, cilia often glandular. Flowers in clusters of 1-3, on long stalks, erect, rotate or expanding, rose-coloured, very deciduous. Calyx-teeth lanceolate, acute, reddish purple. Anthers purple-black.

Abundant, but local, in stony Alpine and sub-Alpine places, on limestone, but not making such a feature in the landscape of the Eastern Alps as the other species, the flowers being paler, and the leaves appearing only after the flowers. May to July.

Distribution.—Carpathians, Eastern Alps from Tyrol to Carniola, 4000-5000 feet. A partially shaded place suits it best.

To succeed in the sun with it, the plant must be well established before planting out, or it must be shaded from the sun by artificial means; then it will bloom much more freely than in a shady place.

Hard peat and sand should be pressed firmly against the roots, and it should be top-dressed twice a year with the same compost. (W. A. Clark.)

ANDROMEDA L.

Andromeda polifolia L. Marsh Andromeda.

A low, branching, wiry shrub 6-12 inches high, glabrous. Leaves alternate, oblong, lanceolate, evergreen, revolute at the edges, and very glaucous beneath. Flowers on pedicels, in short terminal clusters; corolla pale pink or nearly white, waxy, ovoid and enclosing the 10 stamens.

Peat bogs of Northern Europe, Asia, and America to the Arctic regions, and in similar places in the mountains of Central Europe (Alps, Jura, Pyrenees). Rather rare in Switzerland. British, but strangely absent from the Scotch Highlands, where so many plants of similar continental distribution are found. It flowers in May and June. In 1901 it was found by Mons. Beauverd in the Tourbières des Glières at 1500 m. in the Alps of Annecy, and hitherto in only one other French Alpine station.

ARCTOSTAPHYLOS Adanson. Bearberry.

Low, straggling shrubs, with alternate, entire, or toothed leaves, and rather small flowers, 2 or 3 together in short, terminal racemes. Ovary with only one ovule in each cell. Fruit a berry. The genus is represented more fully in America than in Europe or Asia.

Arctostaphylos alpina Spreng.

A small under-shrub, forming great masses or cushions on rocks

and stones. Leaves often dry, annual, toothed, wedge-shaped or narrowly obovate, running into the leaf-stalk, ciliate at the base, otherwise glabrous, reticulately veined. The new leaves are not developed at time of flowering. Flowers 2-6, arranged in a raceme at the summit of the branches, small, greenish or reddish white. Drupe green, then red, and finally blue-black, not ripening till the second year.

Stony places on the calcareous Alps up to 8500 feet. May, June.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Pyrenees; high mountains of Europe; Arctic Europe and Asia; Rocky Mountains. British.

Arctostaphylos Uva ursi L. Red Bearberry. (Plate XII.)

A small, much-branched shrub 3-6 feet high. Leaves evergreen, glossy above, with sunken dots (brown glands) beneath, usually entire, but rarely, as in the drawing, somewhat toothed, leathery, net-veined. Flowers white or pale pink, larger than the last, in compact, drooping, terminal racemes. Berries globular, bright red, smooth and shining.

Dry, rocky, or heathy places in the plains, sub-Alps, and Alps up to 8000 feet; rarely 9000 feet. On heaths in Scotland. April, May.

Distribution.—Central and Northern Europe, Asia and N. America to the Arctic Circle.

CALLUNA Salisb.

Calluna vulgaris Hull. Ling, or Heather.

Small, straggling shrubs. Leaves acicular, very small and short. Flowers pink or rarely white. Stamens with anthers dorsally fixed. Calyx coloured like the corolla, with 4 small bracts at the base.

Heaths, woods, and mountain-sides up to 8800 feet in Switzerland, preferring siliceous rocks. July to October.

Distribution.—Central and Northern Europe to the Arctic Circle, Western Asia, Morocco, Azores. N. America. British Isles.

ERICA L. Heath.

About 400 species inhabiting Europe, the Mediterranean region, and S. Africa, but with only one truly native species in Switzerland, viz. *Erica carnea*; for though *E. vagans* (the Cornish Heath) grows in the Canton de Genève in a wood near Juvigny, and at the foot of the Voirons above Lake Lemman, it is doubtfully indigenous, though it is native on French territory to the west.

Erica carnea L.

A shrubby, somewhat prostrate plant, with branches 3 inches to 1 foot long, erect or ascending, glabrous like the whole plant. Leaves 4 or more in a whorl, deciduous, acicular. Flowers in

terminal, spicate, usually unilateral racemes. Petals tubular-urceolate. Stamens and styles projecting from the corolla. Calyx and corolla rose-coloured, rarely white, anthers purple-black.

Rocks, margins of woods, and in the woods themselves, up to 8500 feet, often covering large tracts; local, and almost always on limestone. April, May.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Central and Southern Europe.

It is interesting to note that, according to Keller and Schinz, no fewer than 9 of the 13 Swiss plants belonging to Ericaceæ have been seen in that country up to 2400 metres (7870 feet), and 3 reach 3000 m. They do not place *Pyrola* in this family, as we have done in accordance with old tradition.

PYROLA L.

Very beautiful white or greenish white flowers, in racemes or rarely solitary, nodding. Corolla globose or spreading, of 5 free or slightly connate petals. Sepals 5. Stamens 10. Style prominent. Ovary 5-celled. Leaves glabrous.

A small genus confined to the northern hemisphere of the Old and New World.

Pyrola uniflora L. (*Moneses grandiflora* Salisb.). (Plate XIII.)

Stem 2-4 inches high, erect, 1-flowered, slender, leafless except at the base, and springing from a single slender root-fibre, which absorbs water and nutriment from the moss and decaying pine-needles upon which it grows. Leaves ovate, roundish, suddenly narrowed into a foot-stalk, finely serrate, usually in loose rosettes. Corolla shallow, white, nodding. Stigma large, 5-lobed. Anthers orange.

Margins of moist woods in shady, mossy places, and frequently growing in a bed of pine-needles; 1500-5600 feet; not frequent.

Distribution.—Erzgebirge, Eastern, Central, and Western Alps; Vosges, Cevennes, Pyrenees, Corsica, Arctic Europe and Asia, North America. British. *Typical in the Alps*

Mr. Reginald Farrer aptly points out that this little gem has "only one feeble, long, white piece of cotton by way of a root," but at Lanslebourg he found it growing in slaty silt in a wood, and producing "normal masses of compact roots exactly like any other decent plant's."¹

Pyrola rotundifolia L.

Stem erect, leafless except at the base, often reddish, with several red scaly bracts near the summit. Leaves roundish or ovate, entire or obscurely crenate, dark green, shining, and leathery. Raceme

¹ *Among the Hills* (1911), p. 21,

loose, many-flowered. Calyx and teeth lanceolate, acuminate, with apex recurved, half as long as the shallow, widely open corolla. Stamens curved upwards. Style bent downwards, with the apex ascending, thickened above in a ring, and there as wide as the stigma, projecting from the corolla. Flowers white. Anthers and style orange-red.

Shady, Alpine, and sub-alpine woods. June, July.

Distribution.—Eastern, Central, and Western Alps; Europe, Central and Northern Asia, N. America. British.

Pyrola media Swartz.

Differs from the next chiefly in the style, which is considerably longer, and from the last in never being so curved. The flowers are variable in size.

Woods and moist, shady places; not very common. June, July.

Distribution.—Europe, ascending the mountains in the south and in the Caucasus; Armenia, Northern Asia, extreme north of N. America. British.

Pyrola minor L. Common Wintergreen.

Leaves on long stalks as in the 2 last, broadly ovate, rather thick, entire or slightly crenate. Flowers drooping in a short, loose raceme. Sepals short and broad, rather triangular. Petals connivent, ovate or orbicular, quite free, closing over the stamens, often pinkish. Style usually shorter than corolla, nearly straight, with a broad, 5-lobed, spreading stigma.

Woods and shady places. June, July.

Distribution.—Europe, Northern and Western Asia, and extreme north of N. America. British.

Pyrola chlorantha Swartz.

Somewhat like *P. rotundifolia*, but with the long style more curved and reflexed. Root-leaves orbicular, rounded at the top, and sometimes almost truncate at the base, though variable, slightly toothed, longly petioled. Inflorescence loose, 5-7 flowered. Flowers greenish white. Sepals ovate, acuminate, very short.

Mountain woods up to 6000 feet; rather rare. June, July.

Distribution.—Alps, Jura, Cevennes, Pyrenees, Corsica, Central and Northern Europe, Asia Minor, N. America.

Pyrola secunda L. (Plate XIII.)

Raceme unilateral. Style long and nearly straight. Leaves ovate, acute, distinctly toothed and prominently veined. Flowers small, greenish white. Easily distinguished from all the other species by the leaves and flowers.

Mountain woods of the sub-alpine region; common. June, July.

Distribution.—Alps, Jura, Pyrenees, Corbières, Cevennes; Europe, Western and Arctic Asia, N. America. British.

MONOTROPA L.

Erect, succulent herbs of a pale brown or yellowish colour, leafless except for small scales the colour of the stem. Are like Broomrape, and parasitical upon the roots of trees. Allied to *Pyrola*, but easily distinguished by the want of green leaves.

A very small genus inhabiting woods in Europe, Asia, and America. Sometimes accorded a family to itself.

Monotropa Hypopitys L. Bird's-nest.

Stem 6-9 inches high, with oblong or ovate scales instead of leaves. Flowers few, in a short, terminal raceme. Sepals and petals about the same size, ovate or oblong, glabrous or slightly downy inside. The whole plant of a pale yellowish brown, turning black on drying.

Parasitical upon the roots of trees, especially Beech and Birch, and flowering from June to August. From the plains to 5000 feet.

Distribution.—Europe, except in Arctic regions; Western and Northern Asia, N. America. British.

PRIMULACEÆ

Leaves undivided except when under water (as in *Hottonia*). Calyx usually 5-cleft. Corolla regular, 5-lobed. Stamens inserted opposite the centre of the corolla lobes. Ovary 1-celled. Style and stigma undivided. Ovules numerous, with a free central placentation. Fruit and capsule dehiscent by valves or transversely.

A widely-spread family, many inhabiting mountain regions often at a great elevation. A few appear in the Antarctic regions and even within the tropics.

ANDROSACE L.

Small Alpine herbs, often with small rosettes and dense, elongated tufts of leaves. Flowers white or pink (yellow in *A. Vitaliana*) in small umbels, within an involucre of bracts, or solitary in the axils of the leaves. Corolla-limb rotate, tube long, suddenly contracted at the mouth, where there are 5 scales.

High mountain plants, chiefly distributed in Central Europe and Central Asia.

Androsace Chamæjasme Host.

Root tapering, tufted, putting up shoots ending in rosettes. Scape 2-4 inches high. Leaves oblanceolate or elliptical, villous at the margin, with long, simple hairs like the rest of the plant. Flowers in umbels surrounded by an involucre. Involucral bracts lanceolate or linear-lanceolate, rather shorter than or equalling the flower-stalks. Corolla white or rose-coloured; throat yellow.

Alpine pastures and stony places on calcareous and schistose Alps; 5000-9000 feet. June to August.

Distribution.—Carpathians, Erzgebirge, Eastern and Central Alps. Not in the Western Alps except very rarely in Savoy. Arctic Russia, Asia, and North America.

Androsace lactea L.

Scape glabrous, 2-4 inches high, springing from a large rosette of green linear or linear-lanceolate, acute leaves, which are glabrous and only ciliated towards the apex. Involucral bracts very small, linear-lanceolate, much shorter than the flower-stalks. Flowers sometimes solitary, and then without an involucre, white, with a golden-yellow disc at the throat; lobes cordate. Flowers usually 3-5 in a loose umbel.

Alpine pastures and stony places on limestone; 4800-8000 feet. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Haut-Jura; rare in Switzerland, except in the Stockhorn Range and Alps of Fribourg.

Androsace septentrionalis L.

An annual species resembling the last, but taller and with smaller flowers in a more numerous-flowered umbel, and oblong-lanceolate, *toothed* leaves.

Grassy places and fields in the mountains up to 6500 feet; local. June, July.

Distribution.—Eastern, Central, and Western Alps, Northern Europe, Caucasus, Siberia, North America; rare in Switzerland, and only in Grisons and Valais (Saas Thal, etc.).

Androsace lactiflora Pall.

An annual species not found in Switzerland, but in some of the French Alps in the south. Plant 4-8 inches high, glabrescent. Leaves in a radical rosette, oblong-lanceolate, slightly *toothed*. Central flower-stem erect, the side one spreading, almost glabrous. Flowers on long, slender pedicles, forming a loose, spreading cluster or umbel. Corolla white or pink, small, 4-10. Involucral bracts small, lanceolate-acute. Lobes of calyx triangular, shorter than the tube.

Woods and pastures in the mountains. April to July.

Distribution.—Departments of Isère, Hautes-Alpes, Basses-Alpes, Alpes-Maritimes, Var, Vaucluse; Northern Asia.

Androsace maxima L.

Annual or biennial, 2-4 inches high. Leaves large, in a radical rosette, obovate-wedge-shaped, *toothed* at the top. Scape low, rather thick, the central erect, the others spreading. Pedicels

short, erect. Flowers white or pink, 3-8 in a stiff umbel. Involucral bracts obovate. Calyx downy, large, twice as long as the corolla, increasing after fertilisation; lobes of calyx ovate-lanceolate.

Fields on limestone soil. April, May.

Distribution.—Only in Valais in Switzerland; Southern and Central Europe, Western and Northern Asia, N. Africa.

PRIMULA L.

Leaves radical. Flowers solitary or in a terminal umbel, on leafless, radical peduncles. Calyx tubular or campanulate, with 5 lobes. Corolla a tube, with an expanding 5-lobed limb, each lobe usually notched. Capsule opening at the top in 5 teeth. Seeds numerous.

A genus widely spread in Europe and Central and Northern Asia, containing many Alpine species, one or two of which reappear in Antarctic America.

Primula farinosa L. (Plate XX.) Bird's-eye Primrose.

Stem 3-9 inches high, erect, leafless, mealy in the upper part like the flower-stalks and calyx. Leaves radical, obovate-lanceolate, narrowed into a foot-stalk, dentate or nearly entire, obtuse, glabrous on the upper side, white mealy beneath, rolled up when young. Flowers in a crowded terminal umbel. Involucral bracts linear-apiculate, serrate at the base. Calyx-teeth oval, acute. Capsule longer than calyx. Corolla rather small, darker or lighter pink, very rarely white, with a yellow eye.

Damp, grassy pastures and meadows from the plains to the Alpine region, up to 8200 feet, often in great abundance on limestone. April to July.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps; Jura, Central Pyrenees, Northern and Central Europe, Central and Northern Asia. British.

Primula Auricula L.

Leaves all radical, obovate or lanceolate, narrowed towards base, obtuse, entire, or with a wavy or toothed margin, coriaceous, glaucous on upper side, downy beneath and on margin with fine glands, when young more or less mealy and rolled up. Stem erect, leafless, glabrous, or covered with a white powder or mealy with fine glands like the flower-stalks and calyx. Flowers in a terminal, 2-8 flowered umbel, stalked, yellow, fragrant, mealy towards the throat, 8-10 lines in diameter. Involucral bracts oval, obtuse. Calyx shortly campanulate, with short, oval-obtuse teeth.

Limestone cliffs and perpendicular rocks up to 7000 feet, and on rocky pastures at lower elevations in the sub-alpine district and Jura. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps ; Jura, Black Forest, Servia, Apennines.

Primula marginata Curt.

Stem 2-6 inches high, fleshy, bearing a few-flowered umbel of rather larger rose-purple flowers. Leaves smooth, thick, oval-elliptical, narrowed into a foot-stalk, cartilaginous, serrate, the margin mealy and white. Involucral bracts short and oval or nearly orbicular. Petals obcordate. Calyx mealy, with rounded tube and short oval bracts. Capsule sub-globular. A somewhat variable plant, according to position, etc.

Rocky places (limestone) in the Western Alps of Dauphiny and Provence, Liguria, and Piedmont ; very local. June, July.

We have seen this species as low as 800 metres, near San Dalmazzo di Tenda in the Maritime Alps, and up to 2745 metres, or 9000 feet on Monte Santa Maria in the same district, and at Mont Cenis at 2590 metres or 8500 feet.

Primula Allionii Lois.

Somewhat like the last in habit, but pubescent, viscous, and greyish green in colour. Plant about 2 inches high, from a creeping root. Scape almost wanting or much shorter than the leaves, bearing a solitary bright rose flower. Leaves oboval, lengthened into a long foot-stalk, entire or crenate, velvety and very viscous. Calyx viscous, with oval, obtuse teeth. Corolla-tube twice as long as calyx. Capsule globular, shorter than calyx.

Rocks in the sub-alpine region of the French and Italian Maritime Alps. (Endemic.) March to May.

Primula spectabilis Tratt.

Leaves lanceolate or elliptic-lanceolate, acute, entire, glabrous, with cartilaginous margin, very shortly ciliated, dotted on the upper side. Umbels 1-5 flowered. Involucral bracts linear, equalling the flower-stalks. Calyx tubular-campanulate, shorter than the corolla-tube.

Stony pastures and limestone rocks descending to the lower Alps. June to August.

Distribution.—Eastern Alps (Southern Tyrol and Carniola).

Primula tirolensis Schott.

Leaves on the lower parts of the stem imbricate, ending in a rosette about three-fourths the height of the stem, ovate ; the upper ones broader, dentate, covered on both sides with glandular hairs ; uppermost leaves small, scale-like. Scape 1-2 flowered, very short. Flower-stalks shorter than the scale-like bracts. Lobes of corolla bifid. Corolla bright rose-coloured. Leaves thick and succulent, with thickened cartilaginous teeth at the margin.

Southern Tyrol, on dolomitic limestone ; rare. June.

Primula viscosa Vill. non All. (*P. villosa* Jacq., *P. hirsuta* All. non Vill.).

A variable plant, whose nomenclature is rather involved. Stem 2-4 inches high, pubescent-glandular and viscid, like the leaves and calyx. Leaves roundish obovate, suddenly narrowed into a broad foot-stalk, crenate, dentate, very viscid. Flowers rose or rose-purple, fragrant, in umbels of 3-6, rather large, the tube being twice as long as the calyx. Pedicels longer than the oval involucre bracts. Calyx-teeth ovate, obtuse. Capsule shorter than calyx.

Shady, granitic rocks, and more rarely on limestone, banks, and roots of larch trees, etc., and occasionally on stony pastures, 5000-8500 feet; common; descending sometimes to the plains, as, e.g. at Vernayaz in the Rhône Valley and above Lake Maggiore. May to July.

Distribution.—Tyrol, Switzerland and Western Alps as far south as Provence; Pyrenees.

Though this plant is generally known as *P. viscosa*, under the Vienna Rules of Nomenclature that name should be given to the next species and this should be called *P. hirsuta* All.

Primula latifolia Lapeyr. (*P. viscosa* All. non Vill., *P. hirsuta* Vill. non All.).

A stout plant, 6-8 inches high, on a long, robust, cylindrical root-stock, covered with the scales of old leaves. Leaves broadly lanceolate or oboval, narrowed below into a long stalk, the whole being 4-6 inches long, toothed or crenate, pubescent, viscous. Flowers a beautiful purple-violet, not red or pink, fragrant, in umbels of from 3-20, and with unequal pedicels, longer than the involucre, with oval bracts. Calyx-teeth oval, glandular. Corolla-tube 3 times length of calyx. Capsule longer than the calyx. Somewhat variable in size and in the shape of the leaves.

Rocks and cliffs in the high mountains and sub-Alps up to 2000 metres; rather rare. May to July.

Distribution.—In Switzerland only in Grisons (Engadine and near Poschiavo), Western Alps from Savoy to Provence; Pyrenees.

Primula elatior Jacq. Oxlip.

Somewhat like the Cowslip, but with primrose or straw-coloured flowers, more erect than in the Cowslip, and somewhat larger, and longer leaves, less conspicuously veined and a duller green. Flowers not scented. Calyx-teeth triangular, acuminate, one-third the length of the calyx-tube.

Woods and pastures from the plains up to 7000 feet at least; common.

It flowers from March to May in the plains, and continues till July in the higher mountains.

Distribution.—Europe, especially Western and Central; Taurus, Caucasus. In Britain in East Anglia only.

Primula veris Hudson. Cowslip.

Leaves oblong-spathulate, green to greenish grey beneath. Flowering-stem erect, simple, 6–10 inches high. Umbel many-flowered (3–30), yellow, with the throat spotted with orange. Bracts subulate. Calyx yellowish white, swollen, campanulate, with oval, sub-obtuse lobes.

Dry meadows and pastures from the plains to the Alps. April to July, according to situation.

Distribution.—Europe, Caucasus, Altai, Siberia.

CORTUSA L.

Cortusa Matthioli L.

Stem erect, 6–12 inches high, 3–12 flowered, leafless, densely villous below like the leaf-stalks, covered in upper part, like the flower-stalks, with shorter, weaker hairs. Leaves radical, on long stalks, roundish cordate, 11 or 12-lobed, glabrous above, hairy below and on the margin. Lobes obtuse, coarsely toothed. Flowers in a loose, terminal umbel, nodding on one side. Corolla rose, becoming violet, faintly fragrant, with lanceolate, acute lobes. Involucral bracts lanceolate, entire or serrate, or deeply toothed at the apex. Calyx glabrous, small, with 5 lanceolate, acute segments. The foliage of this plant is very handsome, and altogether it forms a useful and ornamental subject to plant in loam and leaf-mould or peat.

Damp, shady woods, moist spots on débris, or in ravines in the lower Alps up to 6500 feet; very local. May to July.

Distribution.—Eastern Alps, Switzerland (Grisons), and Western Alps of Savoy, Hautes-Alpes and Piedmont; Arctic Russia and Northern Asia.

SOLDANELLA L.

Small Alpine herbs, appearing on the edge of the snow and sometimes flowering through the snow. Flowers solitary or in few-flowered umbels on long stalks, mauve or rarely white. Corolla campanulate, nodding, finely divided into many linear segments. Capsule 5-valved, each valve with 2 teeth.

Only 4 species, inhabiting Central Europe.

Soldanella alpina L. (Plate VI.)

Stems erect, 3–6 inches high, leafless, glabrous or rough, with sessile glands or pubescent from gland-hairs. Leaves radical, dark green, shining, dotted on the under side and often tinged with purple, stalked, roundish cordate or reniform, coriaceous, glabrous, entire, margin wavy or shallowly crenate. Flowers usually nodding or pendent, in a terminal, 1–4 flowered umbel. Fruiting

flower-stalk elongated, rigid, erect. Corolla campanulate, funnel-shaped, divided half-way down, bearing in the throat 5 ovate, membranous scales between the stamens and at their base. Anthers about twice as long as the filaments. Style shorter or longer than the corolla (dimorphic). A variable plant.

Moist Alpine pastures; 4000–9500 feet; common, and often in great quantities, both on limestone and slate. It appears immediately after the melting of the snow on the Alpine pastures. May to July.

Distribution.—Erzgebirge, Eastern, Central, and Western Alps; Black Forest, Jura, Auvergne, Pyrenees.

Soldanella pusilla Baumg. rarely if ever descends to the sub-Alps. *S. minima* Hoppe. is also a more truly Alpine species, found in the Eastern Alps of Tyrol, etc., but not in Switzerland or France.

CYCLAMEN L.

Herbaceous plants with tuberous roots. Flowers red, rose, or white, often scented, nodding at the extremity of naked one-flowered scapes, which are coiled spirally after flowering. Corolla with 5 reflexed lobes. Stamens 5. Capsule with 5 reflexed valves. Leaves all radical, undivided.

About a dozen species inhabiting temperate Europe, Western Asia, and the Mediterranean district. Much cultivated for their beauty.

Cyclamen europæum L. (Plate X.)

Tuber roundish, of varying size. Leaves stalked, orbicular-cordate, sinuate-crenate, coriaceous, often purplish beneath like the stems. Flower-stalk or scape coiled spirally downwards after flowering. Flowers purple-red, rarely white, entire at the throat, fragrant. Corolla-lobes revolute, acute.

Stony and bushy places, preferably limestone, in sub-alpine districts and the lower hills. August to October.

Distribution.—Eastern, Central, and Western Alps; Moravia, Jura, Bavaria, Balkan States.

Cyclamen neapolitanum Ten.

Leaves ovate-acuminate, deeply heart-shaped at the base, angular, sinuate, rolled in when young. Flowers scentless, purple-red, toothed at the throat, appearing before the leaves, very longly pedicelled.

Thickets on limestone hills; local. August to October.

Distribution.—Very rare in Switzerland (Valais); Western and Southern France from the Eastern Pyrenees to Haute-Savoie, Corsica, Italy. Southern Europe.

TRIENTALIS L.

Trientalis europæa L. Chickweed Wintergreen.

Stem erect, simple, 3-6 inches high, with a whorl of 5 or 6 leaves at the top, which are obovate or lanceolate, usually pointed, 1-2 inches long, and with 2 or 3 small alternate leaves lower in the stem. From the centre of the leaves 1-4 slender pedicels arise, each terminated by a single flower, white or very pale pink with a yellowish ring. Corolla rotate. Calyx-segments narrow. Stamens with slender filaments.

Peat bogs and damp woods ; very local. May to July.

Distribution.—Very rare in Switzerland (Bernina, Poschiavo, Wildhaus, Zumdorf, etc.), Savoie (Albertville), Ardennes, Corsica, Southern Tyrol, Carniola, Central and Northern Europe ; especially common in Norway and the Scotch Highlands ; Northern Asia and Arctic America. British.

SAMOLUS L.

Samolus Valerandi L. Brookweed.

This plant, which grows almost at sea-level in England, is not infrequently seen in damp places in the lower Alps and Pyrenees, but it is rare in Switzerland. Leaves obovate, entire, dark green, glabrous like the whole plant, usually alternate. Stems 6-12 inches high. Flowers small, milk-white, in terminal racemes or corymbs. Stamens 5. Seed-vessels a 5-valved capsule.

Marshes, by ditches, and in the mountains on wet rocks, it having been observed on damp rocks by the writer in both Alps and Pyrenees at a considerable elevation. June to August.

Distribution.—Alps, Jura, Vosges, Pyrenees ; most of Europe, and indeed in most temperate regions of the world. British.

ASCLEPIADACEÆ

Flowers regular. Calyx 5-toothed. Corolla 5-lobed. Stamens usually 5 united round the stigma into a column. Ovary 2-celled, the carpels connate above. Seed-vessel of two follicles, with numerous seeds clothed with silky hairs. Leaves opposite, entire.

A large family, chiefly of tropical and sub-tropical trees and shrubs with milky juice. There are very few European species.

VINCETOXICUM Mœnch.

Corolla rotate, 5-lobed, with 5 internal scales. Stigma apiculate.

About 80 species in the tropical or sub-tropical regions of both Old and New World.

Vincetoxicum officinale Mœnch. (*Cynanchum Vincetoxicum* R.Br.).
(Plate X.)

A rather shrubby or straggling plant from 1 to nearly 3 feet high,

finely pubescent, with creeping rootstock. Leaves opposite, entire, shortly petioled, the middle ones cordate-ovate, dark green in colour. Flowers small, dirty white or yellowish in axillary clusters, petioled. Follicles glabrous, very large ($1\frac{1}{2}$ –2 inches), lanceolate-acuminate, swollen towards the base, and when ripe showing beautiful silky seeds. Polymorphic.

Stony, thickety places, common in the plains and lower mountains. June to September.

Distribution.—Europe, Caucasus, N. Africa. Widely spread throughout France and Switzerland.

LENTIBULARIACEÆ

Marsh or aquatic plants with radical or floating leaves, or rarely none, and irregular flowers on leafless radical or terminal peduncles. Corolla 2-lipped, projecting below into a spur or pouch. Stamens 2. Ovary and capsule 1-celled.

A family of very few genera, dispersed over the greater part of the globe.

PINGUICULA L. Butterwort.

Small insectivorous plants growing in bogs or on wet rocks, with radical, entire leaves, purple or yellowish flowers on leafless, radical peduncles. Corolla spurred, with a broad, open mouth. Capsule opening in 2 or 4 valves. Dead flies are frequently seen on the leaves.

Pinguicula alpina L.

Leaves in radical rosettes, lanceolate or obovate, obtuse, entire, with revolute margins, thick, glabrous, or covered with viscid glands. Stem erect, 1-flowered. Corolla pendent, creamy white with yellow spots on the central lobe and apex of the spur, which is gibbous.

Wet rocks and damp, stony pastures in Alpine and sub-alpine regions and in Switzerland, descending to turf-moors in the plain. May to July.

Distribution.—Mountain ranges of Central Europe and Russian Asia. Arctic Europe and Asia. British.

Pinguicula vulgaris L. Common Butterwort.

Leaves similar to the last, but larger. Spur of corolla subulate, slender, about half length of corolla. Flowers violet, larger than in *P. alpina*.

Wet rocks and damp places, and especially in peaty meadows from the plains to about 6500 feet. May to July.

Distribution.—Europe and all round the Arctic Circle, Russian Asia, and North American. British.

Pinguicula grandiflora Lamk.

Resembling the last, but larger in all its parts, with broader lobes and a longer spur to the corolla, and a more obtuse capsule. Throat generally white.

Damp meadows and peat bogs in the Alps and sub-Alps. May to August.

Distribution.—In Switzerland only in some of the Jura frontier peaks; Western Alps, Jura, Pyrenees, Corbières, etc.; Ireland.

Pinguicula Reuteri Genty.

Probably a sub-species of the last. Upper lobes of calyx broader, obtuse. Corolla rose or lilac, with more or less violet throat. Spur very pointed. Transverse section of the capsule elliptic lozenge-shaped.

Damp sub-alpine meadows and pastures; rare. June to August.

Distribution.—Southern Jura, Haute-Savoie (Alps of Annecy, etc.). Maritime Alps.

OLEACEÆ

Name taken from *Olea* the Olive. Flowers regular, generally small. Calyx with 4–5 divisions or sometimes 0. Stamens 2. Leaves simple or pinnate, always opposite. Fruit a berry or samara. A family of trees and shrubs inhabiting the temperate and hot regions of the two worlds; but comprising no Alpine species.

FRAXINUS L.

Fraxinus excelsior L. Ash.

Flowers diœcious. Fruit a broadly-winged samara. Leaves with 9–15 opposite leaflets, appearing after the flowers.

This well-known tree is frequently seen at about 3000–3800 feet in Switzerland, but never in large quantities.

Distribution.—Temperate Europe, as far north as Scandinavia, Western Asia.

GENTIANACEÆ

Herbs often bitter, usually glabrous. Leaves opposite and entire without stipules. Flowers in terminal, dichotomous cymes or panicles, with a single flower in each fork, or solitary. Calyx 4–8 toothed. Corolla regular, 4–8 lobed. Stamens 4–8 and alternating with the corolla lobes. Capsule opening in 2 valves with many seeds.

A rather large family, extending nearly all over the world, but chiefly in temperate or mountain regions.

SWERTIA L.

Swertia perennis L.

Glabrous. Stem erect, 6–12 inches high, 4-edged, simple below and bearing an elongated raceme. Leaves crowded at base of stem, the upper ones opposite, entire, lanceolate, sessile; lower ones elliptical, running into the leaf-stalk. Angles of flower-stalk narrowly winged. Calyx-teeth and corolla segments lanceolate, acuminate. Flowers dark, dingy purple.

Boggy Alpine meadows and peat mosses and other wet places on Alpine pastures; 3000–6800 feet; very local. July, August.

Distribution.—Carpathians; Riesengebirge; Eastern, Central, and Western Alps; Jura, Black Forest; North German plain, Erzgebirge, Pyrenees, Central France, Caucasus.

GENTIANA L.

Leaves opposite, entire. Flowers usually blue, but also purple, mauve, yellow, and nearly white, solitary or in terminal cymes. Calyx tubular, often angled, with 5 or rarely 4 lobes. Corolla with a narrow campanulate tube and spreading limb divided into 5 or rarely 4 lobes, and occasionally 5 additional ones in the angles. Style remaining attached to the capsule after the flower fades. Stigmas 2. Capsule 1-celled and 2-valved.

A large genus, spread over the northern hemisphere, especially in the mountains, and in the higher ranges of both New and Old Worlds, penetrating into the tropics.

Gentiana lutea L. Great Yellow Gentian.

Glabrous. Stem erect, stout, 2–4 feet high. Root cylindrical, thick, ringed. Leaves large, elliptical, strongly 5-nerved, the lowermost stalked, channelled; stem-leaves cordate, half-clasping. Flowers yellow with brown spots, in dense clusters or whorls, corolla 5-cleft nearly to the base, the divisions being lanceolate, acuminate. Calyx sheathing, deeply divided on one side. Root used as a tonic.

Grassy Alpine and sub-alpine pastures, descending to 800 metres in the Jura. Often in colonies. July to September.

Distribution.—Carpathians, Alps, Vosges, Jura, Black Forest; Central and Southern Europe; Asia Minor.

Gentiana punctata L.¹

Stem about 1 foot high, erect, robust. Stem-leaves oval or lanceolate sessile, nerved, the lower ones stalked. Flowers yellowish, spotted with purple, brown, or grey, sessile in terminal clusters. Corolla 6-cleft, the lobes a quarter the length of the tube, throat naked. Calyx campanulate with erect, lanceolate, unequal teeth.

¹ In the Linnæan Herbarium (at Burlington House) the specimen of *G. punctata* is *G. pannonica* Freyn, according to Prof. Ascherson.



PLATE XXV.

4/7 NATURAL SIZE.

- | | |
|---|------------------------------|
| 1. GENTIANA PURPUREA. | 2. G. PURPUREA VAR. FLAVIDA. |
| 3. G. KOCHIANA (BLUE AND WHITE). | 4. CLADONIA SP. |
| 5. GENTIANA CAMPESTRIS (MAUVE AND WHITE). | |

Grassy places in the Alps and sub-Alps, especially on siliceous soil. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Silesia, Erzgebirge, Bavaria, Macedonia, Albania, Bulgaria.

Gentiana pannonica Scop.

Stem erect, simple, 1-2 feet high, purple above. Lower leaves elliptic, petioled, the upper ones lanceolate, acute, sessile, 3-nerved. Calyx-lobes reflexed, equal. Flowers sessile, usually in clusters in the axils of the leaves. Corolla dull purple, with pale greenish yellow base and streaked with reddish brown, campanulate, 5-7 cleft, throat naked. Root very bitter.

Sub-alpine pastures, 4500-6500 feet; chiefly on limestone. July, August.

Distribution.—Carpathians, Eastern Alps, Erzgebirge. In Switzerland only on the northern side of the Curfirsten. Bavaria, Bohemia, Transylvania.

Gentiana purpurea L. (Plate XXV.)

Stem erect, 1-2 feet high, simple. Leaves oval-lanceolate, the lower ones petioled, the upper sessile. Calyx-lobes erect, cleft almost to the base on one side in the form of a spathe. Corolla campanulate, reddish brown or purple outside, yellowish within, rarely white or yellow; divided one-third of its length into oval, obtuse lobes. Flowers sessile.

Alpine and sub-alpine pastures and rough, broken ground under fir trees. July, August.

Distribution.—Tyrol, Styria, Hungary, Bavaria (rare), Switzerland, Western Alps, Southern Norway, Kamtschatka.

On the same plate is also an illustration of the yellow variety *flavida*, which grows about le Planet sur Argentière and occasionally in Switzerland.

Gentiana cruciata L.

Stem erect or ascending, 6-18 inches high, simple, very leafy. Leaves elliptic-lanceolate, 3-5 nerved; stem-leaves sheathing, decussate; upper leaves much longer than the flowers. Flowers blue, rather small for the size of the plant, sessile, campanulate, 4-cleft (the lobes being triangular, acute) in a dense panicle at the leafy top of the stem. Calyx short, with 3-4 spatulate teeth.

Thickets and grassy, gravelly places on the Alps and sub-Alps, not often above 5800 feet, and usually on limestone. Frequent in the plains. June to September.

Distribution.—Central Europe, France, Portugal, N. Spain, N. Italy, S. Russia, Greece, Asia Minor, Caucasus, Armenia, Siberia.

Gentiana asclepiadea L. Willow Gentian. (Plate XXVI.)

Root very long and tapering, sometimes 2 feet or more in length. Stem erect, simple, 1-3 feet high, many-flowered, leafy except at the base. Stem-leaves lanceolate or ovate-lanceolate, acuminate, 5-nerved, sessile, from a rounded base; no root-leaves. Flowers usually in clusters of 2-3 in the axils of the upper leaves, forming a long terminal leafy, spicate cyme. Corolla campanulate, 5-cleft, large (1½-2 inches long), dark azure-blue or ultramarine, variegated internally with white streaks and dark spots, throat naked. Corolla-teeth not fringed, lanceolate, acuminate. Calyx tubular, with 5 very short linear teeth. Flowers rarely white. (See plate.)

Bushy sub-alpine regions and stony Alpine pastures up to 6800 feet, especially on limestone; a very handsome species. July to September.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps; Vosges, Jura, Corsica, Dalmatia, Bithynia, Greece, Caucasus, Asia Minor.

Gentiana alpina Vill. *Prosp.*, p. 22 (*G. acaulis* L. part.).

Stem very short. Root-leaves in small rosettes, small, leathery, 1-nerved, a pair of lanceolate stem-leaves often immediately below the calyx. Calyx-lobes lanceolate, subacute, divided by a usually sharp sinus. Corolla deep blue with greenish streaks, rarely white or mauve, 1-1½ inches long, lobes rather obtuse and short.

Grassy Alpine pastures up to 8500 feet, but not often seen in the sub-Alps, and much less common than *G. excisa*.

Distribution.—Alps, Jura, Pyrenees, Spain, N. Italy. In Switzerland in the southern ranges only.

On the type specimen of *G. acaulis* in the Linnæan herbarium Linnæus wrote, "Gentiana caule unifloro flore campanulato caulem longitudine excedente."

Gentiana excisa Presl. in *Flora*, 1828, p. 268 (*G. Kochiana* Perr. et Song.,¹ 1853). (Plate XXV.)

Larger and taller than the last, with which Linnæus combined it and the next to form *G. acaulis* L. Stem 2-4 inches high, erect, with a pair of small, lanceolate leaves lower in the stem; stem much elongated on maturity. Leaves larger and softer than in *G. alpina*, but very variable in shape and size. Calyx-lobes oval-lanceolate, from a narrow base, contracted, shorter and broader than in the last and spreading; sinus between calyx-lobes truncate, the membrane connecting the divisions of the calyx more developed. Corolla 1½-2½ inches long, campanulate, deep blue, spotted or streaked with green within and often of a duller or purplish blue, very rarely white or violet. Corolla-lobes large, toothed, and deflexed.

¹ Perrier et Songer, *Pl. nouv. Savoie* (1853), p. 53.

Pastures in the primitive or granitic Alps, less often on limestone. Often abundant from 3800–8500 feet. May to August, according to position.

Distribution.—Eastern, Central, and Western Alps; Jura, Cevennes, Corbières, Pyrenees, Central Europe; Carpathians.

The beautiful and very rare white variety drawn by Mr. Flemwell was found by him near the Hôtel du Planet, above Argentière. (Plate XXV.)

Gentiana Clusii Perr. et Song. *Ind. Pl. nov. rares et crit. Savoie*.

Stem short, often almost wanting. Radical leaves coriaceous, stiff, lanceolate or elliptic-lanceolate, acute or acuminate. Stem-leaves much smaller, oval-lanceolate, sharply acuminate; uppermost stem-leaves rough at the edges. Corolla always peduncled (peduncles much elongated after maturity), azure-blue, not spotted or streaked with green. Calyx-lobes always very acute, not contracted at the base, about half length of calyx-tube; sinus usually acute.

Alpine pastures on limestone, and limestone rocks from 4000–8500 feet, lower in the Jura, and in Cantons Vaud and Zurich. May to July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Cevennes, Pyrenees, N. Spain, Central Italy, Dalmatia, Bosnia, Servia, Montenegro.

Sometimes this species and *G. Kochiana* seem to mutually exclude the other in their respective areas.

Gentiana angustifolia Vill. *Hist. Dauph.*, 2, p. 526.

Stem 3–4 inches high, erect. Rosette leaves linear-lanceolate, narrow, obtuse, or shortly acuminate, 3–5 times as long as broad, soft and shiny. Calyx-lobes spreading, acute, and contracted at the base, the sinus between the calyx-lobes being broad. Corolla-lobes acute. Flowers solitary, very large.

Limestone Alpine pastures; rare. May to July.

Distribution.—Central and Western Alps; rare in Switzerland. Jura, Cevennes, Pyrenees.

Gentiana verna L. Spring Gentian. (Plate XXVI.)

Stem erect, simple, few-leaved, 1-flowered, 1–4 inches high. Leaves ovate, elliptical or lanceolate, acute, the lowest in rosettes, the upper 1 or 2 pairs distant. Corolla saucer-shaped, 5-cleft, throat white. Flowers light or dark azure-blue, varying considerably, and occasionally mauve or white. In Flemwell's *Flower Fields of Alpine Switzerland* (1911) is a beautiful and unique picture showing all these varieties of colour.¹

Meadows and pastures from the plains to at least 10,000 feet

¹ These colour forms are also shown in Plate XXVI.

in the Alps ; often abundant and in large clusters in the sub-alpine zone and above. April to July.

Distribution.—Carpathians, Alps, Erzgebirge, Jura, Black Forest, Pyrenees, Caucasus, Central and Southern Europe, Western and Northern Asia ; rare in British Isles.

Gentiana bavarica L. Bavarian Gentian.

Stem erect, simple, leafy, 2-5 inches high, 1-flowered. Leaves obovate or nearly spatulate, obtuse, slightly 3-nerved, crowded except sometimes the uppermost ; imbricate in the young shoots. Corolla saucer-shaped, 5-cleft, handsome, deep azure-blue, or very rarely violet.¹ Lobes not fringed. Throat naked. Style deeply 5-cleft.

Damp pastures, preferably on the higher calcareous Alps ; local, but often in great masses ; 5000-8500 feet. June to September.

Distribution.—Bavaria, Eastern, Central, and Western Alps, Abruzzes.

Gentiana pyrenaica L. Pyrenean Gentian.

Stem ascending from a creeping base, 2-4 inches high, densely leafy. Leaves small, linear-lanceolate, mucronate, rough at the edges. Flowers a rich violet, solitary, shortly peduncled. Corolla-lobes 10, unequal, 5 of which are oval, obtuse, and 5 are smaller and toothed. Capsule elliptical.

Damp pastures and banks of rivulets in the mountains at about 4000 to 6000 feet, but extending rarely to 9000 feet. June, July.

Distribution.—Eastern Pyrenees, Central Pyrenees (rare), Spain, Ariège, Aude ; Carpathians, Armenia, Caucasus. Not known in the Alps.

Gentiana nivalis L.

Annual. Stem 1-6 inches high, erect, leafy, rather fragile ; usually cymosely branched and many-flowered, less often simple and 1-flowered. Leaves 3-5 nerved ; root-leaves ovate, in rosettes ; stem-leaves lanceolate. Calyx cylindrical, with 5 prominent angles and acute teeth. Corolla rotate, with a cylindrical tube, naked throat and acuminate, unfringed teeth. Flowers small, blue, or sometimes mauve, very rarely white, only opening in sunshine.

Alpine meadows and pastures 5000-10,000 feet. June to September.

Distribution.—Eastern, Central, and Western Alps, Jura, Pyrenees, Carpathians, Servia, Bulgaria, Montenegro, Turkey, Iceland, Scotland (rare), Central and Arctic Europe (Iceland), Asia Minor, North America, Greenland.

¹ Found by the writer with violet flowers near Bovine (Col de la Forclaz), June, 1908. This was the first record.



PLATE XXVI.

4/7 NATURAL SIZE.

1. GENTIANA ASCLEPIADEA (WITH WHITE VARIETY).
2. G. VERNA (IN FOUR COLOUR FORMS). 3. G. CILIATA.

Gentiana campestris L. (Plate XXV.)

Annual or biennial. Corolla 4-lobed, lilac, but frequently darker violet and sometimes white. (Plate XXV.) Calyx-teeth very unequal, the two outer lobes three times as broad as the inner ones, the former being ovate-acuminate, and the latter lanceolate.

Rather dry places in the Alps, sub-Alps, and hills. It ascends to 9300 feet in Switzerland, as, e.g. on the Col de Torrent. May to August.

Distribution.—Central and Northern (but, excepting Iceland, not Arctic) Europe, and most of the mountain ranges in the south; Spain, Italy. British.

Gentiana baltica. Murbeck.

This little-understood plant is probably a sub-species of the last. Dr. C. E. Moss tells me he considers the English lowland form of "*G. campestris*," which is usually biennial, to be the annual *G. baltica*. Stem erect, often branched above, usually still bearing the cotyledons at time of flowering; they are broadly lanceolate. Upper leaves sessile-acute. Calyx-lobes as in *campestris*. Corolla 4-lobed, violet or white. Capsule sessile, cylindric, finally longer than the corolla.

In Switzerland it has been recorded from Schafberg and near Samaden in Grisons and from Villeneuve in Valais. In England the true plant grows in several places as, e.g. on the Lancashire sand-hills.

Gentiana Amarella L. (*G. axillaris* Reichb.).

An erect, much-branched annual, 3–10 inches high; often purplish or livid green in colour. Leaves ovate or lanceolate. Flowers numerous, usually crowded in a leafy panicle, pale purplish blue. Corolla-lobes 5, ovate or oblong, spreading, with a fringe of hairs at the mouth of the broad tube. Calyx divided to the middle into 5 narrow lobes.

Dry, hilly pastures; becoming a sub-alpine plant in Southern Europe. June to September.

Distribution.—Europe, especially Central and Northern, extending to the Arctic Circle in both Europe (Iceland) and Asia. Rare in Switzerland (Lower Engadine), Roumania. British.

Gentiana germanica Willd.

Larger and stouter than *G. Amarella*, but also frequently purplish in colour, the stems and leaves being sometimes a distinct reddish purple. An annual, about 10–18 inches high. Stem-leaves ovate or ovate-lanceolate. Calyx-lobes unequal, shorter than corolla-tube, usually glabrous, but sometimes finely ciliate, lanceolate. Corolla large, 4-lobed, deep lilac or violet, campanulate.

Pastures, open woods, etc., in the plains, hills, and Alpine valleys; preferably on limestone. August to October.

Distribution.—Central Europe, extending to Northern France, Holland, Belgium, Germany, and Southern England. In Switzerland in the central plateau and such Alpine localities as Andermatt and St. Moritz. N. Italy, Servia, Roumania, Russia.

A more Alpine form of *G. germanica* is called *G. rhætica* Kerner. The corolla-lobes are never spreading, the stems are shorter and the stem-leaves rather longer. It has been recorded from the Albula in Eastern Switzerland. It apparently prefers siliceous soil.

Gentiana ciliata L. Fringed Gentian. (Plate XXVI.)

Biennial or perennial. Stem 3–10 inches high, simple or branched, leafy to the top. Leaves erect, lanceolate or linear-lanceolate, acute, 1-nerved. Flowers rather pale blue, large and handsome, solitary or several on a stem. Corolla divided to the middle into 4 spreading lobes, which are toothed and strongly ciliated. Calyx campanulate, with 4 lanceolate, acuminate segments, much shorter, than the long tube. The blue may be called electric.

Pastures and sloping banks in the Alps, sub-Alps, and plains, especially on shale or limestone. August to October. The writer has found it from 8250 feet on the Aiguille de Goléon in Dauphiny, and from near Annecy at only 1650 feet. It is distinctly an autumnal species.

Distribution.—Central and Southern Europe, from Belgium to Bulgaria; Spain, Pyrenees, Italy, Alps, S. Russia, Cilicia, Armenia, Caucasus.

POLEMONIACEÆ

POLEMONIUM L.

A small genus of about 10 species, inhabiting Europe, Asia, and America.

Polemonium cœruleum L.

Stem 1–2 feet high, erect, furrowed, hollow, glabrous, like the leaves, or with a few scattered hairs. Rachis of panicle glandular-downy. Leaves pinnatifid, segments ovate-lanceolate or lanceolate, entire, acute or acuminate, often curled, dark green. Flowers in a terminal panicle, handsome, bluish or white, with orange-yellow anthers.

Margins of woods and boggy meadows, and by streams in sub-alpine districts, especially on turf. May, June.

Distribution.—Carpathians, Eastern and Central Alps, Savoy, Jura, Pyrenees, Caucasus, Siberia, North America, Central and Northern Europe. British.

CONVOLVULACEÆ

Twining or prostrate herbs, with alternate leaves, or leafless and parasitical (*Cuscuta*). Calyx of 4 or 5 sepals often very unequal. Corolla usually campanulate, with 4 or 5 lobes or nearly entire. Stamens 4 or 5, attached near the base of the corolla. Partitions of the capsule very thin.

The family is not represented in Alpine regions properly so-called, but in the lower mountains of Europe *Cuscuta* or Dodder is frequently seen.

CUSCUTA L. Dodder.

Cuscuta Epithimum Murray. (Plate X.) Lesser Dodder.

An annual parasitical, leafless plant, with twining, thread-like reddish stems, which attach themselves to Thyme, Heath, Gorse, and other shrubby plants by means of minute suckers. The heads of flowers are small, globular, and compact, the flowers themselves being very small, white or pale pink, and the calyx still smaller. Corolla-lobes pointed, spreading, and about as long as the tube. Capsule globular, with 4 seeds in 2 cells.

Parasitical upon various plants in sunny places in the plains and Alps to at least 6000 feet. July to October.

Distribution.—In Europe from Denmark southward, N. Africa, W. Asia. British.

Dodder was observed by the author during the hot summer of 1911 in unusual abundance in the Pennine Alps and upon a variety of plants, such as *Euphorbia Cyparissias*, *Carduus defloratus*, and *Teucrium montanum*. He also found it actually parasitical upon two fronds of *Polypodium Robertianum*, which is perhaps the first record of any kind of *Cuscuta* upon a fern;¹ though, according to Prillieux, Rye-grass has been attacked by *C. Epithimum*. It is also occasionally found on *Lotus corniculatus*, Lavender, and other Labiates, *Hypericum* and *Achillea millefolium*. When Dodder grows on Clover, or Lucerne, which it often does in the sub-Alps, as in England, the name *C. Trifolii* Bab. is given to the variety. It differs from the type in its shorter distant scales. Several other species of *Cuscuta* are occasionally found in the lower mountains of Southern Europe, but they are difficult to determine, and it is hardly within the scope of this book to attempt to describe them here.

BORAGINACEÆ

Herbs usually rough with coarse hairs. Leaves alternate, simple, and usually entire. Flowers in 1-sided spikes or racemes, rolled back when young, and usually forked. Calyx of 5 teeth. Corolla regular, or slightly irregular, monopetalous, with a 5-cleft limb.

¹ *Journal of Botany*, December, 1911.

Stamens 5, inserted on the corolla-tube. Ovary 4-lobed, with a simple style inserted between the lobes. Fruit of 4 1-seeded nuts, like seeds, and enclosed within the calyx.

A large family in the northern hemisphere, with a few representatives in the tropics and southern hemisphere.

CERINTHE L.

Glabrous and glaucous plants with entire, amplexicaul leaves with more or less heart-shaped base. Ovary composed of 2 carpels. Corolla yellowish, throat naked without scales.

Cerinthe glabra Miller (*C. alpina* Kit.).

A glabrous plant. Stem 12–18 inches high, erect, branched, leafy to the summit. Leaves ovate-cordate, embracing the stem. Flowers yellowish or purplish, rather small, pendent, in a long panicle, very dense at the top. Sepals lanceolate, obtuse, not ciliated as in *major*, nor toothed as in *minor*. Corolla about one-third longer than the calyx, with short, triangular, sub-obtuse teeth. Anthers terminated by a short appendix. Nuts small.

Pastures, stony slopes, and borders of woods in Alpine and sub-alpine districts up to 6000 feet, especially on limestone. June to August.

Distribution.—Alps, Jura, Corsica, Pyrenees, Central Europe.

Cerinthe major L.

About the same height. Stem leafy, erect. Leaves ciliate, spotted with white tubercles, obtuse. Corolla large, yellow at the base, violet at the insertion of the stamens, limb red, but sometimes entirely yellow or purple. Anthers as long as the filaments.

Dry hillsides and stony places; rare. June in Switzerland; earlier in the South.

Distribution.—In Switzerland very rare; near Sion. Southern Europe, Corsica, N. Africa.

Cerinthe minor L.

A smaller plant, with smaller flowers and narrower corolla-lobes and sepals edged with minute teeth.

Mountain woods and pastures (not in Switzerland). May to July.

Distribution.—Savoy, Dauphiny, Provence; W. Central Europe, W. Asia.

CYNOGLOSSUM L.

Cynoglossum montanum L. Hound's-Tongue.

Leaves green, with scattered hairs, but almost glabrous above, shining; lower leaves elliptic or oval-elliptic narrowed into a petiole; upper leaves heart-shaped at base, amplexicaul. Flowers reddish or violet, small in forked cymes. Corolla funnel-shaped.

Calyx 5-partite. Nutlets 4, with a thickened border. Not always easy to distinguish from the common *C. officinale*, which grows in sandy, waste places in Switzerland, as in England.

Mountain woods; infrequent. May, June.

Distribution.—Alps, Jura, Vosges, Corbières, Pyrenees, Cevennes, Central Europe, Western Asia; rare in England.

LAPPULA Mœnch.

Flowers regular, small, blue. Corolla saucer-shaped, closed at the throat by 5 small scales. Nutlets 4, trigonous, bordered by several rows of barbed bristles. About 50 species inhabiting temperate regions of Old and New World.

Lappula echinata Gilib. (*Echinosperrnum Lappula* Lehm.).

Stem branched in the upper part, hispid and grey like the whole plant. Fruit-stalks erect. Flowers in small axillary clusters, sky-blue. Nutlets finely tubercled outside, the side angles edged with 2 rows of hooked hairs.

Dry, waste places in the plains and sub-Alps. June to August.

Distribution.—Most of Europe, Western and Northern Asia, Japan, N. Africa.

Lappula deflexa Garcke (*Echinosperrnum deflexum* Lehm.).

Fruit-stalks reflexed. Stem branching from the middle or lower. Leaves lanceolate, the upper ones sessile. Fruit winged and bordered with only one row of hooked bristles. Flowers small, blue. Scarcely distinguishable from the last except by the fruit.

Stony places and shady gorges in the mountains. June to August. Seen by the author as high as about 6600 feet in Southern Savoy (above Lanslebourg).

Distribution.—Switzerland, Savoy, Dauphiny, Central and Northern Europe (Norway), Altai, Siberia.

ASPERUGO L.

Asperugo procumbens L. Madwort (the only species).

A coarse, straggling weed; annual. Stems branched, hispid like the leaves, climbing or recumbent, and clinging to objects by small prickles which are turned downwards. Leaves rough, oblong-elliptic. Flowers small, 1 or 2 together in the leaf-axils. Corolla violet at first, then blue, rarely white. Tube whitish. Throat furnished with scales. Calyx-lobes 5, large and irregular, enlarged after flowering and concealing the fruit.

Rubbish-heaps and waste places and fields near dwellings; changeable and erratic. June to August.

Distribution.—Europe, including Norway and the Alps, Pyrenees

and other mountain ranges, but not everywhere in Switzerland; Western Asia, N.W. India, N. Africa. A weed of cultivation in parts of Britain.

LYCOPSIS L.

Lycopsis arvensis L. Small Bugloss.

A coarse annual covered with small, stiff hairs. Stems branched, 1-1½ feet. Leaves lanceolate, sinuate and often toothed. Flowers in terminal spikes (usually forked). Corolla pale blue, small, with the tube curved in the middle. Calyx deeply 5-cleft. Nuts wrinkled as in *Anchusa*.

Sandy fields and waste places from the plains to the lower Swiss Alps (at 5000 feet near Zinal). June to August.

Distribution.—Europe, N. Asia, N. America and other parts of the world where introduced by cultivation. British.

PULMONARIA L.

Perennial herbs with rather large blue or purple flowers. Calyx tubular-campanulate, 5-cleft. Corolla with a straight tube, without scales, and a spreading 5-lobed limb. Nuts smooth.

A very small European genus.

Pulmonaria angustifolia L. (*P. azurea* Bess.).

Stems 6-12 inches high, erect, leafy. Leaves not spotted. Radical leaves lanceolate, 8-10 times as broad as long, lengthened into a broadly-winged leaf-stalk; stem-leaves oblong or oblong-lanceolate, sessile, the lower ones slightly attenuated at the base, the upper ones amplexicaul. Leaves and calyx covered with short, spreading and glandular hairs. Corolla reddish at first, and then a deep azure-blue, flowers in short racemes. Calyx cylindrical, cleft to the middle, teeth lanceolate-acute. Calyx pendent after flowering. A very beautiful plant.

Bushy Alpine places up to 6500 feet; local.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Central and Eastern Europe, Caucasus, Asia Minor.

Pulmonaria officinalis L. Lungwort.

Stems 6-18 inches high, with alternate, mostly sessile leaves. Root-leaves ovate-oblong on long footstalks, coarsely hairy and often much spotted. Calyx very hairy, much increasing in length after flowering, the lobes barely reaching the middle. Flowers in a terminal-forked cyme. Limb of corolla broadly spreading, with short lobes. Flowers dull rose-coloured, then blue-violet, though sometimes remaining rose or white.

Hedge-banks and woods in the plains and sub-Alps. April, May.

Distribution.—Central and Southern Europe to the Caucasus, extending northward to Scandinavia; rare in Britain.

Pulmonaria montana Lej. (*P. ovalis* Bast.).

Plant covered with glandular hairs. Leaves green, not spotted; root-leaves broadly elliptical-lanceolate, acute, petiole broadened at the top; stem-leaves oblong-linear, the upper ones lanceolate, clasping the stem. Corolla violet. Anthers deep violet. Inflorescence covered with viscid glands.

Woods and cool places in the lower mountains; local. April, May.

Distribution.—Southern Switzerland, and occasionally elsewhere, Pyrenees and French mountains generally.

MYOSOTIS L. Forget-me-not.

Flowers regular, small, blue, white or pink, in terminal scorpioid cymes. Corolla saucer-shaped, the throat closed by 5 scales alternating with the stamens. Stamens included in the tube. Calyx-tube long. Nuts smooth and shining, compressed or triangular.

A rather large genus in Europe and Northern Asia; scarce in N. America and well represented in Australia.

Myosotis sylvatica Lehm. Wood Forget-me-not.

A branched, hairy plant with stems 6–10 inches high springing from a tufted stock. Calyx cleft nearly to the base, with narrow segments, erect when in fruit and covered with spreading hairs. Corolla large, azure-blue, with spreading limb. Very variable in size and stature, and in the Alps often almost impossible to distinguish from the next.

Mountain pastures, woods, and other shady places. April to June.

Distribution.—Northern Europe and Asia, becoming a mountain plant in the central ranges from the Pyrenees to the Caucasus and Altai.

Myosotis alpestris Schmidt. (*M. pyrenaica* Pourret).

A smaller, more tufted plant with shorter and denser inflorescence. Calyx almost silvery, with spreading hairs, closed after flowering. Corolla deep azure-blue, sometimes white and rarely pink, scented. This species, if it be one, passes into *M. sylvatica*, every intermediate form being found in the lower Swiss Alps; but it has stiffer hairs, shorter cymes, thicker flower-stalks, larger calyx and more compressed habit.

Grassy or stony pastures of the Alps and sub-Alps, extending to 10,000 feet. June to August.

Distribution.—Alps, Jura, Vosges, Pyrenees, Corsica, Caucasus, Scandinavia, Morocco, Siberia, N. America, N. Britain.

LITHOSPERMUM L. Gromwell.

Corolla regular, funnel or salver-shaped, throat usually naked, corolla-limb shortly 5-lobed. Flowers in leafy cymes or one-sided spikes. Nutlets 4, very hard.

A genus spread over Europe, especially in the Mediterranean region, and Northern Asia.

Lithospermum purpureo cœruleum L. Purple Gromwell.

Stems decumbent, leafy, 1-2 feet long or more, with shorter ascending or nearly erect flowering stems, ending in a leafy, forked cyme. Leaves lanceolate, hairy. Flowers nearly sessile, deep blue and handsome. Calyx-segments narrow. Nuts smooth and shining. The long, arching, leafy, barren shoots have the property of rooting at the tips, and thus the plant *strides* over the ground, not by creeping roots, as was formerly stated in English manuals.¹

Thickets, hedge-banks, and open woods, especially on carboniferous limestone, from the plains to the hills. May to July.

Distribution.—Central and Southern Europe from the Atlantic to the Caucasus; rare in Britain, and only in Glamorgan, Somerset, and a few other counties.

This plant is useful for covering up large areas in rock-gardens where little else will grow, but it must be kept in check.

Lithospermum arvense L.

An erect, generally branched annual about a foot high, and usually hoary with adpressed hairs. Leaves linear-lanceolate. Flowers small, white, or rarely blue in the Alps, sessile, in leafy terminal cymes. Calyx-segments nearly as long as corolla. Nuts hard, conical, and wrinkled.

Cultivated and waste places from the plains to about 5000 feet in the Western Alps and Switzerland. May to July.

Distribution.—Europe, except the extreme north, Central Asia, and introduced as a cornfield weed in many parts of the world. British.

ECHIUM L.

Coarse, hispid plants with handsome blue or purple flowers. Corolla with a broad, open mouth to the tube, and 5 erect, equal lobes. Stamens protruding from the tube, and unequal in length. Style 2-cleft. Nuts wrinkled. Calyx deeply cut.

About 30 species inhabiting temperate and sub-tropical countries of the Old World.

Echium vulgare L. Viper's Bugloss.

Stem erect, 1-2 feet high, covered with stiff, spreading hairs

¹ J. W. White, "The Life History of *Lithospermum purpureo-cœruleum* L.," reprinted, with additions, from the *Journal of Botany* (1884).

springing from a tubercle. Leaves 1-nerved, the root-leaves stalked and spreading; the stem-leaves lanceolate, sessile. Flowers handsome, at first reddish purple, afterwards bright blue, rarely white. Cymes short, disposed in a long, terminal panicle. It differs chiefly from *E. italicum* (the only other species in Switzerland) by its simple, and not branched, inflorescence.

Dry meadows and stony places in the plains and Alpine valleys. June to September. Common, biennial.

Distribution.—Europe, Western Asia, except the far north; Algeria. British.

SCROPHULARIACEÆ

Corolla monopetalous, usually 2-lipped and irregular, with 4 or 5 lobes. Stamens 4 or rarely 2, inserted on the tube of the corolla. Ovary 2-celled. Style simple. Ovules numerous. Fruit a many-seeded capsule.

A large family, widely spread over the globe, though most abundant in the temperate regions.

VERBASCUM L. Mullein.

Flowers in simple or compound spiked racemes. Corolla nearly regular, 5-lobed, rotate, yellow, sometimes violet at the throat. Stamens 5, unequal, with bearded filaments. Leaves usually woolly.

Over 100 species native in the Old World, many of them hybridising, which makes their determination rather difficult.

Verbascum nigrum L. Dark Mullein.

Stem 2-3 feet high, lightly clothed with woolly hairs, ending in a long, usually simple raceme. Leaves crenate, nearly glabrous on upper side, slightly woolly beneath; the lower ones cordate-oblong, on long stalks; the upper ones nearly sessile, small and pointed. Flowers numerous, rather small in comparison with some of the genus, yellow, with bright purple hairs on the filaments and purple throat.

Banks, roadsides, and hills. July, August.

Distribution.—Europe, except the Mediterranean region and extreme north; Caucasus, Western Asia.

Verbascum Thapsus L. Great Mullein.

This well-known Mullein is the largest and commonest species, though in Switzerland, as elsewhere, it usually occurs singly or in twos and threes, not in colonies. It is 3 or 4 feet high, and the leaves are woolly and decurrent. The flowers are in a dense, woolly terminal-spike often a foot long. Biennial.

Waste places, hills, and roadsides. July, August.

Distribution.—Europe, Caucasus, Altai, Himalaya, and naturalised in America and Algeria.

Verbascum montanum Schrad.

Closely resembles *V. Thapsus*, of which it is sometimes considered a variety, but the flowers are larger, filaments of all the stamens are woolly, and the leaves not so strongly decurrent.

Hilly woods and waste places, especially in Southern Switzerland. June to August.

Verbascum Chaixii Vill.

A perennial species, 2–3 feet high, covered with greyish tomentum. Stems rather slender. Leaves pubescent above, crenate or dentate, the lower ones oval-oblong, contracted into a petiole or truncate at the base; upper leaves almost heart-shaped and sessile. Flowers rather small, yellow, with violet throat.

Woods, chestnut groves, and hills. July, August.

Distribution.—Tessin in Switzerland, Maritime Alps, Pyrenees, Cevennes, Central and Southern Europe, Caucasus, Armenia.

LINARIA Hill.

Corolla personate, spurred. Stamens 4. Stigma notched or 2-lobed. Capsule of 2 nearly equal cells, dehiscing by pores.

A numerous genus of mostly annual plants, especially abundant in South-western Europe.

Linaria alpina Miller. (Plate V.)

Annual or biennial. Root tapering, fibrous, whole plant glabrous and glaucous. Stem procumbent or ascending at the apex, simple or branched, weak, glabrous like the leaves. Leaves sessile, linear or linear-lanceolate, obtuse, glaucous, entire, in whorls of 3 or 4, or the upper ones alternate. Flowers in short, loose racemes; flower-stalk as long as the calyx. Corolla large, violet, with orange throat. Seeds elliptical, flat, smooth, surrounded by a membranous rim. Very rarely the flowers are yellow.

Débris and moraines in the calcareous Alps and sub-Alps; common, and descending into the valleys in the dry beds of streams. July to September.

It also mounts to a great height on some of the highest peaks, and has been gathered at 3800 metres or 12,460 feet on the Grivola.

Distribution.—Eastern, Central, and Western Alps; Jura, Carpathians, Transylvania, Balkans, Pyrenees, Spain.

Linaria petræa Jord. (Plate V.)

May be only a variety of the above, of looser habit, with blue-violet flowers, usually without any orange, and seeds less broadly winged.

It grows in similar places, but is far from common, except in the

Jura. It reaches a height of about 6600 feet above Lanslebourg in Southern Savoy. It is not infrequent above Argentière in Haute-Savoie, whence came the plant figured, and above Zinal. It is probably biennial.

Linaria striata DC.

Stem 1-1½ feet high, glabrous, very leafy. Lower leaves in whorls of 3-4; upper ones single, linear-lanceolate, acute. Flowers pale lilac or mauve streaked with violet. Palate yellow, in long, loose, spiked racemes. Spur of corolla straight, obtuse, short.

Waste, stony places and hillsides, up to 4500 feet in Savoy. June to September.

Distribution.—Southern Switzerland (very rare), France and Western Europe from the Pyrenees to Germany, Scandinavia and Dalmatia.

Linaria minor Desf, *L. viscida* Moench.

This small glandular-pubescent annual species, with minute pale yellow and mauve flowers, is sometimes seen as a weed between the metals of railways and other waste places in sub-alpine France and Switzerland, just as it appears in the plains of those countries and in England.

SCROPHULARIA L. Figwort.

Rather tall herbs, with flowers in paniced cymes, small, greenish purple, yellow or violet. Corolla 2-lipped, not spurred. Tube ventricose. Stamens 4, with a scale representing the 5th. Stigma notched. Capsule ovoid, acute.

About 120 species inhabiting Europe, temperate Asia, Africa, and N. America.

Scrophularia canina L.

Plant 1-2½ feet high, glabrous, nearly simple, with a loose-branched glandular panicle of small flowers which are reddish brown mixed with white. Upper lip of corolla one-third as long as the tube. Leaves pinnatifid.

Stony places, dry beds of mountain torrents, and débris, here and there in Switzerland, commoner in Southern France. July, August.

Distribution.—Central and Southern Europe, Corsica, Asia Minor, N. Africa.

Scrophularia Hoppei Koch.

Closely allied to the last. The upper lip of corolla longer, i.e. more than half as long as the tube. Flowers reddish brown, with white margin. Anthers bright orange-coloured. Leaves pinnatifid or pinnate. Segments inciso-dentate, deeper and broader than in the last.

Dry, stony places in sub-alpine valleys. June to September. It ascends to 6600 feet near Lanslebourg in Southern Savoy.

Distribution.—Alps, Jura, Pyrenees, Cevennes, Auvergne; Central Europe.

ERINUS L.

Erinus alpinus L.

The only species. A small tufted, creeping plant. Leaves spathulate, serrate or crenate; stem-leaves alternate, usually hairy. Flowers in terminal corymbs, rose-coloured (very variable). Corolla saucer-shaped, nearly regular, with 5 emarginate lobes and slender tube.

Rocky Alpine and sub-alpine pastures, dry beds of streams, rocks and walls, descending to the plains in both Switzerland and Savoy. May to October.

Distribution.—Central and Western Alps, Jura, Cevennes, Corbières, Pyrenees, Spain, Sardinia, Balearic Isles, Algeria.

DIGITALIS L. Foxglove.

Flowers in long terminal racemes, large, purple or yellow, rarely white. Corolla campanulate or ventricose, with bearded throat. Stigma 2-lobed. Capsule oval-acuminate, with 2 cells.

About 18 species inhabiting Europe, S. Africa, and Central and Western Asia.

Digitalis grandiflora All. (*D. ambigua* L.). (Plate XXVII.)

2-3 feet high. Leaves oblong-lanceolate, serrulate, ciliate. Corolla broadly campanulate, large, glandular-pubescent, dull yellow or yellow-ochre, with brown veins within. Sepals lanceolate, acute.

Woods and bushy, rocky places in the Alps and sub-Alps. June to September. Very common on the limestone about Engelberg.

Distribution.—Alps, Pyrenees, Jura, Ardennes, Vosges. Europe from Belgium and Spain to Russia and West Siberia.

Digitalis lutea L. (Plate XXVII.)

1-3 feet high, usually glabrous. Leaves lanceolate, shining, glabrous on both sides, finely serrated, the lower ones shortly petioled; upper leaves sessile and rounded at the base. Flowers pale lemon-yellow, neither veined nor spotted, in a long, compact, tapering, unilateral raceme. Flowers much smaller than the last. Calyx-lobes linear-lanceolate. Capsule ovoid, conic, glabrescent.

Woods and bushy, stony places in sub-alpine districts; common. June to August.

Distribution.—Central Europe, from Belgium and Spain to Hungary and Galicia; Morocco.

The Purple Foxglove (*D. purpurea* L.) does not grow in Switzer-



PLATE XXVII.

$\frac{4}{7}$ NATURAL SIZE.

1. MULGEDIUM ALPINUM. 2. DIGITALIS AMBIGUA.
3. DIGITALIS LUTEA.

land or in the Jura, though widely spread through France, and it reappears in Corsica and Sardinia.

TOZZIA L.

Tozzia alpina L.

Rootstock covered with succulent, imbricate scales, with thick fibres among them, forming an ovoid, compact body. Stem erect or ascending, succulent, quadrangular, with short hairs on the angles, with opposite branches from the middle, and a pair of leaves at the axils of each pair of branches. Leaves ovate, acute or obtuse, sessile, glabrous, coarsely serrate or entire. Flowers opposite in the axils of the upper leaves, shortly stalked, forming short, loose, leafy racemes at the summit of the branches; flower-stalk downy, recurved when the fruit is ripe. Corolla yellow, with red spots on lower lip. Perhaps semi-parasitic.

Moist, stony, shady places in limestone woods and among débris in the Alps and sub-Alps; local. June to August.

Distribution.—Carpathians, Silesian Mountains; Eastern, Central, and Western Alps, Jura, Pyrenees.

BARTSIA L.

Bartsia alpina L. (Plate XXII.)

Rhizome branching, many-stemmed. Stem simple, erect, or ascending, purplish brown, with glandular hairs, 2–8 inches high, quadrangular, scaly at the base. Leaves opposite, ovate, somewhat amplexicaul, bluntly serrate, wrinkled, covered with short hairs; upper leaves violet. Flowers solitary in the axils of the upper leaves, shortly stalked, dark violet-red, covered with glandular hairs. Anthers bearded. Calyx hairy. Becomes black on drying.

Fresh, grassy places in the Alps and sub-Alps, extending upwards to 8800 feet. July, August.

Distribution.—Carpathians, Sudetic Mountains, Eastern, Central, and Western Alps, Jura, Vosges, Black Forest, Pyrenees. All mountainous Europe, and as far as Arctic Russia and Siberia. British.

VERONICA L. Speedwell.

Herbs with opposite stem-leaves and small flowers, blue, white, or pink, in spikes or racemes, or in the axils of alternate floral-leaves. Calyx 4 or rarely 5-cleft. Corolla with very short tube, and rotate limb, deeply 4-cleft. Stamens 2. Capsule more or less flattened laterally, and opening in 2 valves. Seeds few.

A large genus in the northern hemisphere; a few species extending into the tropics and southern hemisphere, and others (mostly shrubs) are peculiar to New Zealand and Australia.

Veronica Beccabunga L. Brooklime.

A stout, glabrous plant with hollow stems, broad, oval, serrate, shining leaves and small bright blue flowers in axillary panicles.

Ditches, damp mountain-sides, and wet places generally from the plains to about 5000 feet. May to August.

Distribution.—Europe, Northern and Western Asia, Himalaya, Japan, N. Africa.

Veronica montana L.

Foliage very similar to that of the Germander Speedwell, but more glabrous. Stem trailing, rooting at the nodes. Leaves ovate-cordate, on long stalks. Racemes loose, slender, and with few flowers, which are pale blue or mauve. Capsule very flat, orbicular, ciliate.

Moist mountain woods. May to August.

Distribution.—Temperate Europe, Corsica, Algeria. British.

Veronica urticæfolia Jacq. (Plate XVI.)

Stem erect, roundish, 10–16 inches high, hairy like the leaves. Leaves sessile, ovate, acute, from a cordate base; upper ones acuminate, all sharply serrate, entire at the base. Racemes opposite, loose. Peduncle shorter than the leaf. Pedicels erect, usually longer than the linear-lanceolate bracts, patent when fruit is ripe. Flowers pale pink or mauve. Capsule erect, compressed, nearly globular, slightly emarginate, twice as long as the calyx.

Shady declivities and woods in the Alps and lower mountains. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Pyrenees, Jura; Central and Southern Europe from Spain to Turkey.

Veronica officinalis L.

Stems creeping, much-branched, rooting at the nodes, usually about 6–8 inches high. Leaves obovate or oblong, toothed, and hairy. Racemes or spikes axillary, hairy. Flowers nearly sessile, rather small, pale blue or lilac. Capsule obovate or obcordate.

Woods and dry, bushy pastures in the plains and lower mountains. Sometimes up to 5000–6000 feet in Savoy. June to September.

Distribution.—Europe, Western Asia, N. America. (British.)

Veronica Teucrium L.

Plant 6–12 inches high, covered with greyish pubescence, and with an almost woody rootstock. Stems prostrate or ascending. Leaves sub-sessile, oblong or lanceolate, strongly toothed. Flowers blue, large, in axillary and opposite spikes, numerous. Calyx hairy, with 5 very unequal segments. Capsule oboval, hairy, at length longer than the calyx. Style rather longer than the capsule.

Dry pastures, borders of mountain woods, etc. June, July.

Distribution.—Central and Southern Europe, Western Asia; very common in Switzerland and France.

Veronica prostrata L.

Allied to *V. Teucrium*, but smaller, and with narrow-lanceolate leaves, slightly toothed or entire, and thickly covered with grey pubescence. Flowers pale blue, rather small, in axillary and opposite spikes. Calyx glabrous, very unequally divided. Stems prostrate and then ascending. Rootstock almost woody.

Dry hills and grassy places; local. May, June.

Distribution.—Central and Southern Europe. Rather rare in Switzerland and Jura, and commoner in France.

Veronica spicata L.

Stems ascending and erect, 6–12 inches high, simple. Leaves oblong or ovate in lower part of stem, downy and finely crenate or toothed. Flowers bright blue, rarely pink or white, small, in a dense terminal spike. Lobes of corolla narrower and less spreading than in many species.

Hilly pastures and dry, grassy places from the plains to the Alpine region. Seen as high as 8500 feet near Mont Cenis by the author; most common in limestone districts. July to September.

Distribution.—Central and Northern Europe, Northern and Western Asia, but not within the Arctic Circle; rare in Britain.

Veronica fruticulosa (L.) Wulf.

Stem woody below and procumbent, rooting, annual shoots 6–9 inches high. Leaves opposite, glabrous, fleshy, crowded with weak hairs on the margin; upper leaves lanceolate, obtuse, sessile, entire or crenate; lower leaves smaller, narrowed into a short leaf-stalk. Raceme terminal, at length elongated. Flowers pink or rose, veined with a darker tint. Capsule roundish ovate, compressed, hairy towards apex, as long as the calyx. Style as long as the capsule. Distinguished from the nearly allied *V. saxatilis* L. by the glandular hairs, red flowers, and the longer leaves.

Stony Alpine and sub-alpine places up to 8000 feet; local. June to August.

Distribution.—Eastern, Central, and Western Alps, Southern Jura, Pyrenees, Sierra Nevada; rare in Switzerland except on the Jura (Dôle) and about Engelberg, on limestone.

Veronica saxatilis Scop. (*V. fruticans* Jacq.). (Plate XVI.)

Stem 2–6 inches high, ascending from a woody base. Leaves oblong-lanceolate or oval, obtuse, entire or slightly crenate, thick, coriaceous; lower leaves smaller. Inflorescence covered with very short, curved glandular hairs. Flowers large, handsome, blue with

a red ring at the throat. Capsule longer than the calyx, ovoid, and slightly conical. Style at least as long as the capsule. A very variable species, according to situation, soil, etc. It possesses a strong dye, which is such that a dried specimen in the herbarium frequently makes an exact impression on the sheet of that above it.

Stony places in the Alps and sub-Alps. June to August or September. Prefers granite.

Distribution.—Carpathians, Sudetic Mountains, Eastern, Central, and Western Alps; Vosges, Jura, Auvergne, Pyrenees, Corsica; rare in Scotland; Scandinavia.

Veronica aphylla L.

Stem naked, 1–2 inches high. Runners creeping, few-leaved, hairy. Leaves ovate or obovate, crenate-serrate or nearly entire, obtuse, with very short leaf-stalk, crowded almost into rosettes. Flowers pale blue or mauve, very fugitive, in a single axillary or apparently terminal, long-stalked, few-flowered, glandular, corymbose raceme, which is elongated when the fruit is ripe. Flower-stalks erect in fruit, longer than the capsule. Capsule oval or obovate, emarginate, longer than the 4-cleft calyx.

Rocky, moist places on the high Alps up to 9000 feet, and not descending to the sub-alpine regions. June to August.

Distribution.—Carpathians, Alps, Jura, Pyrenees, Caucasus, Altai, N. America.

Veronica bellidioides L.

Much like *V. alpina*, but larger in all its parts, though intermediate forms appear to occur. Stem 4–6 inches high, simple, ascending, rough-haired like the entire plant, glandular above. Leaves light green, hairy, obovate-lanceolate, obtuse, entire or crenate; the lowermost much larger, narrowed into a leaf-stalk, and crowded almost into rosettes, persistent; upper leaves sessile, distant. Flowers in a roundish, crowded spike, elongated and looser when in fruit. Flowers dull blue. Capsule oval or ovoid, slightly emarginate. Seeds flat.

Alpine and sub-alpine pastures and stony places. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Pyrenees; Moravia, Transylvania, N.E. Balkans.

EUPHRASIA L. Eyebright.

Small, erect herbs, partly parasitic on roots. Flowers small, in dense leafy spikes. Calyx 4-toothed. Corolla tubular, 2-lipped; upper lip concave. Stamens 4. Anthers hairy. Capsule oblong. Leaves opposite, lobed or incised. Many grow in the Alps and sub-Alps, and only a very brief account of so critical a genus can be given here.

Euphrasia officinalis L. Common Eyebright. (Plate XXVIII.)

A small, branched annual, varying much in size, shape of leaves, size and colour of flowers, etc. Leaves small, sessile, opposite, ovate, deeply toothed. Flowers in loose, terminal, leafy clusters or spikes. The calyx with 4-pointed teeth. Corolla white or pinkish, streaked with purple and with a yellow spot in the throat. Capsule oblong. Sometimes in alpine regions the plants are only 1 or 2 inches high.

Pastures from the plains to the high Alps. July to October.

Distribution.—Europe, Northern and Central Asia to the Arctic Circle. British.

Euphrasia salisburgensis Funck. (Plate XXVIII.)

A stiff, erect annual, often simple, though more frequently branched, with prominent sharp teeth to the glabrous leaves, the teeth being very large towards the base of the leaf. Flowers small (6–8 mm.), usually white, with bluish upper lip or entirely blue, mauve, or violet. Leaves often purplish.

Pastures in the Alps and sub-Alps. July to October.

Distribution.—Alps, Central and Southern Europe extending to Scandinavia and Corsica. Ireland. Particulars, with plate and map, of its distribution in Ireland are given in Mr. Praeger's very cheap and excellent little book on the Flora of the West of Ireland.¹

Euphrasia minima Jacq. (Plate XXVIII.)

A very small annual, yellow-flowered species, simple or branched below. Leaves always obtuse, the lower ones with only 1 tooth each side, the upper with 2–4 teeth. Bracts oval or oval-oblong, spreading, with 3–4 teeth on each side. Corolla 5–6 mm. long, very variable in colour and outline; though usually yellow it is sometimes whitish or mauve or partly yellow and mauve.

Pastures in the Alps and sub-Alps. July to September.

Distribution.—Alps, Jura, Auvergne, Pyrenees, mountains of Central Europe and Asia Minor. Two or three years ago a form of this plant was discovered on Exmoor, new to the British Isles. A rather unlikely spot for the plant. The Exmoor specimens recently seen by the author at the British Museum are not very typical of the Continental plant, though they may be a form of it.

Euphrasia lutea L. (Plate XXIX.)

A very distinct annual species, formerly known as *Odontites lutea* Reichb. Stems slender, branched, the branches being opposite and spreading, finely pubescent. Leaves linear or linear-lanceolate, scabrous, scarcely toothed, the upper ones and bracts entire. Corolla bright yellow, with ciliated border.

Dry, hot hills in the sub-alpine region. July, August.

Distribution.—Central and Southern Europe, Caucasus, Asia Minor, Syria, Algeria.

¹ R. Lloyd Praeger, *A Tourist's Flora of the West of Ireland* (1909), p. 173.

MELAMPYRUM L. Cow-wheat.

Annual plants, with opposite leaves and branches, and semi-parasitical. Floral-leaves often developed into coloured bracts. Flowers yellow, purple, or variegated; axillary or in terminal leaf-spikes. Calyx tubular or campanulate, 4-toothed. Upper lip of corolla compressed, entire, or with a small lobe on each side; lower lip spreading, with 3 short lobes and a projecting palate nearly closing the mouth of the tube. Capsule ovate, oblique.

A small, distinct genus confined to Europe and N. Asia.

Melampyrum pratense L. (Plate XXVIII.)

Stem erect, 6-12 inches high, with spreading opposite branches, glabrous. Leaves lanceolate, upper ones usually toothed at the base. Flowers usually entirely yellow, rarely with whitish tube, and sometimes partly lilac, in distant axillary pairs. Calyx-teeth erect, shorter than the tube, but very variable. Annual.

Woods and pastures from the plains to the lower Alps. June, July.

Distribution.—Europe, Western Asia. British.

Melampyrum sylvaticum L. (Plate XXVIII.)

Much like certain forms of the last, but usually smaller, with the floral-leaves entire and much smaller flowers, of a deep yellow. Calyx-teeth prominent, lanceolate, acute. An annual.

Woods and thickets in the mountains. July.

Distribution.—Alps, Jura, Vosges, Cevennes, Pyrenees, Corbières, most of Europe, Caucasus, Altai, Siberia. N. Britain and Ireland.

Melampyrum nemorosum L. (Plate XXVIII.)

Annual, like the rest; easily distinguished by its large violet-coloured bracts or floral-leaves, yellow flowers, with orange palate and rusty red tube.

Borders of mountain woods and hills. July.

Distribution.—Local in Switzerland (banks of the Veveyse near Vevey), Savoy (south of the Salève, near Argentière, etc.), Alps, Cevennes, Pyrenees. Europe and Western Asia.

RHINANTHUS L. Yellow Rattle.

Annual herbs, parasitic on roots, turning black when dry. Flowers yellow, in unilateral spikes, with broad bracts. Calyx ventricose, 4-toothed, enclosing the seed-capsule like a bladder. Corolla 2-lipped. Stamens 4. Seeds winged. Leaves opposite, narrow, toothed.

About 20 species, difficult to distinguish, inhabiting the northern hemisphere. Several are abundant in the lower Alpine meadows and pastures.



PLATE XXVIII.

4/7 NATURAL SIZE.

- | | |
|---------------------------|------------------------------|
| 1. EUPHRASIA MINIMA. | 2. RHINANTHUS SUBALPINUS. |
| 3. EUPHRASIA OFFICINALIS. | 4. MELAMPYRUM PRATENSE. |
| 5. MELAMPYRUM NEMOROSUM. | 6. EUPHRASIA SALISBURGENSIS. |
| 7. MELAMPYRUM SYLVATICUM. | |

Schinz and Keller point out that the genera *Melampyrum*, *Rhinanthus*, *Euphrasia*, and certain Gentians present a *seasonable* differentiation (un dimorphisme saisonnier): 'Une espèce donnée peut se redoubler par adaptation directe à la station en une *race printanière ou estivale* peu rameuse, fleurissant et fructifiant de bonne heure et une *race automnale* très rameuse, fleurissant et fructifiant plus tard.'¹

For information on these interesting points and for a full descriptive account of the species and sub-species of this difficult genus found in Switzerland the reader is referred to the *Flore de la Suisse*, by Schinz and Vilczek.

Rhinanthus sub-alpinus Schinz and Thellung. (Plate XXVIII.)

Plant 6–12 inches high. Stem streaked with black, almost glabrous. Leaves broadly lanceolate, crenate-dentate, sub-acute. Bracts triangular, ending in a short point, the lower teeth being subulate, aristate. Upper lip of corolla with violet lobes, narrowly conical, sub-acute, 2 mm. long.

Alpine and sub-alpine meadows in the Alps and Jura, and also in the plain of Switzerland.

The writer did not see the plant which was drawn and here figured, and cannot be sure that it belongs to this species.

PEDICULARIS L. Lousewort.

Flowers usually in bracteate spikes or racemes, large and showy, red or yellow. Calyx tubular or campanulate, often inflated, 2–5 toothed. Corolla 2-lipped, tube often dilated, upper lip entire or notched, lower lip 3-lobed. Stamens 4. Anthers hairy. Erect herbs with deeply divided leaves, turning black when dry, parasitic upon roots.

There are about 150 species inhabiting the mountainous parts of Europe, Asia, Africa, and America. Many are acrid, and consequently harmful to the pastures. Nearly all are Alpine or sub-alpine, and the great majority in the Alps grow from about 4500–6000 feet, and having been fully treated in the author's *Alpine Plants of Europe*, he does not propose to repeat many of those descriptions here, but to give a brief summary of them and to add a few species which grow at lower altitudes. This summary is based on that of the late A. W. Bennett.²

A.—*Flowers yellow. Upper lip of corolla drawn out to a long narrow beak:*

P. elongata Kerner. Stem 6–12 inches, few-leaved, nearly glabrous. Spike elongated. Calyx-teeth leaf-like, inciso-dentate, bracts glabrous, pinnatifid. Leaves deeply pinnatifid. Segments inciso-serrate. South-eastern Tyrol and Venetian Alps; rare.

¹ *Flore de la Suisse* (1909). Ed. française par Vilczek et Schinz, p. 519.

² *The Flora of the Alps*. By A. W. Bennett (1897), vol. ii. p. 89.

P. tuberosa L. Stem densely woolly, 4-10 inches. Spike short. Calyx-teeth leaf-like, inciso-dentate. Upper bracts trifid. Leaves bipinnatifid, with toothed lobes and woolly petiole. Alpine pastures, Alps, Pyrenees, etc.

P. Barrelieri Reichb. Spike long and lax, less hairy than the last. Calyx-teeth entire, lanceolate. Western Alps; rare.

B.—*Flowers yellow. Upper lip of corolla not prolonged into a long beak:*

P. Oederi Vahl. Stem scarcely 3 inches, leafy. Corolla bright yellow, glabrous, and spotted with scarlet or dark purple on the under side of upper lip. Leaves pinnatifid with blunt segments, obscurely serrated. Carpathians, Eastern Alps, Piedmont, and Switzerland.

P. foliosa L. Flowers large, sulphur-yellow. Plant 1-2 feet high, leafy, nearly glabrous. Spike leafy. Leaves pinnatifid, with linear-lanceolate segments irregularly incised. Alps, Jura, Vosges, Pyrenees, Apennines.

P. comosa L. Flowers large, citron-yellow. Stem 1-2 feet high, rough with woolly hairs. Spike elongated, dense. Upper bracts entire, lanceolate. Leaves pectinate-pinnate, with narrow incised segments. S. Tyrol, Western Alps, Cevennes, Pyrenees, N. Asia.

C.—*Flowers red. Corolla beaked. Stem-leaves alternate:*

P. incarnata L. Stem erect, 6-18 inches, leafy. Flowers large, light rose-colour or reddish. Spike long and lax. Calyx-teeth nearly entire, woolly like the bracts. Leaves pectinate-pinnatifid, glabrous. Segments inciso-dentate, not encrusted at margin. Alps, frequent.

P. cenisia Gaudin. Stem nearly leafless; smaller plant than the last and always woolly. Spike very short. Calyx-teeth pinnatifid. Piedmont and Western Alps of France.

P. asplenifolia Floerke. Flowers few, rose-red, large. Calyx-teeth nearly entire or sometimes crenate, with recurved tip. Stem 1-3 inches. Leaves small, pinnatifid. High Eastern Alps, from Grisons to Carinthia; rare.

P. rostrata L. Flowers large, few, bright rose, with long darker beak. Calyx-teeth crenate, with recurved leaf-like tip. Stem 2-4 inches. Leaves pectinate-pinnate. Highest pastures and granitic moraines. Carpathians, Alps, Pyrenees.

P. Portenschlagii Sauter. Stem 2-4 inches. Flowers large, pink, few, with long tube and short beak. Calyx-teeth crenate, with recurved tip. Leaves pectinate-pinnatifid, with linear-lanceolate segments. Jura, Tyrol, Carinthia, Carpathians.

P. gyroflexa Gaudin (*P. fasciculata* Bell.). Stem about 8 inches high. Flowers rose-coloured, large. Beak of corolla short, lower

lip very small. Calyx woolly, with leaf-like segments. Leaves bipinnatifid with inciso-serrate segments. Southern Switzerland, Tyrol, Western Alps.

D.—*Flowers red. Corolla not beaked. Stem-leaves alternate :*

P. sylvatica L. Stem nearly simple, leafy, about 6 inches long, prostrate or spreading. Flowers sessile, dark pink or rarely white, in short terminal heads. Calyx-lobes unequal, lower ones toothed. Leaves pinnate, with deeply cut segments. Damp meadows and pastures in the plains and sub-Alps. Western, Central, and Northern Europe. British.

P. palustris L. A larger and more-branched, glabrous plant, at least a foot high. Leaves sometimes opposite, pinnate, with short ovate, crenate segments. Flowers rather large, purple-red, upper lip darker. Calyx bifid. Damp meadows and marshes. Northern and Central Europe to the Arctic regions, Siberia. British.

This does not ascend so high in the Alps as the last.

P. rosea Jacq. Flowers rose-coloured, rather large, upper lip darker, in a terminal, short, crowded spike. Stem, bracts, and calyx woolly. Leaves pectinate-pinnate, with linear-incised segments. Eastern and Western Alps, but not in Switzerland.

P. recutita L. Stem 1-2 feet, leafy. Flowers dull greenish or rusty red, in a long dense spike. Calyx-teeth lanceolate, entire. Leaves pectinate-pinnatifid, with broad segments. Alps and Carpathians.

E.—*Flowers deep pink. Stem-leaves in whorls :*

P. verticillata L. Stem erect, simple, with a few whorls of 3-5 narrow pinnatifid leaves. Flowers in crowded, terminal, whorled spikes. Calyx inflated. Corolla not beaked. Alps, Pyrenees, N. Asia, N. America.

F.—*Flowers pink, large. No stem :*

P. acaulis Scop. Quite distinct. Flowers pale pink, large, on short radical stalks. Leaves in a radical whorl. Eastern Alps.

OROBANCHACEÆ

Leafless brownish root-parasites. Rootstock often tuberous, naked or scaly. Stem stout, solitary, scaly, not often branched. Flowers in more or less dense spikes or racemes. Sepals 4 or 5. Corolla 2-lipped. Stamens 4. Ovary 1-celled. Seeds numerous, minute. A widely distributed family, chiefly in Southern Europe.

OROBANCHE L. Broom-rape.

Characters of the family. None are truly Alpine, though several, and particularly *O. epithymum* DC. (*O. rubra* Sm.), are found in the sub-Alps. That species has been seen by the author as high as 6600

feet in Savoy and in Switzerland, where it is parasitical upon Thyme, as in parts of England. The following species of Broom-rape, with the host-plant upon the roots of which they grow, have been recorded from Switzerland by A. W. Bennett, Keller and Schinz, etc. :

- O. minor* Smith, on various plants, very commonly on Purple Clover. Style violet.
- O. loricata* Rchb., on *Artemisia campestris*. Style yellow.
- O. Picridis* Schultz, on *Picris hieracioides*. Plant very pale.
- O. Scabiosæ* Koch., on *Scabiosa Columbaria* and on spp. of *Carduus* and *Cirsium*. Corolla yellow and violet.
- O. epithymum* DC. (*O. rubra* Sm., *O. alba* Stephan), on Thyme.
- O. Teucrii* Holan., on *Teucrium* and *Thymus*. Spike short.
- O. caryophyllacea* Sm., on *Galium*. Plant yellow, scented.
- O. flava* Mart. (*O. Frölichii* Rchb.), on *Adenostyles*, *Petasites offic. albus* and *niveus*, and *Aconitum Lycoctonum*.
- O. Hederæ* Duby., on Ivy. Spike elongated.
- O. Salviæ* Schultz, on *Salvia glutinosa*. Corolla yellow.
- O. lucorum* A.Br., on *Berberis* and *Rubus cæsius*. Corolla brownish yellow.
- O. Laserpitii Sileris* Reuter, on *Laserpitium Siler*. Stem swollen at base into a large ball. Corolla brownish yellow, streaked with violet.
- O. elatior* Sutton (*O. major* L.), on *Centaurea scabiosa*. Plant yellow. Corolla reddish brown.
- O. Cervariæ* Suard. (*O. alsatica* Kirchl.), on *Peucedanum Cervaria* and *Seseli Libanotis*. Corolla fawn-coloured, tinted with violet. Sepals distinct.
- O. rubens* Wallr. (*O. gracilis* Sm.), on *Lotus*, *Hippocrepis*, *Genista*, etc. Corolla reddish brown. Sepals 2-3 cleft.
- O. Rapum Genistæ* Thuill., on Broom and other Leguminosæ. Tall, coarse, with large brown flowers.
- O. cruenta* Bert., on *Medicago sativa* and *Melilotus*. Yellow.
- O. purpurea* Jacq. (*O. cærulea* Vill.), on Yarrow. Whole plant purplish.
- O. lævis* L. (*O. arenaria* Berk.), on *Artemisia campestris*. Bluish. Anthers hairy (smooth in *purpurea*).
- O. ramosa* L., on hemp and tobacco. Stem branched.

LATHRÆA L.

Lathræa Squamaria L. Toothwort.

Lathræa is closely allied to *Orobanche*, but the calyx has 4 broad, short teeth. Plant fleshy, yellowish white or pale purple. Raceme

unilateral, drooping. Rootstock fleshy, and creeping, covered with short, thick, fleshy scales. Parasitical upon roots of Hazel, Poplar, and Alder, and rarely upon Vines and Apple trees.

Distribution.—Europe, Central and Russian Asia except the extreme N. British.

GLOBULARIACEÆ

A small family of about 14 species, inhabiting Europe and the Mediterranean district.

GLOBULARIA L.

Flowers blue, in globular heads. Corolla tubular. Calyx 4-cleft, teeth linear. Stamens nearly equal in length. Stigma simple, capitate.

Globularia cordifolia L.

Root tapering, branched, putting up branching prostrate, rooting shoots, which ultimately become woody and knotty. Stem herbaceous, erect or ascending, simple, leafless except for 1 or 2 scales, glabrous like the leaves. Flowers blue, in a solitary umbel, flatly hemispherical. Leaves of the shoots alternate, crowded, stalked, obovate-lanceolate or spatulate, entire, rounded at the apex, emarginate or 3-toothed.

Gravelly, stony, and dry Alpine and sub-alpine places, often covering large tracts. May to July.

It prefers limestone, and is found from the plains up to 8000 feet.

Distribution.—Eastern, Central, and Western Alps; Jura, Pyrenees, Central and Southern Europe.

Globularia nudicaulis L.

Rootstock with fusiform branches, many-headed, but with no runners. Stem herbaceous, 3–6 inches high, naked, or with a few scales, erect, simple, glabrous like the leaves, bearing only a single hemispherical capitulum of blue flowers. Radical leaves, stalked, cuneate-oblong, entire, rounded at the apex or shallowly emarginate. Scales of the stem small, lanceolate-membranous, not ciliated. Leaves coriaceous, dark green.

Pastures and stony places on the calcareous Alps and lower Alps. June, July. It does not reach quite so high an altitude as the last.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Spain, Apennines.

Globularia vulgaris L.

Rootstock almost woody. Scape erect, 4–12 inches high, with numerous, alternate, small, sessile, lanceolate-acute leaves. Root-leaves large, oboval, entire, sometimes trifid at top, gradually narrowing into a long petiole. Flowers blue in small globular heads.

Variable and represented in Switzerland by the sub-species *Willkommii* Nyman.

Dry hills, especially limestone. May, June.

Distribution.—Central and Southern Europe. Very widely spread in France.

LABIATÆ

Herbs, or rarely shrubs, with square stems and opposite leaves, often glandular and fragrant. Flowers solitary, or in opposite, axillary, crowded, stalked, or sessile cymes. Corolla tubular and 2-lipped. Calyx persistent, 5-cleft. Stamens 4, epipetalous, rarely 2. Ovary 4-lobed, with one ovule in each lobe. Stigma 2-fid. Fruit of four 1-seeded nutlets.

A very large family, spread all over the globe, and easily known from all other Monopetals, except the Borage family, by the 4-lobed ovary and the 4 small nuts in the base of the calyx. The family, however, comprises comparatively few Alpine species, and not one high "Alpine."

MENTHA L. Mint.

Flowers small, in dense axillary cymes or leafy spikes. Corolla-tube short, limb 4-lobed. Stamens nearly equal; whole plant usually strongly scented.

About 30 species inhabiting north temperate regions. They hybridise very easily, and hence are rather difficult to determine. The Swiss Mints are practically the same as the English.

Mentha sylvestris L. (*M. longifolia* Hudson). Horse-mint.

Stems 2–3 feet high, erect, slightly branched, hoary like the whole plant with close down. Leaves sessile, broadly lanceolate. Flowers small and numerous, in dense cylindrical spikes, forming oblong-terminal panicles.

Wet mountain pastures and waste places in the plains, forming great colonies in some sub-Alpine districts as, e.g. about Argentière.

Distribution.—Temperate and Southern Europe, Russian and Central Asia. British.

THYMUS L. Thyme.

Flowers small, in axillary cymes, often unisexual. Calyx 2-lipped. Corolla obscurely 2-lipped. Stamens 4, very unequal. Leaves small, entire. Stem procumbent. Most species very fragrant.

Thymus Serpyllum L. Common Thyme.

Stems slender, prostrate, much branched, hard but scarcely woody at the base, forming low, dense tufts, and often almost covered with purple flowers. Leaves very small, oblong or ovate, fringed with a few long hairs at the base. Flowers usually 6 in a whorl, with no true bracts, in short, terminal, leafy spikes. Calyx



PLATE XXIX.

4/7 NATURAL SIZE.

1. *AJUGA PYRAMIDALIS*.
3. *SALVIA GLUTINOSA*.

2. *EUPHRASIA LUTEA*.
4. *SALVIA PRATENSIS*.

usually hairy, and whole plant often densely covered with short, hoary hairs. Very polymorphic, and in Switzerland several subspecies and varieties are known.

Banks, hillsides, and pastures from the plains to 9000 feet.

Distribution.—Europe, Northern and Central Asia. British.

SALVIA L.

Flowers usually in whorls of 6 or more, forming terminal racemes or spikes. Calyx 2-lipped, the upper lip entire or with 3 small teeth, the lower one 2-cleft. Corolla with upper lip erect, concave or arched, the lower spreading, 3-lobed, the middle lobe often notched. Stamens really 2, but easily mistaken for 4, on account of the arrangement of the anthers, which have a long, slender connectivum having the appearance of a filament.

A large genus widely spread over temperate and warm regions of the globe, being mountain plants within the tropics.

Salvia pratensis L. Meadow Sage. (Plate XXIX.)

A handsome plant 1-2 feet high with shortly stalked root-leaves, ovate heart-shaped or oblong, 3 to 5 inches long, coarsely toothed and much wrinkled; stem-leaves smaller, mostly sessile. Flowers in a long, terminal, simple or branched spike, composed of whorls of large rich blue or deep mauve flowers. Upper lip of calyx slightly 3-toothed.

Dry pastures and mountain-sides, common and often in large colonies in sub-alpine districts, but being nevertheless one of the most beautiful of Alpine flowers. June, July, and again sometimes in autumn.

Distribution.—Central and Southern Europe to the Caucasus, and northwards to Sweden, Northern France, and Kent.

Salvia glutinosa L. (Plate XXIX.)

Cymes 2-3 flowered; flowers dirty yellow, very large, soon fading; upper lip of calyx entire. Leaves cordate hastate, pubescent, longly petioled, large, crenate-dentate. Stems 2-3 feet high, erect, viscous above. Calyx also covered with viscid, glandular hairs.

Mountain woods and thickets in the sub-alpine region. June to August.

Distribution.—Alps, Jura, Cevennes, Eastern Pyrenees, Corsica, Europe and Asia from Spain to the Himalaya.

Salvia verticillata L. Whorled Salvia.

Flowers small, pale blue or mauve or rarely white, shortly pedicelled, in dense whorls forming elongated spikes. Calyx violet, hairy, upper lobe trifid. Leaves petioled, broadly ovate-cordate, irregularly crenate-dentate, soft and green. Whole plant usually hairy and disagreeably scented.

Waste places, dry hills, etc. June to August.

In August, 1911, we observed several large clumps of this plant on the embankment of the new electric railway just below Argentière at the unusual height of about 4000 feet above the sea.

Distribution.—Central and Southern Europe ; Western Asia.

CALAMINTHA L.

Calamintha alpina L. Alpine Calamint. (Plate XXI.)

Stem prostrate or ascending, simple or branched, downy like the calyx. Leaves ovate or elliptical, acute, slightly serrate, usually glabrous. Flowers reddish purple in few-flowered axillary cymes. Calyx open in fruit with spreading teeth, and clearly 2-lipped. Very rarely the flowers are pink as in the figure, this specimen coming from near Le Planet, above Argentière.

Sunny, stony, Alpine and sub-alpine slopes, descending to the plains of Switzerland. June to August.

Distribution.—Alps, Jura, Pyrenees, Carpathians.

Calamintha nepetoides Jord.

Plant about 2 feet high, covered with greyish hairs, and pleasantly scented. Leaves ovate, serrated, petioled. Flowers pink, rather small, in very lax panicles or whorls on branched peduncles longer than the leaves. Calyx long, with almost equal teeth, shortly ciliate, 2 of the teeth being narrower and rather longer than the 3 others.

Dry, stony places in the lower calcareous mountains. June to September.

Distribution.—Alps, Jura, Eastern Pyrenees, Corsica, Southern Europe, Asia Minor.

HORMINUM L.

Horminum pyrenaicum L.

About 6 or 10 inches high. Root-leaves stalked, ovate-lanceolate, crenate, wrinkled, glabrous. Flowers violet, usually in false whorls (axillary cymes) of 6. Calyx 2-lipped, upper lip 3-toothed ; lateral teeth wedge-shaped. Corolla 2-lipped, upper lip erect, 2-cleft, tube provided with a ring of hairs. Stamens 4, distant, connivent towards the apex beneath the upper lip of corolla. Anthers coherent in pairs ; anther-lobes coalescent at the apex, dehiscing by a common longitudinal fissure. It is the only species known.

Grassy pastures in the Alps from about 4000–6500 feet ; local, and absent from many large districts, though abundant in Tyrol. June to August.

Distribution.—Eastern, Central, and Western Alps, but extremely rare in the Western Alps, and in Western Switzerland. Pyrenees.

DRACOCEPHALUM L.

Dracocephalum Ruyschiana L.

Stem 8-12 inches, erect, branched, nearly glabrous, very leafy. Leaves linear-lanceolate, entire, shining above, paler beneath and dotted, margin slightly recurved. Inflorescence spicate. Bracts broad, ciliate. Flowers violet-blue, handsome.

Pastures and stony places in the Alps; rare. July, August.

Distribution.—Central and Western Alps; Central Pyrenees; Norway; parts of Germany; Asia, Japan.

Dracocephalum austriacum L.

Rather taller. Leaves with 3-7 linear-lobes, those of the upper leaves narrower, aristate. Flowers large, deep violet, in a short, terminal spike.

Rocky places; rare. May to July.

Distribution.—Grisons, Valais, Tyrol, Dauphiny, Pyrenees (?), Carpathians.

MICROMERIA Benth.

Micromeria Piperella Benth.

Flowers red-purple. Corolla with long, slender tube, 2-lipped, lower lip of 3 nearly equal lobes. Stamens 4. Cymes 1-3 flowered, on short stalks, unilateral. Calyx cylindrical, 5-toothed, not 2-lipped. Leaves small, ovate, sessile, glabrous. Stems wiry, 4-6 inches high.

Rocky places in hot, southern mountains (e.g. about Tenda); very rare. June to August.

Distribution.—French and Italian Maritime Alps; endemic.

MELITTIS L.

Melittis Melissophyllum L. Balm.

Flowers very large, about 1½ inch, pink, or white, spotted with purple, solitary or in pairs in the axils of the leaves. Calyx with rounded lobes. Leaves ovate-cordate, serrate, hairy.

Mountain woods, hedges, and ravines. May to July.

Distribution.—Switzerland, Dauphiny, Savoy, Pyrenees, Corsica; most of France; Central and Southern Europe; rare in England.

LAMIUM L. Dead Nettle.

Cymes many-flowered, sessile. Upper lip of corolla arched, lower lip spreading. Stamens 4. Anthers hairy. Flowers purple, white, or yellow, rather large.

About 40 species in Europe, Asia, and N. Africa, several being weeds in arable-land.

Lamium maculatum L. Spotted Dead Nettle.

Flowers large, light pink, or purple, rarely white. Leaves often spotted and blotched with white, petioled ovate-cordate, acuminate, hairy, unequally toothed. Very variable in size and habit.

Woods and hedge-banks; common. April to October.

Distribution.—Europe, Caucasus, Asia Minor, Persia.

Lamium longiflorum Ten.

Flowers very large and handsome (25–30 mm.), rose-purple, rarely white, upper lip bifid. Corolla-tube much dilated at the throat, at least twice as long as the calyx. Calyx-teeth lanceolate, acuminate, glabrescent. Leaves all petioled, the upper ones acuminate, deeply toothed. Stems thick, glabrous, and often plum-coloured.

Stony places in Alpine valleys; rare. May to October.

Distribution.—Maritime Alps, Dauphiny, Cevennes, Corsica, N. Italy, Bosnia, Montenegro, Algeria.

PRUNELLA L. (OR BRUNELLA).

Prunella grandiflora L.

Stem erect, green, or reddish. Leaves petioled, oblong-ovate, obtuse or sub-acute, entire or with very small teeth. Corolla blue-violet, handsome (20–25 mm.), about twice as large as in the common Self-Heal. Upper lip of calyx with 3 pronounced triangular, acute teeth. Flowers in a short terminal head.

Dry, rocky places from the plains to the Alps. June to August.

Distribution.—Alps, Jura, Pyrenees, Caucasus, Central and Southern Europe.

SCUTELLARIA L.

Scutellaria alpina L.

Stem procumbent and ascending, 4–8 inches high, leafy and branched. Leaves ovate, crenate-serrate; lower leaves stalked; upper leaves sessile, more or less hairy like the flowers and stems. Flowers in a rather dense terminal spike with membranous, imbricate bracts which vary in colour like the flowers (being not always green). Flowers mauve or bluish purple, with the lower lip whitish; sometimes purple, red, or white, and the lower lip tinted accordingly. Upper lip of corolla trifid; lower lip undivided, large. Calyx very small.

Dry, stony places in the Alps and lower Alps, chiefly on limestone; local. June to August.

Distribution.—Carpathians, Western Switzerland, Western Alps, Cevennes, Pyrenees, Siberia. Mont de la Chens in the Var.

The colour of the flowers is extremely variable, and they often vary even on the same plant.

STACHYS L.

Coarse, hairy herbs with flowers often in whorls of about 6, forming terminal racemes, spikes, or heads. Calyx 5 or 10-ribbed, with 5 nearly equal pointed teeth. Corolla with upper lip concave, entire, and lower lip longer, spreading, 3-lobed. Stamens 4, in pairs under the upper lip. Nuts smooth, rounded at top.

A large genus, spread nearly all over the world, but in tropical regions only in the mountains.

Stachys Alopecurus Benth. (*Betonica Alopecurus* L.).

Stem 8–20 inches, erect, simple, few-leaved, rough-haired like the whole plant. Leaves stalked, ovate or cordate, coarsely crenate or dentate. Flowers yellowish white, in axillary cymes forming a dense, false-whorled, capitate spike. Calyx as long as corolla-tube, with sharp teeth one-third length of the tube.

Alpine and sub-alpine pastures. July, August.

Distribution.—Alps, Pyrenees, Carpathians.

Stachys densiflora Benth. (*Betonica hirsuta* L.).

Stem 6–12 inches, erect, leafy, and hairy like the whole plant. Leaves cordate, elliptical, coarsely crenate, lower ones stalked; upper pair sessile and turned downwards. Flowers purple-rose in axillary cymes, forming an oval compact spike. Calyx 12–15 mm. long, with lanceolate-acute teeth one-third its length.

Alpine and sub-alpine pastures up to 8200 feet; local. July, August.

Distribution.—Alps, Pyrenees, Spain.

Stachys alpina L. Alpine Woundwort.

A tall species 2–3 feet high, with erect and often branched stem, hairy and glandular at the top. Lower leaves broadly oval, obtuse, cordate at the base, softly downy on both sides, crenate-dentate and petioled; upper leaves lanceolate, sub-sessile. Flowers in a long, irregular spike. Bracts lanceolate, entire, often reddish. Calyx-teeth lanceolate and ending in a white mucro. Corolla dull purple. See plate and interesting notes by J. W. White in his excellent *Flora of Bristol* (1912).

Mountain woods. July, August.

Distribution.—Central and Southern Europe, except the Mediterranean region; Caucasus. In England on the Cotswold Hills only.

Stachys recta L.

A much smaller and more fragile plant 1–2 feet high, green, hairy, and scented, with almost woody stock and many ascending stems. Leaves hairy and green on both sides, oblong-lanceolate, very shortly petioled. Flowers pale yellow, in loose whorled spikes. Calyx-teeth hairy, triangular, half length of the tube.

Waste places and limestone hills, extending to the Alps. June to September.

Distribution.—Central and Southern Europe, Asia Minor, Caucasus.

Stachys annua L.

Readily distinguished from the last by its deflexed leaves, which are oblong-lanceolate and nearly glabrous.

An annual weed in cultivated land, often seen in fields in the sub-alpine region. June to August.

Distribution.—Europe, Asia Minor, Caucasus. British.

GALEOPSIS L.

Galeopsis ladanum L.

Is another annual weed often seen in the lower Alps. Leaves narrow, on short stalks, downy. Stem square, often much branched. Leaves narrow, linear-lanceolate, shortly petioled. Flowers purple, red, or rarely white, large. Calyx greyish, hairy, with long but unequal teeth. Very polymorphic.

Cultivated and uncultivated ground, walls, etc.; common. July to October.

Distribution.—Europe, especially Central and Southern. British.

AJUGA L. Bugle.

Cymes usually many-flowered. Calyx 5-toothed. Corolla-tube usually with a ring of hairs within; upper lip short, notched; lower lip 3-lobed. Stamens 4, exserted. Anthers divergent.

About 30 species inhabiting the Old World and Australia.

Ajuga pyramidalis L. (Plate XXIX.)

Stem 3–12 inches high, densely leafy, erect, simple, woolly. Leaves decreasing in size upwards, the lowermost very large. Leaves obovate-lanceolate or oblong, obtuse, slightly serrate, wavy or entire, more or less pilose like the bracts; lower leaves narrowed into a leaf-stalk; upper leaves sessile, passing into ovate, often obscurely 3-lobed bracts, even the uppermost bracts twice as long as the flowers. Bracts often with a violet tinge. Flowers pale azure-blue, collected into whorls towards the summit of crowded spikes.

Pastures and Alpine woods up to 7000 feet. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Black Forest, Vosges, Pyrenees, Caucasus, Central and Northern Europe; Altai. British.

Ajuga genevensis L.

Stem 6–18 inches high, erect, simple, very woolly throughout. Leaves oblong, woolly on both sides, crenate or dentate; stem-

leaves scarcely smaller than root-leaves. Flowers deep blue, handsome, rarely pink, in a long, irregular spike. Bracts crenate, or trifid, often bluish. Calyx woolly, with lanceolate teeth, longer than the tube.

Dry places, especially on limestone hills. May to August.

Distribution.—Europe, Western and Northern Asia.

This beautiful plant is much more worth cultivating in gardens and on rockeries than the last, which figures in most nurserymen's catalogues. Bentham, in his *Handbook of the British Flora*, combined the two species under *A. genevensis* L. and the "*Kew Hand-list*," fell into the same error. The two plants are quite distinct, and *pyramidalis* cannot be considered even an Alpine variety of the other.

Ajuga reptans L. Common Bugle.

This well-known and widely spread plant is as frequent in the lower Swiss mountains as in England. The plant is glabrous. Leaves ovate or obovate, crenate, wrinkled and shining above. Flowers blue, or rarely pink or white. Known by its long, leafy stolons.

Wet meadows and woods. May, June.

Distribution.—Europe, from the Mediterranean to Scandinavia; Western Asia, Algeria.

TEUCRIUM L. Germander.

Herbs or under-shrubs, varying much in habit. Flowers few in each whorl. Corolla apparently without an upper lip, the 2 upper lobes forming 2 small teeth, one on each side of the base of the lower lip, which has thus 5 lobes. Stamens 4, protruding between the two upper teeth of the corolla.

A large genus spread all over the globe.

Teucrium montanum L.

Stock woody, sending out many procumbent stems and forming great mats sometimes a foot across, densely covered with small leaves and yellowish white flowers, which grow in terminal heads. Leaves linear-lanceolate, entire, white tomentose beneath; lower leaves oblong. All the leaves are green above and slightly rolled in at the borders.

Rocks and limestone hills; common, and extending well into the Alpine zone. July, August.

Distribution.—Central and Southern Europe; Asia Minor.

Teucrium pyrenaicum L.

Almost woody at the base, tufted, softly woolly. Stem slender, procumbent, rooting at the base. Leaves nearly orbicular, deeply crenate. Flowers large, upper lip purple, lower lip yellow, toothed.

Flowering cymes in dense, terminal heads. Calyx hairy, green, with lanceolate, acute teeth, rather shorter than the tube.

Rocks and dry hillsides on limestone; very local. June to September.

Distribution.—Pyrenees, Landes, Spain, Isère in Dauphiny.

HYSSOPUS L. Hyssop.

Though not the Biblical Hyssop.

Flowers deep blue or violet, handsome, in terminal spikes. Leaves oblong or linear-lanceolate, entire, smooth, sub-sessile, with glandular dots, 1-nerved. Aromatic plants with woody base, growing in tufts.

There are 5 or 6 closely allied species native in the Mediterranean region, Southern Alps, and Western Asia. Often cultivated.

Hyssopus officinalis L. Common Hyssop.

Stems 1-1½ feet high. Stock woody, with erect branches. Leaves greyish green, linear-lanceolate, entire, smooth, sessile, with glandular dots, ciliated. Spikes terminal, unilateral. Calyx with 15 nerves and triangular teeth, acute. Corolla-tube equalling the calyx. Corolla deep blue, upper lip erect, spreading, emarginate; lower lip 3-lobed. Stamens 4. Nutlets trigonous, ovoid.

Stony places and hot rocks in sub-alpine regions; local. July, August.

Distribution.—Tessin and Valais, Savoy, Dauphiny, Southern Europe, Western Asia, Morocco.

Hyssopus montanus Jord.

Flowers smaller, dark blue. Plant entirely glabrous, bright green. Leaves linear, obtuse.

Dry hills; rare. August, September.

Distribution.—Hills in Hautes-Alpes, and mountains of Dauphiny, Southern Russia.

LAVANDULA L. Lavender.

About 20 species inhabiting the Mediterranean region, Western Asia, and India. Bitter and aromatic herbs, used medicinally, as stimulants and as a perfume.

Lavandula spica L. (*L. vera* DC.).

An under-shrub 1-2 feet high, greyish green with tomentum, with woody stem rising to about a foot above the ground. Branches simple, naked for 6 or 8 inches to the top, and bearing a terminal spike of bluish flowers in false-whorls. Leaves linear or linear-oblong, obtuse, rolled in at the margins. Upper lip of corolla bifid; lower lip trifid, with oval, obtuse lobes. Stony hillsides and dry mountains in the south. June to August.

Distribution.—Sub-spontaneous at Neuveville and Vully only in Switzerland. Native in the French Jura, Dauphiny, Savoy, Provence, Cevennes, Pyrenees, Corsica, Sardinia, Spain, Sicily, Italy, Dalmatia, Algeria.

In abundance near the roadside below Lanslebourg, in the valley of the Arc, at about 3000 feet; the road itself is thickly strewn with cut spikes of Lavender in August, for a lavender-water factory is there.

Lavandula latifolia Vill. (*L. spica* L. part).

This is perhaps only a variety with broader leaves, and rather smaller flowers, which are pale violet.

Dry hills in Dauphiny and elsewhere in Southern France, Spain, Balearic Isles, Italy, Dalmatia, Algeria, and Tunis.

PLANTAGINACEÆ

Flowers small, green, in leafless, crowded spikes. Sepals 4, persistent. Corolla 4-lobed. Stamens 4, with large exerted anthers. Ovary free, 2-4 celled. Stigma feathery.

PLANTAGO L. Plantain.

Leaves all radical, with strong parallel ribs.

Plantago alpina L.

Root long and tapering, woody. Scape 6-9 inches long. Spike about 1 inch long. Leaves linear, 3-nerved, turning black when dry. Corolla-tube hairy.

Alpine and sub-alpine pastures up to 9000 feet. June to August.

Distribution.—Alps, Jura, Pyrenees, Spain, Bavaria.

Plantago montana Lam.

Leaves shorter than in *alpina*, linear-lanceolate and more spreading, 3-5 nerved, glabrous or slightly hairy. Spike few-flowered. Corolla-tube glabrous.

Alpine pastures up to 8500 feet. June to August.

Distribution.—Alps and Pyrenees.

Plantago fuscescens Jord.

Scape 8-10 inches high, covered with silky hairs, like the whole plant. Spike many-flowered, with large oval-orbicular bracts. Corolla-tube glabrous. Leaves linear-lanceolate, acute, with 5-7 nerves, densely covered with silky hairs.

Alpine pastures from about 5600-7300 feet; very local.

Distribution.—S. Tyrol (Mte. Baldo) and Western Alps.

Common in some of the Maritime and Ligurian Alps. Doubtfully recorded from two places in the Valais.

Plantago major and *P. media* are also common in the lower Alpine region.

CHENOPODIACEÆ

A large family of inconspicuous greenish herbs, widely distributed many species are Maritime and none truly Alpine.

CHENOPODIUM L. Goosefoot.

Flowers small, bisexual, without bracts. Stem angular. Seed-vessel a membranous article, often enclosed in the persistent calyx. Weeds either glabrous or covered with a mealy dust. Widely distributed over the globe.

Chenopodium Bonus-Henricus L. Good King Henry.

Stock perennial, with thick, fleshy root like that of a Dock. Stems about a foot high. Leaves like those of Spinage, broadly triangular, stalked, sinuate or with a few large teeth, thick and dark green; upper leaves smaller and nearly sessile. Flowers numerous, in clustered spikes, forming a terminal panicle, leafy at the base.

Waste ground, near villages and mountain chalets, often at considerable elevations in the Alps. May to July.

Distribution.—Europe and Russian Asia except the extreme north. British.

Other species of *Chenopodium* and also of *Atriplex* are often seen in cultivated and waste land about Alpine villages.

POLYGONACEÆ

Herbs with simple leaves and scarious, sheathing stipules (ochreæ). Flowers usually bisexual. Sepals 3–6, petaloid or green, often in 2 rows. Stamens 5–8. Ovary usually trigonous. Styles 1–3. Ovule solitary. Fruit hard, indehiscent, enclosed in the persistent perianth.

A considerable family, dispersed over the whole globe.

RUMEX L. Dock.

Flowers unisexual or bisexual, in racemes or paniced whorls. Sepals 6, in two rows, the inner ones enlarged in fruit. Stamens 6.

A rather large genus spread over the greater part of the world.

Rumex alpinus L. Monk's Rhubarb.

This is the Dock so often seen in the neighbourhood of herds-men's huts in Alpine pastures, sometimes up to nearly 8000 feet. The young stems when stewed afford a not unpleasant dish, resembling Rhubarb. The stems are 1–2 feet high, branched, glabrous like the whole plant. Leaves undulate, crenate, or entire, the lower ones cordate-orbicular or cordate-ovate, obtuse; higher ones ovate or ovate-lanceolate, acute, the uppermost lanceolate. Flowers in pseudo-verticillate, leafless, crowded racemes. The 3 inner valves

of fruiting perianth cordate-ovate, reticulately veined, entire or serrate; none of them tubercled. Petioles long, channelled.

Damp Alpine and sub-alpine pastures, generally near huts. July, August.

Distribution.—Carpathians, Riesengebirge, Eastern, Central, and Western Alps; Jura, Vosges, Black Forest, Auvergne, Pyrenees; Western Asia. Naturalised in N. Britain.

Rumex scutatus L. (Plate XVI.)

A glaucous species 1-2 feet high, with long rampant rootstock, and numerous slender flexuous leafy stems. Leaves hastate or sagittate with large basal lobes, with long petioles longer than the limb. Flowers bisexual, in few-flowered whorls forming lax spiked panicles. Seed-vessel membranous, sub-orbicular, entire.

Old walls and stony places in the Alps, sub-Alps, and plains. May to August.

Distribution.—Central and Southern Europe, Western Asia, N. Africa. Naturalised near Edinburgh.

Rumex arifolius All.

Stem 1-3 feet high, leafy. Leaves thin with spreading auricles, ovate-hastate, entire; root-leaves short and few; stem-leaves larger, embracing the stem. Flowers dioecious, in long panicles.

Alpine meadows, pastures, and open woods. June to September.

Distribution.—Alps, Jura, Vosges, Pyrenees, Corsica, Central and Southern Europe, Caucasus, Siberia.

Rumex Acetosella L. Sheep-sorrel.

A slender plant 3-10 inches high, acid and frequently turning red. Leaves petioled and sagittate, the lobes at the base spreading and sometimes toothed; upper leaves generally linear and nearly sessile. Flowers small, red, dioecious, in slender terminal panicles. Perianth segments small, orbicular, entire and thin, the inner ones closing over the nut.

Dry pastures, walls, and waste places, from the plains to the High Alps; common. May to September.

Distribution.—Temperate regions of the globe, and penetrating far into the Arctic regions. British.

POLYGONUM L.

Herbs with alternate leaves and membranous stipules. Flowers bisexual, in terminal spikes or racemes. Sepals 5, usually petaloid. Stamens 5-8. Styles 2-3.

About 200 species distributed throughout the globe.

Polygonum viviparum L. (Plate VI.)

Stem 4-8 inches high, erect, simple, glabrous like the whole

plant. Leaves entire, with recurved margin and crenate from the thickened transverse veins; lower leaves elliptical or lanceolate, contracted into a wingless leaf-stalk; upper ones lanceolate or linear-lanceolate, acute, sessile. Flowers in a linear-cylindrical, crowded, erect spike, the lower part of which is composed of bulbils. Perianth white or light flesh-coloured.

Alpine and sub-alpine pastures, descending to the valleys. June to August.

Distribution.—Alps, Carpathians, Jura, Pyrenees, Europe, Asia, N. America, Arctic regions. British.

Polygonum Bistorta L. Bistort. (Plate VI.)

Stem 1–3 feet high. Leaves lanceolate-ovate with cordate base and winged leaf-stalk, upper leaves sessile. Flowers in a short terminal spike, pink.

Damp meadows and pastures in the Alps and plains, frequently giving a pinkish tinge to the colour of the Alpine meadows before the grass is cut, as so cleverly shown in some of Mr. Flemwell's pictures.

Distribution.—Europe, Asia, N. America, and Arctic regions. British.

Polygonum alpinum All.

Stem 1–2 feet high, branched, leafy. Leaves lanceolate, acute, narrowed into a short petiole, wavy or toothed. Flowers in a paniculate raceme, yellowish white or pink; scaly sheaths (ochreæ) with rough hairs. Fruit shining, trigonous, equalling the perianth.

Damp meadows in the mountains; local. July, August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Central and Northern Asia.

Polygonum aviculare L. Knotgrass.

A much branched and often prostrate, wiry annual, varying much in size and habit from an inch high (var. *nana* Boiss. which we have seen at 9000 feet) to a foot or two long in arable ground. Stipules white, scarious, ragged at the edges. Leaves small, narrow-oblong, but very variable. Flowers small, reddish, shortly stalked in clusters in the axils of the leaves. Nuts trigonous, minutely granulated or wrinkled.

Waste places, extending nearly all over the globe from the tropics to the Arctic regions.

THYMELEACEÆ

Herbs or shrubs, with white, pink, or green flowers, which are usually bisexual. Perianth with 4 equal lobes, often petaloid and fragrant. Ovary usually 1-celled. Fruit a drupe or berry.

About 400 species inhabiting temperate and hot regions.

DAPHNE L.

Shrubs with pink, white, or green fragrant flowers, and often thick evergreen leaves. Perianth tubular, 4-lobed, petaloid.

About 80 species inhabiting Europe, Asia, and Africa.

Daphne alpina L.

A small shrub. Leaves lanceolate or obovate, spathulate, downy, ultimately glabrous, deciduous. Flowers terminal, crowded, sessile, woolly, appearing at same time as leaves, fragrant. Perianth white, segments lanceolate, acuminate, about one-third shorter than the perianth-tube.

Alpine and sub-alpine rocks, descending to the plains; local. May to July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Cevennes, Pyrenees; mountains of the Var.

Daphne Blagayana Freyer.

An evergreen creeping shrub with coriaceous leaves and very fragrant yellowish white flowers. Stem ascending, usually simple. Leaves obovate-lanceolate, obtuse, glabrous. Flowers in terminal clusters. Tube of perianth slightly hairy on the outside, longer than the oval segments of the perianth-limb.

Bushy places at about 5000 feet; very rare. April, May.

Distribution.—Carinthia, Styria, and Carniola.

Daphne Cneorum L.

A small under-shrub 6–18 inches high, with spreading reddish brown branches, downy and very leafy at the top. Leaves glabrous, leathery, persistent, small, oblong or linear-spathulate, sessile, 1-nerved. Flowers rose-coloured, very scented, sub-sessile, 6–12 inches, terminal heads. Perianth-lobes oval or lanceolate, tube long. Berry ovoid, yellow-orange.

Dry, stony places from the plains up to 5000 feet. April to August. The rose-coloured *D. striata* is more Alpine.

Distribution.—Southern Switzerland (Tessin), S. and S.W. France, Eastern Alps, Central Europe.

Daphne Mezereum L. Mezereon.

A stiff, glabrous shrub 1–3 feet high with the branches ending in a tuft of lanceolate leaves about 2½ inches long. The flowers appear before the leaves, and are light purple and sweet-scented. Perianth-tube slightly hairy. Berries red, as large as peas.

Mountain woods and stony pastures, sometimes seen at 7000 and even 8000 feet in the Alps. Flowers in spring.

Distribution.—Nearly all Europe, to the Arctic regions. British.

Daphne Laureola L. Spurge Laurel.

A glabrous, erect shrub 2-4 feet high, with few branches and evergreen oblong-lanceolate leaves crowded towards the top. Flowers rather small, greenish yellow, in clusters in the axils of the leaves. Berries bluish black.

Bushy places and mountain limestone woods up to 5000 feet; local. April, May.

Distribution.—Southern and Western Europe, Corsica, N. Africa. British.

ELÆAGNACEÆ

Shrubs or trees, more or less covered with minute, silvery or brown scurfy scales. It differs from the *Daphne* family in having erect and not pendulous ovules and seeds.

A small family of few genera spread over the northern hemisphere.

Hippophaë rhamnoides L. Sea Buckthorn.

The only species. A stiff and spiny willow-like shrub, covered with scaly scurf, silvery on the under-side of the leaves, thin or none on the upper, and more rusty on the younger shoots, which often end in a stout prickle. Leaves alternate, entire, broadly linear. Male flowers very small and in little clusters like catkins, female flowers crowded in the axils. Fruit a small yellowish or orange-brown berry in almost sessile, crowded clusters on the bare, woody stems.

Sandy and stony places, and beds of rivers and mountain torrents from the sea-level to 5000 feet in the Alps, as, e.g. on the Col de Balme (French side). Flowers in spring.

Distribution.—Central, Eastern, and Northern Europe; Central and Russian Asia. Local in Britain and often planted to mat the sand of sand-hills together. This useful property can be seen naturally in some of the river valleys of Switzerland and in the north of France, as, e.g. between Calais and Paris.

EMPETRACEÆ

The family contains 3 genera and only 4 species.

Empetrum nigrum L. Crowberry.

The only species. This well-known prostrate shrub, with wiry branches and linear leaves, pale red flowers and black berries, is locally common in the Alps, and is an example of a plant which, though usually growing on the hills, is sometimes found at sea-level in England (as in Dorset), in the Arctic regions, and at over 8000 feet in the Alps of Europe. May to July.

Distribution.—Europe, Asia, North America, Arctic regions.

SANTALACEÆ

THESIUM L. Bastard Toadflax.

Flowers minute, hermaphrodite, solitary and axillary or in cymes. Calyx 3-5 lobed, persistent. Stamens 3-5, attached to the calyx. Ovary 1-celled. Fruit a 1-celled, 1-seeded achene. Leaves narrow, entire, without stipules. Slender herbs parasitic on roots, of which there are about 100 in the ancient world and in Brazil.

Thesium alpinum L. (Plate VI.)

Stem prostrate, branching on one side only, leafy from the base upwards. Calyx rolled up at the tip after flowering, as long as or longer than the fruit. Middle bract much longer than the two lateral ones.

Dry pastures and stony places in the Alps and sub-Alps up to 7500 feet.

Distribution.—Eastern, Central, and Western Alps; Western and Northern Asia.

There are 3 or 4 more species of *Thesium* found in the Alps, including the British *T. humifusum* DC. They are all difficult to determine, especially without ripe fruit.

EUPHORBIACEÆ

One of the largest families, with over 3000 species represented in nearly every part of the world, except the Arctic regions. But we are unaware of a single species which is purely Alpine.

EUPHORBIA L. Spurge.

Herbs, in European species, with the inflorescence composed of many male and one female flower collected into a cluster, subtended by bracts and glands which are often yellow and crescent-shaped. Ovary 3-celled, with 3 bifid stigmas. Seed-capsule 3-lobed. Many have a milky juice.

About 650 species in the temperate and hot regions of both worlds, especially abundant in the Mediterranean district. None are truly Alpine.

Euphorbia Cyparissias L. (Plate XX.)

Stems 8-12 inches high, erect, reddish at the base, rising from a stoloniferous root, and with numerous barren and flowering branches. Leaves linear, setaceous and almost imbricate, glabrous. Flowers yellow, often turning red in autumn, in a terminal umbel, with a whorl of linear leaves at its base. Bracts broadly ovate-triangular. Capsule 3 mm. long, trigonous, glabrous.

Gravelly and stony places from the plains to the Alps, sometimes seen as high as 9000 feet, and often very abundant in the lower Alps. May to September.

Distribution.—Almost all Europe. Introduced into Britain.

Sometimes *Cuscuta*, or Dodder, is parasitical upon this plant. In the Zinal valley in the hot summer of 1911 much of it was seen on this rather unusual "host."

LORANTHACEÆ

A family of over 600 species spread over the greater part of the world, but chiefly in the tropics.

VISCUM L.

About 30 species in the hot and temperate regions of the ancient world.

Viscum album L. Mistletoe.

This well-known parasitical plant is very common in Switzerland, growing not only on Apple, Poplar, Oak, etc., but also upon Fir and other Coniferous trees.

It ascends to at least 4000 feet in some of the pine forests.

Distribution.—Europe, Asia, N. Africa.

CUPULIFERÆ

Trees or shrubs with alternate stipulate leaves. Flowers monœcious. Male flowers in drooping catkins, sepals 4 or less, stamens 2-4; female flowers 2-3, under each scale of a catkin; perianth 0. Fruit indehiscent.

A large family chiefly found in the temperate regions.

BETULA L.

Stamens 2; scales of female catkin thin, deciduous, trifid.

Betula nana L. Dwarf Birch.

A small dwarf shrub. Leaves very shortly stalked, nearly orbicular, about $\frac{1}{2}$ inch long, very obtuse, crenate or serrate. Catkins small and sessile, the males oblong, the females very short, erect.

Moors and bogs in the Alps and sub-Alps up to 6500 feet. May, June.

Distribution.—Central and Northern Europe, Northern Asia and Arctic America. British.

Betula pendula Roth. (*B. alba* L.). Silver or Common Birch.

A small tree, 40-50 or rarely 70 feet high, with white papery bark and glabrous ovate-acuminate, doubly serrate leaves. Fruit broadly winged.

Woods, marshes, and hills, up to the superior limit of the Beech. April, May. In Scandinavia to the upper limit of Pines.



PLATE XXX.

417 NATURAL SIZE.

1 GERANIUM SYLVATICUM

2. PARADISIA LILIASTRUM.

3. ANTHERICUM LILIAGO.

Distribution.—Europe, temperate and Arctic Asia ; N. America (a variety).

Betula pubescens Ehrh.

A similar tree with narrower pointed leaves which are pubescent and finally only downy at the midrib. Fruit broadly winged.

Damp woods, peat-bogs and moors in the plains, sub-Alps and Alps. April, May.

Distribution.—Switzerland, Jura, Alps, Pyrenees ; Central and Northern Europe, Caucasus, Northern Asia, Greenland.

ALNUS L. Alder.

Stamens 4. Scales of female catkin persistent, woody.

Alnus viridis DC. Green Alder. (Plate XVIII.)

A shrub sometimes attaining the height of a small tree in the lower mountains. Leaves stalked, green, ovate-acute, doubly serrate, glabrous. Flowers in monœcious catkins, male cylindrical, drooping ; female oval, stalked, 2-5 in erect racemes, not $\frac{1}{2}$ inch long, forming a woody cone ripening the second year.

Mountains and clearings in the lower Alps, from 3000 to 6600 feet, especially abundant on granite and schist.

Distribution.—Central and Eastern Europe, Northern Asia and America.

Alnus incana Medik.

A shrub or tree with silvery bark and oval-acute leaves doubly serrate, glabrous above, downy and grey beneath. Fruit not winged.

Damp woods, borders of streams, etc., up to 5000 feet. March, April.

Distribution.—Alps, Jura ; Europe, temperate Asia, N. America.

Alnus glutinosa L. Common Alder.

This well-known tree has obtuse, almost orbicular leaves, which are shortly petioled and sticky at first on the upper side.

Damp woods, by water, etc., up to 4000 feet. February to April.

Distribution.—Europe, temperate Asia, N. Africa. British.

CORYLUS L.

Fruit a woody, 1-seeded nut, enclosed in the much enlarged coriaceous involucre. Species 7.

Corylus Avellana L. Hazel.

A glandular, pubescent shrub, rarely a tree of 30 feet. Leaves orbicular-cordate, doubly serrate cuspidate. Fruit a woody 1-seeded nut, enclosed in the greatly enlarged coriaceous involucre. Male

catkins 1-2 inches, several in a raceme; female heads sessile, crimson.

Woods, thickets, hedges, etc., from the plains up to about 5000 feet in Switzerland, though the maximum limit varies considerably.

Distribution.—Europe, Western Asia, N. Africa.

FAGUS L.

Fruit usually in pairs, enclosed in the hardened or coriaceous involucre. Species 15.

Fagus sylvatica L. Beech.

Tall trees with smooth bark. Leaves oblong-ovate, acuminate, obscurely toothed, shortly petioled, silky when young. Fruit usually in pairs, and enclosed in the hardened coriaceous scaly involucre (beech-mast). Male flowers capitate, pendulous; female flowers on shorter peduncles.

Woods, up to 1680 m. in French Switzerland, and 1500 m. in Tessin, and 1350 m. in N. Switzerland, *vide* Schinz.

Distribution.—Temperate Europe, Asia Minor, Caucasus, Persia, Japan.

QUERCUS L. Oak.

Fruit an acorn, seated in a smooth or spiny cup. About 300 species. Distributed throughout the northern hemisphere.

Quercus Cerris L. Turkey Oak.

Scales of cups long, linear-subulate, spreading and twisted. Leaves sinuate or pinnatifid, oblong.

Mountain woods in Tessin. April.

Distribution.—Southern and Eastern Europe, Western Asia.

Quercus pubescens Willd. *Q. lanuginosa* Thuill.

A small tree, the leaves petioled, oboval, sinuate or lobed, pubescent beneath. Twigs pubescent.

Dry hills and woods, extending to about 1450 m. in Switzerland, *vide* Schinz (Poschiavo, Jura, Rhone Valley, etc.).

Distribution.—Central and Southern Europe, Western Asia.

Quercus Robur L. Common Oak.

Leaves sinuate-lobed, very shortly petioled, glabrous like the twigs. Acorns on long peduncles.

According to Keller and Schinz, this extends to 1000 metres in the Oberland of St. Gall., 800 m. in Swiss Jura, and 1250 m. in the Valais.

Distribution.—Europe, Asia Minor, Caucasus, Morocco.

Quercus sessiliflora Salisb.

Leaves with longish petioles, very short peduncles, and acorns nearly sessile. Leaves pubescent below; twigs glabrous.

Dry hills, especially on limestone, but less common in Switzerland than the last, except in Valais and the Southern Alps, where it reaches 1600 m. (Keller and Schinz).

Distribution.—Europe, especially Central, Western Asia.

SALICACEÆ

Trees or shrubs with alternate, stipulate leaves. Flowers dioecious. Perianth 0. Male flowers (in catkins) of 2 or more stamens. Female flowers of a 1-celled ovary with 2 styles and many ovules. The family is not represented in Australia or Malay.

SALIX L. Willow.

Trees or shrubs, with simple, entire, or serrate leaves. Stipules persistent or deciduous. Stamens 2 or more. Catkins usually erect. Many species found in damp and cold regions of the globe, with a great tendency to hybridise.

Salix retusa L.

A small, creeping shrub with ascending branches and 5-9 flowered terminal catkins. Leaves obovate, running into a short leaf-stalk, entire or glandular-serrate at the base, obtuse, sometimes emarginate, glabrous, shining above, smooth beneath. Female catkins, long, few-flowered. Scales as long as the glabrous ovary. Stigmas 2-3 cleft. Lobes filiform.

Wet Alpine pastures and rocks up to 10,000 feet. June, July.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Pyrenees, Jura, Apennines, Balkans, Altai.

The variety *serpyllifolia* Scop. has much smaller leaves.

Salix reticulata L.

This small, creeping shrub, with round, entire, net-veined leaves does not often descend below about 4500 feet in Switzerland, and it ascends to over 8000 feet. June to August.

Distribution.—Carpathians, Alps, Pyrenees, Arctic Europe, Asia and America. British. Often found fossilised.

Salix herbacea L.

This very small, creeping shrub, with branches only about 2 inches above the ground, and small, nearly orbicular, crenate-serrate leaves, does not descend below about 5000 feet in Switzerland; and it ascends to at least 11,000 feet.

Distribution.—Carpathians, Alps, Pyrenees, Arctic Europe, Asia and America. British.

Salix arbuscula L.

An erect shrub, 2-3 feet high, bushy, with small coriaceous

leaves, which have 5-8 yellow glandular teeth. Leaves lanceolate-elliptical or obovate, entire or serrate, glabrous or slightly hairy when young, dark green and shining above, light green and glaucous beneath. Catkins at apex of short leafy shoots; scale of catkins 2-coloured, brown or blackish at apex. Stamens 2. Anthers yellow. Nectary projecting above the mass of the ovary. Style elongated. Stigmas divaricate.

Alpine rocks and pastures. June to August.

Distribution.—Carpathians, Alps, Pyrenees, Caucasus, Norway, Siberia, Greenland. British.

Salix Mysinites L.

A low, much-branched shrub, often quite procumbent though not creeping, and sometimes a foot or more high. Leaves small, orbicular, ovate or lanceolate, bright green, with prominent veins, and finely toothed. With long silky hairs when young, afterwards glabrous. Catkins cylindrical, 1 inch longer flower, $1\frac{1}{2}$ -2 inches when in fruit, on short leafy shoots.

Damp places in the mountains. June to August.

Distribution.—Alps, Central Pyrenees, Norway, Northern and Arctic Asia and America. Scotland and Co. Sligo.

Salix phylicifolia L.

A shrub with very variable foliage. Young leaves often downy, becoming glabrous when old; leaves ovate-oblong to lanceolate, 1-2 inches long, pointed, with rather prominent veins above, often toothed, glaucous or whitish underneath. Catkins slender, the males nearly sessile with a few broad bracts at the base; the females shortly stalked, with more leafy bracts, 1-2 inches long when in fruit.

Mountain woods, thickets, and near streams. June.

Distribution.—Alps, Central Pyrenees, and other mountains of Central and Southern Europe. Arctic Europe and Asia, N. Britain.

Salix repens L. Creeping Willow.

A low creeping shrub, the stems rooting at the base and ascending to a foot or more in height when in rich soil. Leaves more or less silky white when young, oblong or lanceolate, but very variable, usually entire, about $1\frac{1}{2}$ inches long. Catkins cylindrical, about $\frac{1}{2}$ inch long, and sessile when in flower, afterwards shortly peduncled and an inch long.

Moors, heaths, and wet mountain-sides. From sea-level in England to the sub-alpine region on the Continent. April, May.

Distribution.—Arctic, Northern, and Central Europe, and occasionally in the mountains of Southern Europe. Russian Asia.

Salix Lapponum L. (? *S. helvetica* Vill.).

A low-spreading, much-branched shrub, attaining 3-4 feet in rich valleys. Leaves oblong or lanceolate, pointed, entire, covered on both sides with a white cottony down, but when old nearly glabrous above. Catkins nearly sessile, with a few bracts at their base, about an inch long in flower, with long silky hairs, lengthening to $1\frac{1}{2}$ or 2 inches when in fruit.

Mountain pastures extending to wet, bushy places. June, July.

Distribution.—Dauphiny, Savoy, Switzerland, N. Italy, Tyrol, Central Pyrenees, Central, Northern, and Arctic Europe. Scotland.

S. Lapponum grows in the Highlands of Scotland, but perhaps the plant of Linnæus is not actually identical with *S. helvetica* of Villari, though generally considered so.

Various other species of Willow can be found in the lower mountains of Switzerland. Want of space prevents further treatment of the genus.

ADDENDA

Sorbus Mougeotii Soyer et Godron (*S. scandica* Fries.).

The leaves of the plant figured (4) on Plate XVIII resemble those of this species in being deeply lobed towards the middle; but the large berries are those of *S. Aria* in being sub-globular rather than oval. The leaves are not so white beneath as in *Aria*. Godet says (*Flore du Jura*, 1853) this species is much more like *S. hybrida*; and remarks that it is commoner on the Jura than *Aria*, and reaches the Alpine region.

Distribution.—Mountain woods in the Jura, Savoy, Aosta Valley, Pyrenees, Vosges, Scandinavia, Arran.

Sorbus Ancuparia L. Mountain Ash.

This well-known tree has pinnate leaves with 6-8 pairs of serrated leaflets; dense-flowered compound cymes and small creamy-white flowers. Berries globose, scarlet with yellow flesh. It reaches 5000 feet in the Alps.

Distribution.—Europe, N. and W. Asia, Japan, N. America.

CLASS II.—MONOCOTYLEDONS

ORCHIDACEÆ

Perennial herbs with roots often thickened into tubers, entire and parallel-nerved leaves and irregular flowers, solitary or in spikes, racemes, or panicles, each one in the axil of a bract. Perianth superior, irregular, with 6 petal-like segments, the 3 outer ones nearly alike, the lower of the 3 inner ones (the lip) usually larger and often spurred. Stamens 1-2. Pollen usually collected into a pollinium. Ovules minute, very numerous. Fruit a 3-valved capsule.

A very large family of more than 5000 species, spread all over the globe. The tropical ones are mostly epiphytes.

ORCHIS L

Root of globose, ovoid, or palmate tubers. Leaves chiefly radical, sheathing. Flowers in spikes. Sepals and petals ascending, connivent, or the lateral sepals spreading. Lip spurred.

About 120 species, inhabiting Europe, temperate Asia, Africa, and America.

Orchis globosa L.

Tubers elliptical, undivided. Stem leafy, 8-18 inches high, slender. Leaves linear or linear-lanceolate, bright green. Flowers small, lilac or pink, in a short compact, conical or nearly globular spike. Lip spotted with purple, 3-cleft, the middle lobe rather larger, obtuse, truncate, or emarginate. Spur short, barely half-length of ovary. Bracts as long or longer than the ovary, 1-nerved, the lower ones 3-nerved.

Alpine and sub-alpine pastures ; 4000-7800 feet ; local. May to July.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps ; Black Forest, Vosges, Jura ; Pyrenees, Apennines, Balkans, Caucasus.

Like many of the European Orchids, it prefers a limestone soil.

Orchis morio L. Green-winged Orchis. (Plate XXXI.)

Tubers globose, entire. Stem erect, 6 or 8 inches high, with a few narrow lanceolate leaves at the base, and several sheathing scales



PLATE XXXI.

4/7 NATURAL SIZE.

1. GYMNADENIA ALBIDA. 2. ORCHIS MORIO (FOUR COLOUR FORMS).
 3. HABENARIA VIRIDIS. 4. GYMNADENIA ODORATISSIMA.
 5. LISTERA CORDATA.

higher up. Flowers in a handsome loose spike (purple, pink, mauve, or white). Bracts thin, greenish purple, scarcely equalling the ovary. Sepals purple, arching in the form of a helmet. Lip longer than the sepals, broadly 3-lobed, purple, paler in the middle and spotted. Spur obtuse, rather shorter than the ovary.

Meadows and pastures, often in large quantities. May.

Distribution.—Central and Southern Europe, extending north into the British Isles and Scandinavia and Western and Northern Asia.

Such a beautiful series of colour-forms of this Orchis is not often seen, and still less often painted. The author remembers once coming upon a colony of *morio* in every shade from white to deep purple on some Lias cliffs on the Somerset coast, west of the River Parret. Rich purple is the usual colour.

Orchis ustulata L. Burnt-tip Orchis.

About the same height as the last, but less robust, and noticeable for its dense spike of small flowers, the colour of the unopened ones at the top giving it a burnt appearance. Tubers entire. Leaves few, broadly lanceolate. Spike 2 inches long, with small bracts. Sepals deep purple, arching over the small narrow petals. Lip white, with a few purple spots, 4-lobed, i.e. deeply 3-lobed, with 2 lateral lobes and the middle one divided into 2 spreading, obtuse lobes. Spur very short.

Pastures of the hills and sub-Alps, extending sometimes higher. May to July.

Distribution.—Central and Southern Europe as far east as the Caucasus and northwards to Scandinavia. England.

Orchis maculata L. Spotted Orchis.

Tubers spreading, rather flat, and divided into 3 finger-like lobes. Stem about a foot high, or sometimes more. Lower leaves usually ovate-lanceolate; upper ones narrow lanceolate, smaller, often with dark spots. Flowers in a dense oblong spike, 2-3 inches long, usually pale pink, but varying from white to deep rose or purple. Lowest bracts generally longer than the ovary. Lip broadly orbicular, irregularly 3-lobed, sometimes toothed, middle lobe smaller than the others, the lip spotted with deeper colour. Spur slender; a little shorter than the ovary. A very variable species.

Meadows, pastures, moors, and open woods from the plains to the lower Alps; very common. May to July.

Distribution.—Europe, Western and Northern Asia. British.

Orchis latifolia L. Marsh Orchis.

Usually stouter than the last, the stem more hollow, the leaves larger and often not spotted, the spike longer and more leafy, the bracts longer, the flowers more deeply coloured and less variegated,

the lip very obscurely 3-lobed or merely toothed, and the spur thicker.

Damp meadows, marshes in the plains and sub-Alps. May, June.

Distribution.—Europe, Western and Northern Asia. British.

We have found hybrids between this and *Gymnadenia conopsea* at Mont Cenis and in the Italian Maritime Alps at about 5000 feet. They are very rare, and the specimens were determined by Mr. R. A. Rolfe of Kew as synonymous with *Orchi-gymnadenia Lebrunii*, *Journ. de Bot.* (1892), p. 479. Camus=*Gymnadenia comigera* Reichb. fil. *Fl. Germ.*, t. 523, fig. 2.

“The bracts are larger. Spur shorter and stouter than in *G. conopsea*.” R. A. Rolfe *in lit.*

Orchis incarnatus L.

Very near *O. latifolia*, 1–1½ feet high. Tubers palmate, with 2–4 spreading lobes. Leaves 5–6, erect, lanceolate or linear-lanceolate, very rarely spotted; middle leaves largest. Flowers rose, or flesh-coloured, rarely white, in a dense spike. Bracts purplish at the borders, longer than the flowers. Lip almost flat, irregularly toothed, almost entire, rose, streaked with purple.

Damp meadows and mountain bogs. May, June.

Distribution.—Europe, especially Central and Northern, including Norway and England; Western Asia.

Orchis sambucina L.

Smelling like Elder. Tubers long and undivided, or shorter and 2–3 lobed. Stem leafy, 4–10 inches high. Leaves not spotted, dark green, lower ones wedge-shaped, broader towards apex, the next lanceolate. Spikes long, moderately dense. Flowers pale yellow or more rarely purple (var. *purpurea* Koch). Bracts many-nerved, about as long as the perianth. Perianth-segments rather obtuse, the two lateral ones spreading, recurved, the 3 upper ones connivent into a helmet. Labellum shallowly 3-lobed or nearly entire, lateral lobes rounded, middle lobe smaller, obtuse or emarginate. Spur cylindrical, directed downwards, as long as or longer than the ovary.

High mountain pastures, often in large quantities. May to July.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Harz Mountains; most of the mountain ranges of Europe.

Orchis pyramidalis L. (*Anacamptis pyramidalis* Rich.).

Tubers entire. Stem often more than a foot high. Leaves lanceolate, rather narrow and pointed. Spike very dense, somewhat obtusely conical, about 2 inches long. Flowers rather small, rich rose, with very slender spur, longer than the ovary. Sepals lanceolate, spreading. Lip broad, 3-lobed, the lobes more or less equal.

Dry banks and hillsides, preferably limestone. June to August.

Distribution.—Not frequent in Switzerland, more so in France. Central and Southern Europe, extending eastward to the Caucasus and northward to Denmark and the British Isles.

CÆLOGLOSSUM Hartm.

Cæloglossum viride Hartm. (*Habenaria viridis* R.Br.). Frog Orchis. (Plate XXXI.)

Tubers more or less lobed. Stem 3–8 inches high, with a few oval or oblong-lanceolate leaves, and a short spike of yellowish green flowers (often brownish in the mountains) with very short spur and long hanging lip, very shortly lobed at the tip. Bracts usually longer than the ovary.

Pastures and hillsides in the Alps and sub-Alps and Jura.

Distribution.—Europe from Mediterranean to Arctic regions, Siberia. British.

OPHRYS L.

Sepals and petals spreading, lip usually convex, velvety, not spurred. Ovary not twisted; otherwise like *Orchis*.

Intermediate forms often occur which are difficult to place.

Ophrys apifera Hudson. Bee Orchis.

Sepals usually pink inside. Lip dark purple, convex, and velvety, like the body of a bumble-bee. Lateral perianth-segments linear, obtuse. Spike usually 3–6 flowered, very handsome.

Dry, open, grassy places in the hills; less common in Switzerland than *O. arachnites*, which grows on hot hillsides. May, June.

Distribution.—Most of Europe, especially Central and Southern; N. Africa. British.

Ophrys aranifera Hudson. Spider Orchis.

Sepals pink or greenish. Lip usually not lobed, or slightly incised, broad, convex, without an appendage. Petals oblong, almost glabrous. Resembling the last in habit.

Sunny hillsides, not frequent in Switzerland. May.

Distribution.—Central and Southern Europe, Algeria; rare in England.

Ophrys muscifera Hudson. Fly Orchis.

Sepals yellowish green. Lip nearly flat, narrow, reddish brown, with a blue patch. 2 lateral lobes linear, small, middle lobe deeply bifid. Flowers distant.

Grassy hillsides, especially on limestone, ascending to about 4000 feet in Switzerland, as, e.g. at Engelberg. May, June.

Distribution.—Europe, especially Central. British.

GYMNADENIA R.Br.

Tubers 2 or more lobed. Sepals spreading. Lip long, spurred, recurved or deflexed. Anther-cells parallel. Pollen-glands remote, linear.

Gymnadenia albida Rich. (Plate XXXI.)

Tubers deeply divided palmately. Lobes cylindrical or tapering. Stem leafy, 4–10 inches high. Lower leaves obovate-lanceolate; upper leaves lanceolate, often small, sheathing. Spike cylindrical, dense, slender, and often slightly unilateral. Bracts 3-nerved, about as long as ovary. Perianth very small, yellowish white, slightly fragrant. Segments obtuse, all 5 connivent into an ovate helmet. Lip 3-lobed, lobes tongue-shaped, acute, the middle one broadest. Spur directed upwards, half or one-third length of ovary.

Meadows, pastures, margins of woods, and among débris in the Alps and lower Alps from 3000–7000 feet, both on limestone and slate. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Black Forest, Vosges, Pyrenees, Cevennes; Central and Northern Europe, Greenland. British.

Gymnadenia conopsea L.

Tubers palmately divided. Stem leafy, 12–18 inches high. Leaves lanceolate or linear-lanceolate, upper ones often very small, sheathing. Spike cylindrical, dense-flowered. Bracts 3-nerved, about as long as ovary. Lip 3-partite. Lobes nearly alike, obtuse, or the middle one acute. Spur filiform, bent downwards, $1\frac{1}{2}$ to twice the length of ovary. Remaining perianth-segments obtuse, the 3 upper ones approximate, forming a helmet, the 2 lateral spreading or reflexed. Very variable both in colour of flowers and size of the separate parts. Usually rose-coloured, lighter or darker, or various shades of purple or mauve, rarely white, with slight scent of vanilla.

Alpine and sub-alpine pastures, often in great quantities, and also in the plains. June, July.

Distribution.—Most of Europe; Western and Northern Asia. British.

Gymnadenia odoratissima Rich. (Plate XXXI.)

Very similar to certain forms of the last, but the leaves are narrower, the spike often more slender, the lip narrow, and the spur straighter and shorter. (The drawing depicts an unusually long-spurred form.) The flowers are strongly scented of vanilla, and rather smaller than in *conopsea*. The two species are often found together, and occasionally hybridise.

Hills, damp meadows, etc., to the Alpine region. June, July.

Distribution.—Carpathians, Alps; Central and Northern Europe as far as Sweden.

NIGRITELLA Rich.

Nigritella angustifolia L. Vanilla Orchid.

Tubers palmately divided. Stem 3–8 inches high, leafy below and sometimes throughout. Leaves linear, channelled, the lower ones crowded. Spike conical or ovate, densely flowered. Bracts as long as or longer than the perianth. Flowers small, like the bracts dark carmine (*N. rubra* Richter) or purple-black (*N. nigra* Reichb.), with the odour of vanilla. Lip ovate. Apex acuminate, entire, or slightly crenate. Spur very short, obovate, much shorter than ovary; remaining perianth-segments lanceolate, acuminate.

Alpine and sub-alpine pastures, often in batches; 5000–8500 feet. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Cevennes, Pyrenees, Apennines, Balkans, Scandinavia. Mountainous Europe. The red variety (*N. rubra* Richter) is found in the Grisons and in the Maritime Alps.

CYPRIPEDIUM L.

Cypripedium Calceolus L. Lady's Slipper.

Rootstock cylindrical, knotty, horizontal, tufted, with fleshy fibres. Stem downy and leafy, 1–2 flowered, about a foot high. Leaves elliptical, or ovate-lanceolate, strongly nerved, glabrous above, downy beneath and at margin. Bracts similar to stem-leaves but smaller. Lip yellow, saccate, large, not spurred; the other perianth-segments spreading, $1\frac{1}{2}$ inch long, purple-brown; the upper one broadly lanceolate, acuminate, a similar one (formed of the 2 lateral segments combined into one) under the lip; the two inner lateral ones linear-lanceolate, acute, usually twisted.

Alpine and sub-alpine woods, chiefly on steep, mossy, limestone slopes under the Pines or near rocks. June.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Pyrenees, Caucasus, Siberia. In Europe almost to the Arctic Circle. British.

PLATANThERA Rich.

Root-leaves large, usually 2. Lip entire, ovary twisted, shorter than the spur. Rostellum short and broad. Flowers whitish, fragrant, in a lax spike.

Platanthera bifolia Rchb. Lesser Butterfly Orchid.

Tubers entire. Stem 12–18 inches, with 2 large broadly ovate to oblong leaves at the base. Flowers yellowish or greenish white, sweet-scented, rather large in a loose spike, 3–5 inches long, and with lanceolate bracts about length of ovary. Two lateral sepals spreading. Lip linear, entire, obtuse. Spur slender, filiform, and curved, twice length of ovary. Anther-cells or pollinia usually parallel. Also called *Habenaria bifolia* R.Br.

Thickets in the hills, wood clearings, and moist pastures. **June.**

Distribution.—Europe, from the Mediterranean to the Arctic Circle, Siberia, Western Asia. **British.**

Platanthera chlorantha Custer. **Butterfly Orchid.**

Closely resembling the last, but taller and larger in all its parts. Stems 2–2½ feet high. Anther-cells or pollinia broadly diverging. Two very large leaves at the base of the stem. Flowers larger, greenish white, less scented. Lip lanceolate-obtuse, yellowish green. Spur long. Spike loose, from 4–6 inches long.

Woods, rarer than the last, but widely spread. **June.**

Distribution.—Europe, Caucasus, Siberia, N. Africa. **British.**

HERMINIUM R.Br.

Herminium Monorchis R.Br. **Musk Orchid.**

A small, slender plant, 4–6 inches high, with usually 2 oval-lanceolate radical leaves. Tubes nearly globular, the new one being produced at the end of one of the root-fibres proceeding from the crown. Spike slender, with many small yellowish green flowers. Sepals erect and narrow. 'Petals' narrower and rather longer. Lip scarcely longer, hollowed into a sort of pouch at the base, but not spurred, with 3 narrow, entire lobes. Plant smelling of Musk.

Mossy banks, hillsides and mountain pastures up to at least 4000 feet. **June, July.**

Distribution.—Mountains of Southern Europe. Hilly pastures of Central, Northern, and Arctic Europe, and Russian Asia. **England.**

GOODYERA R.Br.

Goodyera repens R.Br.

Rootstock creeping, with a few thick fibres. Stems 6–10 inches high, with a few ovate stalked leaves near the base. Spike unilateral, with small greenish white flowers; the lateral sepals shorter and more spreading than the upper sepal and petals.

Shady mountain woods; rather rare. **July.**

Distribution.—Central, Northern, and Arctic Europe, extending to the Caucasus and Altai; Northern Asia and America; **Scotland.**

EPIPOGUM S.G. Gmel.

Epipogum aphyllum Swartz.

Rootstock with a number of thick, fleshy branches, like those of Coralroot. Stem 6 inches high, pale, with a few small sheathing bracts. Flowers 3 or 4 in a loose raceme, rather large, pale yellow with purplish markings, pendulous with the lip upwards, it being large, ovate and somewhat concave.

On rotten leaves and wood in shady woods, probably parasitic upon roots of Conifers and Beech trees. Scattered but always rare. August.

Distribution.—Scattered over Europe and Northern Asia; Alps, Jura, Vosges, Central Pyrenees, Caucasus. Very rare in England.

NEOTTIA Adanson.

Neottia Nidus-avis L. Bird's Nest.

Rootstock a dense mass of thick, succulent fibres. Stem about a foot high, pale brown like the few loose sheathing scales which take the place of leaves. Spike rather dense, 3 or 4 inches long, with 2 or 3 distant flowers below it, all pale brown. Sepals broadly ovate, nearly acute, petals more obtuse, lip twice as long, deeply forked at tip into 2 oblong, spreading lobes.

In the humus of shady woods up to at least 4500 feet, as above Engleberg; widely spread. June.

Distribution.—Europe, Caucasus, Western Asia. British.

LIMODORUM Swartz.

Limodorum abortivum Swartz.

The only species. Not strictly sub-alpine, though found in mountain woods in Switzerland and throughout the Jura. Whole plant of a violet tinge, 1–2 feet high. Leaves reduced to sheathing coloured scales. Flowers large, violet. Sepals and petals sub-campanulate. Lip entire, concave, spurred.

Mountain woods and clearings; parasitical upon the roots of trees. Flowering in May on the Mediterranean and in June and July in the Alps and Jura. Often seen in pine woods above the Riviera.

Distribution.—Switzerland (Grisons, Tessin, Bern, rare), Jura, France, Pyrenees, Corsica, Styria, Central and Southern Europe; Algeria, Asia Minor.

CORALLORRHIZA Scopoli.

Corallorrhiza innata R.Br. (*C. Neottia* Scop.). Coralroot.

Rootstock a mass of short, thick, fleshy, obtuse, and nearly white fibres. A slender plant 6–8 inches high, pale brown or yellowish, tinged with green below, with a few short sheathing scales instead of leaves. Flowers small, yellowish green, in a short, rather lax head. Sepals narrow-lanceolate. Lip oblong, white and hanging, very feebly 3-lobed.

Woods, especially in the mountains, parasitical upon the roots of Beech, and extending to the sub-alpine zone (e.g. Engleberg). June, July.

Distribution.—Scattered over Central and Northern Europe, Russian Asia and N. America. In Europe extending from N. Italy and the Pyrenees to the Arctic regions; Scotland.

MALAXIS Solander.

Flowers small, green or yellowish. Sepals and petals spreading, the latter very small. Lip minute, concave. Pollen masses 4. Leaves very few. About 120 species in the temperate and hot regions of both worlds.

Malaxis paludosa Swartz. Bog Orchis.

This, the smallest European Orchid, with small greenish yellow flowers, only grows on the sphagnum of peat bogs, and is very difficult to find. In Switzerland it is very rare and hardly sub-alpine. Central and Northern Europe. British Isles.

Malaxis monophylla Swartz.

Tubers green, adjacent. Stem with one oval leaf only. Plant greenish yellow, 5–12 inches high. Flowers minute, greenish. Lip acuminate, entire, turned upwards, concave at the base. Ovary club-shaped, slightly stalked.

Damp, shady, grassy meadows and other places in the Alps and sub-Alps; rare. July.

Distribution.—Switzerland, Tyrol, Scandinavia, Finland, Siberia, N. Am.

LISTERA R.Br.

Leaves 2, opposite. Flowers small, green, in a slender, spiked raceme. Sepals broader than the petals. Lip long, linear and 2-cleft. Pollen masses 2.

A small European, North Asiatic, and N. American genus.

Listera ovata R.Br. Tway-blade.

Rootstock with numerous thickish fibres, creeping. Stem 1–2 feet high, with 2 or 3 sheathing scales at the base, and about half-way up the stem are a pair of broadly ovate green leaves, 3–4 inches long, strongly veined. Raceme long and slender, in fine specimens sometimes 6 or 8 inches. Lip twice as long as sepals or petals, ending in 2 linear lobes.

Moist pastures and woods from the plains to the lower Alps. June, July.

Distribution.—Europe, Western and Northern Asia; N. America. British.

Listera cordata R.Br. (Plate XXXI.)

A very much smaller and more delicate plant, 4–6 inches high. The pair of leaves barely an inch long, broadly ovate and slightly cordate at the base. Flowers very small, in a short raceme on a very delicate and often reddish stem. Corolla-lip linear, 2-cleft, with 2 minute teeth at the base.

Among moss and pine needles in mountain woods extending to about 5000 feet; very local. May to July.

Distribution.—Alps, Jura, Pyrenees, Vosges, Auvergne, Caucasus, Central and Northern Europe, Siberia, N. America; British Isles.

CEPHALANTHERA Rich.

Handsome plants with the habit and foliage of *Epipactis*, but the flowers are almost sessile, erect, usually larger and more beautiful, white or red; the lip has no protuberances at the base of the upper portion; the column is longer and the anther shortly stalked.

A small European and North Asiatic genus.

Cephalanthera rubra Rich. Red Helleborine.

Stems flexuose, 10–20 inches high. Leaves oval to lanceolate, acute. Spike loose, with glandular axis. Flowers bright pink, handsome, with rather narrow white lip. Ovary pubescent. Bracts longer than the ovary.

Woods and thickets, chiefly on limestone; rather scarce, extending to 4500 feet at least. June, July.

Distribution.—Europe, Western Asia. Very rare in England.

Cephalanthera longifolia Fritsch. (*C. rusifolia* Rich.).

Resembling the last in habit and size, but the flowers are pure white, more distant than in the next species, and the sepals narrower and more pointed. The leaves are longer, narrower, and stiffer than in either species, being almost linear-lanceolate.

Wooded hillsides up to 4500 feet in Switzerland. May, June.

Distribution.—Europe, Western Asia, N. Africa. Scarce in Britain.

Cephalanthera latifolia Janchen (*C. pallens* Rich., *C. grandiflora* Bab.).

Stem 1–2 feet high. Leaves prominently veined; the lower ones broadly ovate, the upper broadly lanceolate. Flowers cream-coloured, in a loose leafy spike, all the bracts being longer than the ovary, and the lower ones quite leaf-like and considerably longer than the flowers. Sepals oblong and usually obtuse. Lip small, in two distinct parts.

Woods and thickets, scattered, extending to the sub-alpine zone. June.

Distribution.—Europe, extending eastwards to the Caucasus and Asia Minor, and northward to Denmark and the British Isles; Algeria.

All three kinds of *Cephalanthera* and many other interesting orchids grow in the woods or pastures about Engelberg in central Switzerland, on the mountain limestone at a height of about 4000 feet. A lady staying there in June, 1909, found about 26 different Orchids in that charming locality.

EPIPACTIS Adanson.

Rather tall plants with leafy stems and purple, brown, or greenish white flowers sometimes tinged with red, in a loose raceme. Perianth spreading; 'sepals' and 'petals' almost equal in size; the lip thick and concave at the base, the terminal portion broad, with 2 protuberances at its base.

About 10 species only, native in Europe, temperate Asia, N. Africa, and N. America.

Epipactis latifolia Swartz. Broad-leaved Epipactis.

Rootstock shortly creeping, with thickish fibres. Stem 2 to 3 feet high, leafy. Leaves strongly ribbed; lower ones ovate, clasping the stem; upper ones lanceolate and pointed, passing into linear bracts, of which the lower are often longer than the flowers. Flowers pendulous in a long unilateral raceme, greenish purple in England, but usually yellowish green in Switzerland. Sepals ovate-lanceolate. Lip small, the lower portion quite short.

Shady woods and mountain thickets up to 5000 feet. June to August.

Distribution.—Europe, temperate Asia, Siberia, Himalaya, Algeria; British Isles.

Epipactis violacea Durand.¹

Closely resembles the last and differing chiefly in the whole plant being of a purplish green colour, and the inflorescence denser, the flowers being partly greenish yellow and partly purple. It is rarely seen in the Swiss forests in autumn.

Distribution.—Germany, Switzerland, France.

Epipactis atropurpurea Rafin.

Plant 1–2 feet high, slender, pubescent, more or less purplish in colour. Leaves oval or oboval, somewhat clasping. Spike lax, unilateral. Flowers rather small, dark purple-red, but somewhat variable, especially in the Maritime Alps, where we have seen specimens with pale purple flowers. Bracts shorter than the flowers, or the lowest equalling them.

Wooded hills in sunny places, and especially on limestone. June, July.

Distribution.—Europe, especially Central and Southern; Caucasus, Persia.

Epipactis microphylla Swartz. Small-leaved Epipactis.

A smaller and more slender plant with very small lanceolate leaves. Whole plant often purplish like the last. Flowers reddish green, fragrant. Lip glabrous at the base. Mature ovary pubescent.

¹ *E. violacea* Boreau of S.E. England is quite a distinct thing. J. W. White in *Flora of Bristol* (1912), p. 568.

Dry, stony hills and mountain thickets ; rare, and especially rare in Switzerland. Widely spread in France. June.

Distribution.—Central and Southern Europe, Corsica, Caucasus, Asia Minor.

Epipactis palustris Crantz. Marsh Epipactis.

Plant glabrous, about 8–12 inches high. Leaves narrow-lanceolate. Bracts shorter than the flowers. Racemes very loose, few-flowered and not unilateral. Flowers large and very beautiful, white variegated with green, orange, and purple. Terminal lobe of lip blunt and rounded.

Marshes and moist meadows, reaching at least 4000 feet in the Alps ; sometimes in large quantities. June, July.

Distribution.—Europe, especially Central ; Western and Northern Asia. British.

Orchids are generally considered difficult to cultivate, and many have a reputation for not flowering when transplanted. But if they are never moved when in flower or making growth, but in the early autumn, they are much more likely to succeed. A moist loam and peat suits most, but others require lime mixed with the loam instead of peat. All require a deep soil. It is much to be hoped, however, that collectors will leave alone not only many of the British species, but all the rarer ones which grow in the Alps. Those which are parasitic are particularly difficult to cultivate, and are best avoided.

IRIDACEÆ

Perennial herbs, with bulbous, tuberous, or shortly creeping rootstock, frequently ensiform leaves and regular flowers with 2 bracts. Perianth 6-lobed. Stamens 3. Style simple. Stigmas often dilated. Fruit a 3-celled capsule.

About 100 species. Europe, temperate Asia, Africa, and America.

CROCUS L.

Crocus albiflorus Kit.

This includes *C. vernus* All., which some botanists have considered a separate species.

Corm covered with dry membranous scales, scape enveloped in a sheath. Leaves grass-like, recurved at margin. Stigmas orange, shorter than the perianth segments. Perianth 6-lobed. Flowers opening before or with the leaves, immediately the snow begins to disappear, white or violet, the white form having a yellowish tube.

Alpine and sub-alpine pastures up to 7600 feet, often in great profusion. April to June, according to situation.

Distribution. Eastern, Central, and Western Alps, Jura, Cevennes, Pyrenees, Carpathians, Balkans; often naturalised in the plains and in England.

IRIS L.

Seven species of *Iris* (*virescens*, *germanica*, *sambucina*, *squalens*, *graminea*, *Pseudacorus*, and *sibirica*) may be found either native or sub-spontaneous in Switzerland, but none of them reach the sub-alpine region.

AMARYLLIDACEÆ

Root bulbous (in all European genera). Leaves radical. Perianth petal-like, with 6 segments. Stamens 6, the anthers turned inwards. Ovary 3-celled, inferior or adherent to the perianth-tube. Fruit a capsule with several seeds, and 3-valved.

A large family, widely distributed over the globe, but chiefly in dry, sunny countries.

NARCISSUS L.

Flowers solitary, or several together, terminal. Perianth with a distinct tube above the ovary, and 6 usually spreading segments, with a cup-shaped or tubular white or coloured crown at their base, round the orifice of the tube.

A well-defined genus of few real species, chiefly South European or Caucasian.

Narcissus Pseudo-narcissus L. Daffodil.

Bulb rather large. Leaves usually 2 or 3, about a foot long when fully grown and $\frac{1}{2}$ inch wide, bluish green. Stem rather taller with a single, large, yellow flower. Perianth-tube about an inch long, wider at the top, the segments ovate or oblong, paler yellow. Crown slightly 6-lobed or wavy at the margin.

Meadows, orchards, and pastures, especially in the mountains and sub-Alps, and extending to 6000 feet, as at Saas Fee. March to June, according to situation.

Distribution.—Most of temperate and Southern Europe. British.

Narcissus poeticus L. Poet's Narcissus.

Flowers large, usually solitary, white, with yellow crown and red crenulated border, very fragrant.

Meadows and orchards, often abundant though local, and occasionally, as at Mt. Cenis and Saas Fee, reaching 6000 feet. It usually flowers in April and May, but later in the higher altitudes.

According to Keller and Schinz, it is only sub-spontaneous in Switzerland! In the Eastern Pyrenees it reaches 5000 feet.

Distribution.—Central and Southern Europe.

A beautiful reproduction of a photograph showing how this *Narcissus* grows in fields at Chateau d'Oex appears in the *Journ. of the*

Royal Hort. Soc. (1911), Part 1, illustrating a paper by Monsieur Correvon on Alpine Gardens.

Narcissus angustifolius Curtis.

This is perhaps only an Alpine variety of the last, with narrower leaves, and rather smaller flowers with narrower divisions.

It is found in meadows of the Swiss Alps, sub-Alps, and Jura, and descends to the plain.

Narcissus biflorus Curtis.

Flowers usually in pairs, cream-coloured, sweet-scented. Perianth-tube slender, about an inch long, segments rather shorter, oval; crown very short, concave or broadly cup-shaped, slightly crenate, yellow.

Meadows in Southern and Western Europe, Italy, Tyrol. April, May.

Introduced into England. In Switzerland it is probably native about Bex, Locarno, Bellinzona, and several places in Valais.

Narcissus incomparabilis Miller.

Leaves almost flat. Perianth segments pale yellow, twice as long as the lobed corona.

In Switzerland found only near Lugano and at one or two places in Valais. It is native in Provence, Italy, and Spain.

GALANTHUS L.

Galanthus nivalis L. Snowdrop.

The snowdrop is found occasionally in Swiss meadows, orchards, and thickets, and flowers in February and March; but it barely reaches the sub-alpine regions.

Distribution.—Central and Southern Europe, extending eastward to the Caucasus and northward to Central Germany. In Britain probably not indigenous.

LEUCOJUM L.

Like *Galanthus*, but scape 1-6 flowered. Petals larger. Leaves more numerous and broader.

Leucojum vernum L. Spring Snowflake.

Stem 8-18 inches high, springing from a rather large bulb and bearing a handsome, white, usually solitary blossom, drooping and scented. Style broadly club-shaped. The 'petals' usually have a greenish yellow spot at the top, as do those of the Summer Snowflake. Corolla campanulate, with free divisions.

Damp meadows and woods in the mountains and lower Alps. Widely spread in Switzerland, flowering in February and March, and sold in the market at Geneva, etc.

Distribution.—Central Europe.

LILIACEÆ

Perennial herbs with creeping, bulbous or clustered rootstock, and either radical leaves and peduncles, or annual or biennial, leafy flowering-stems. Flowers usually hermaphrodite. Perianth usually 6-lobed. Stamens 6, hypogynous, or attached to the perianthlobes. Styles 1 or 3, rarely 0. Fruit usually a 3-celled capsule or berry.

A large family of nearly 2000 species, widely spread over many regions of the globe.

STREPTOPUS Rich.

Streptopus amplexifolius DC.

Rootstock oblique, knotted with abundant fibres. Stem erect, simple or branched, zigzag, glabrous like the whole plant. Leaves cordate-lanceolate, entire, acuminate, amplexicaul, sea-green on under side. Flower-stalks usually solitary, 1-flowered, bent downwards nearly at a right angle. Flowers whitish. Berries globular or ellipsoidal, watery, scarlet.

Alpine and sub-alpine woods up to 6500 feet; local. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Vosges, Cevennes, Pyrenees, Corsica; Central Europe, Asia, North America.

CONVALLARIA L.

Convallaria majalis L. Lily of the valley.

Stem leafless except for a pair of large, elliptical, radical leaves. Flowers white, nearly orbicular, in a unilateral raceme, sweet-scented. Fruit a red berry.

Woods, sometimes in quantities, ascending occasionally to Alpine thickets at over 5000 feet. May, June.

Distribution.—Europe, except Mediterranean, Western and Northern Asia. British.

POLYGONATUM Tourn. Solomon's Seal.

Flowers axillary and solitary or in racemes, pendulous, usually greenish white. Sepals and petals united below. Stem leafy, springing from a thick rhizome. Leaves broad (except in one or two species), usually alternate. Fruit a berry.

Polygonatum multiflorum All.

Stem 2-3 feet high. Peduncles axillary, bearing 2-5 greenish white and rather small flowers. Filaments of the stamens hairy. Leaves oval or oblong. Berry blue-black.

Woods; frequent. May, June.

Distribution.—Europe, except Mediterranean, Western and Northern Asia, Canada. British.

Polygonatum officinale All.

Stem 8–18 inches high, angular, peduncles usually bearing 1–2 flowers, which are larger than the last and scented. Leaves oval or elliptic. Filaments glabrous. Berry blue-black.

Woods and shady, rocky places, especially on limestone; common. April to June.

Distribution.—Europe, Western and Northern Asia, Japan, England.

Polygonatum verticillatum All.

Rootstock creeping, knotted, horizontal. Stem angular, 1–3 feet high, bearing whorls of 3–7 leaves, which are lanceolate or linear-lanceolate, acuminate, entire, sessile, glabrous. Flowers axillary, pendent, in whorls of about 6, 1–3 on each flower-stalk, greenish white, tubular. Berries globular, violet, blue-black later.

Margins of woods, clearings, and shady, rocky places in the Alps and sub-Alps up to 6500 feet. May, June.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Vosges, Jura, Ardennes, Cevennes, Pyrenees, Central and Northern Europe, Central and Western Asia. Rare in Britain.

MAIANTHEMUM Weber.

Maianthemum bifolium DC. (Plate XVII.) May Lily.

Rootstock creeping, slender. Stems 6–8 inches high, naked but for 2 alternate, stalked, ovate, and deeply cordate, glabrous leaves. Flowers small, white, in a terminal, short raceme. Perianth of 4 divisions. Stamens 4. Ovary 2-celled. Berries small, red.

Mountain woods, often abundant in the lower Alps and in the plains. May, June.

Distribution.—Central and Northern Europe; Russian Asia, N. America. Very rare in England (Yorkshire).

PARIS L.

Paris quadrifolia L. Herb-Paris.

Stem 9–12 inches or more high, with a whorl of 4 (rarely 5) broadly ovate, shortly-acuminate, sessile leaves. Peduncle rising about an inch above the leaves. Perianth yellowish green; the 4 outer segments lanceolate, the 4 inner ones linear and rather yellow; all spreading to form a star-shaped flower. Anthers linear, erect. Berry bluish black, as large as a pea.

Woods and shady thickets. Widely spread. May, June.

Distribution.—Europe, to the Arctic Circle. Western Asia. British.

RUSCUS L.

The only European monocotyledonous plants which are shrub-like and almost woody. A small European and North African genus known by its stiff, shrub-like habit and almost prickly leaves.

Ruscus aculeatus L. Butcher's Broom.

A stiff, dark green, much-bracted shrub 2-4 feet high. Leaves very numerous, ovate, ending in a prickly point. Flowers small, greenish white, apparently sessile in the middle of the 'leaves' or cladodes, which are really leaf-like branches. Actually the flowers are borne on pedicels from the axil of the leaf and closely adnate to the surface with a minute scaly bract under the flowers. Berry red, large.

Woods, hedges, and rocky thickets. March to May.

Distribution.—Central and Southern Europe, Western and Northern Asia, N. Africa. Introduced into Britain.

ERYTHRONIUM L.

Erythronium Dens-canis L. Dog-tooth Violet.

Flowers solitary on a leafless scape, large, pink spotted with white and yellow, the 6 acute perianth-segments recurved abruptly, the 3 exterior ones furnished at the base with a little tooth on each side. Leaves 2, opposite, radical, oblong, or elliptic, spotted with red. Seed-vessel a 3-celled capsule.

Thickets and wooded hills in the south. March, April. In Switzerland only native in Tessin, though naturalised near Geneva, etc.

Distribution.—Apennines, Southern Alps, Cevennes and Central plateau of France, Corbières, Pyrenees; Central and Southern Europe; Caucasus, Siberia, Japan.

LILIUM L.

Bulbs scaly. Stem leafy. Flowers large. Stamens hypogynous or attached to the base of the perianth-lobes. Anthers versatile. Fruit a 3-celled capsule.

About 50 species inhabiting temperate regions of the northern hemisphere, and particularly Japan.

Lilium Martagon L. Turk's-cap Lily. (Plate XXXII.)

2-3 feet high. Leaves in whorls of 6 or 8. Flowers dull pink or lilac, spotted with dark purple, pendent, with recurved segments.

Alpine meadows and pastures and bushy places up to 7300 feet, especially on limestone; local, but sometimes quite numerous. June to August.

Distribution.—Central and Southern Europe, Caucasus, Siberia, Japan.



PLATE XXXII.

$\frac{4}{7}$ NATURAL SIZE.

1 LILIIUM MARTAGON.

2 LILIIUM CROCEUM.

3. LUZULA PILOSA.

Lilium Pomponium L.

This brilliant red, handsome Lily, with leaty stem and narrow linear leaves, is found in stony places in the Ligurian Alps as high as 6000 feet, but is never abundant. May to July.

Distribution.—Var, Basses-Alpes, Alpes-Maritimes, Piedmont.

Lilium croceum Chaix. Tiger-Lily. (Plate XXXII.)

This well-known deep orange Lily is chiefly a native of the warmer sub-alpine districts in the south, but in Switzerland it sometimes reaches 5300 feet. It is the variety of *L. bulbiferum* L. without bulbils. Both occur in Switzerland. June, July.

Distribution.—Jura, Switzerland, Western Alps, Corsica, Eastern France.

ANTHERICUM L.

Flowers white, in a lax terminal raceme, on a leafless scape, springing from a tuberous rootstock. Sepals and petals distinct, spreading. Leaves narrow.

Anthericum ramosum L.

Stem 1-2 feet high, ending in a branched panicle. Peduncles pointed very near the base. Flowers distant, pure white, star-shaped. Leaves linear, channelled, shorter than the stem. Fruit globular, 3-celled.

Sunny hills and sub-alpine slopes. May, June.

Distribution.—Central Europe; Taurus and Caucasus.

Anthericum Liliago L. (Plate XXX.)

Stem unusually shorter, not branched. Flowers larger (1 inch across). Raceme simple. Peduncles jointed below the middle.

Dry hills, mountains and sub-Alps; local. May, June.

Distribution.—Central and Southern Europe, Asia Minor.

In Switzerland it often grows with *Paradisica*, but the latter is a more Alpine plant.

PARADISIA MAZZUC.

Paradisica Liliastrum Bertol. St. Bruno's Lily. (Plate XXX.)

Stem 1-2 feet high, leafless, simple, 3-5 flowered. Leaves linear, radical, slightly furrowed. Flowers shortly stalked in a loose raceme, very large (2 inches), pure white, and like those of a Lily, but more delicate. Perianth 6-lobed, funnel-shaped.

Pastures of the Alps and sub-Alps; scarce. June, July.

Distribution.—Alps, Jura, Pyrenees, Spain and Portugal, Italy.

APHYLLANTHES L.

The only species is :

Aphyllanthes monspeliensis L.

A remarkable plant, 6–10 inches high, tufted and with hard rootstock and fibrous roots. Stem naked, slender, rush-like. Leaves reduced to scaly sheaths at the base of the stem. Flowers blue, rarely white, star-shaped, with 6 spreading segments united at the base into a tube. Stamens unequal, inserted near the base of the petals, with glabrous filiform filaments. Stigma trifold. Capsules within a scaly involucre, trigonous, acuminate.

Dry, hilly places in the South, especially on limestone. April to June.

Distribution.—Southern France, Pyrenees, Spain and Portugal, N. Italy ; N. Africa.

Not strictly sub-alpine, this pretty little plant ascends to about 2000 feet on the Col di Tenda and on limestone hills in the south of France. See note by the author in *Gard. Chron.*, March 16th, 1912.

ALLIUM L. Onion.

Flowers in rounded umbels, surrounded by a membranous spathe. Perianth-segments distinct. Fœtid herbs with radical leaves and a usually naked scape.

Allium Victorialis L.

Rootstock as thick as the finger, sheathed, 2–3 inches long. Stem 1–1½ feet high, leafy nearly to the middle, naked and angular above. Leaves elliptical or lanceolate, narrowed into a short leaf-stalk, with a long sheath, persistent. Leaves 3–8 inches long, 1–3 inches broad, grass-green. Perianth whitish green, funnel-shaped. Stamens longer than perianth. Umbel globular, fertile, large.

Pastures and rocky, bushy places in the calcareous Alps ; local. June to August.

Distribution.—Carpathians, Riesengebirge ; Eastern, Central, and Western Alps ; Jura, Vosges, Black Forest, Cevennes, Pyrenees, Caucasus, Northern Asia, N. America.

Allium Schœnoprasmum L. Chives. (Plate XV.)

About a foot high. Umbel contracted into a dense globular head of rather large purple-pink flowers. Perianth-segments very pointed. Stamens longer than the perianth. Spatha of 2 or rarely 3 coloured bracts, shorter than the flowers. Leaves very narrow, hollow.

Rocky and damp pastures, etc., in the sub-Alps and hills. June to August.

Distribution.—Europe, Western and Northern Asia, N. America. British.

An Alpine form of this is known as *A. roseum* Krock.=*A. sibiricum* L. It grows in Alpine pastures up to 8000 feet.

Allium angulosum L.

Stem 1-2 feet high, angular towards the top. Leaves linear, strongly channelled. Spatha of 2-3 ovate-acute bracts. Umbel rather flat. Flowers rose, rarely white. Stamens nearly as long as the petals. Rootstock horizontal, with several oblong bulbs.

Damp meadows in the plains and lower mountains. June to September.

Distribution.—Switzerland, France, Central and Northern Europe, Caucasus, Siberia.

Allium fallax Roem. et Schultes.

A very similar plant with horizontal stock emitting oblong bulbs. Leaves linear, convex, and obscurely nerved, without being keeled, shorter than the stem.

Rocks in the mountains. June to September.

Distribution.—Jura, Alps, Cevennes, Corbières, Pyrenees, Central Europe, Armenia.

GAGEA Salisbury.

Flowers yellow or greenish, in umbels or corymbs, with leafy bracts on a leafless scape springing from the bulb. Stamens attached to the base of the perianth-segments.

Gagea lutea Ker-Gawler.

Bulbs small. Leaves 1 or very rarely 2, broadly linear, pointed. Stem slender about 6 inches high. Flowers 3 or 4 in a loose, flat, umbel-like raceme, with leaf-like bracts as long or longer than the pedicels. Perianth-segments oblong and spreading, yellow, green underneath.

Meadows, hedges, and orchards. May, June.

Distribution.—Alps, Jura, Vosges, Ardennes, Cevennes, Pyrenees, Corsica, Europe, especially Central, Caucasus, Siberia. British.

Gagea fistulosa Ker-Gawler (*G. Liottardi* Schult.).

Bulbs 1 or 2 in each sheath. Leaves 1-3, usually 2, the one from the larger bulb stouter, glabrous, trigonous, slightly furrowed, tubular towards the apex. Bracts 2, large, opposite, bulging in the middle, and 2 or 3 linear bracts in the branches of the umbel. Flower-stalks woolly. Flowers variable; the first have often only 4 perianth-segments and stamens, the latter ones only 5 segments, yellow within and at the margin, green without.

Rich soil in high Alpine pastures (often near chalets) up to 7500 feet; local. June, July.

Distribution.—Eastern, Central, and Western Alps.

Gagea minima Ker-Gawler.

The smallest species. A single linear root-leaf. Perianth-segments lanceolate-acuminate, with point curved outwards. Flowers 2-5 on glabrous pedicels. Bract solitary. Bulbs 2.

Alpine and sub-alpine pastures; rare. June.

Distribution.—Switzerland.

Gagea pratensis Dumort. (*G. stenopetala* Reich.).

Bulbs 2-4, without a common sheath. Plant downy, with glabrous pedicels. Stems 3-8 inches high. One solitary root-leaf, linear, narrower at each end. Stem-leaves 2, close to the umbel of 2-5 large flowers.

Fields and pastures. April, May.

Distribution.—Central and Southern Europe, including Switzerland.

SCILLA L.

Bulbous plants with radical leaves. Flowers blue, mauve, or rarely pink, in a terminal raceme. Stamens inserted on the perianth, below the centre of the segments. Capsule globular or trigonous, membranous.

Scilla bifolia L.

Plant 6-10 inches high, with 2 linear-lanceolate, spreading leaves. Stem hollow. Inflorescence short, lax, few-flowered. Pedicels erect, the lower ones several times as long as the azure-blue flowers.

Hedges, orchards, and thickets. April.

Distribution.—Switzerland, France (except west and extreme south), S. Central Europe, extending to the Caucasus and Asia Minor.

In Switzerland this takes the place of our Bluebell (*Endymion nultans*), which is entirely absent from that country, though it appears in the lower Pyrenees.

TULIPA L. Tulip.

Flowers large, solitary, on a leafy scape. Sepals and petals distinct. Stamens hypogynous. Stigma sessile, with spreading lobes. Leaves broad.

Tulipa sylvestris L.

Stem about a foot high, with usually 3 linear-lanceolate-acuminate leaves and a single terminal yellow flower, drooping in the bud, nearly erect when fully out. Perianth-segments acuminate.

Fields, meadows, vineyards, etc., in colonies. May, June.

Distribution.—Central and Southern Europe, doubtfully native in Switzerland and still more so in England.

Tulipa australis Link.

Stem about 9 inches high, with 2 narrow-lanceolate, acute leaves. 'Petals' shining on upper surface, lanceolate, acuminate, yellow, the outer ones reddish at the top.

Sub-alpine pastures; local. April, May. In Southern France, Italy, Spain, and Portugal it grows in the ordinary pastures.

Distribution.—Switzerland (rare), Central and Southern Europe, from Portugal to Tyrol.

The variety *alpestris* (Jordan) grows at a height of 6000–7000 feet in Dauphiny and the Maritime Alps.

FRITILLARIA L.

Bulbous herbs, with a more or less leafy stem, and one or more rather large drooping flowers in a terminal raceme. Perianth bell-shaped, with distinct segments as in Tulip, but the 3 inner segments have a nectariferous cavity at their base. Stamens inserted at the base of the perianth; the anthers being attached a little above their base. Capsule 3-celled, with several rather flat horizontal seeds in each cell, as in Tulip.

About 50 species inhabit the temperate regions of the northern hemisphere, being found in Europe, Asia, and North America. They might be more cultivated, for many are both handsome and early flowering.

Fritillaria delphinensis Gren.

Stem 8–12 inches high, leafy above, naked below. Leaves 4–8, broadly lanceolate, flat, erect, alternate. Flower large, purple, obscurely spotted, $1\frac{1}{2}$ inch long. Perianth-segments connivant, concave, the interior segments being oval-elliptic and rounded. Capsule obovate.

High pastures in the Alps; local. May to July.

Distribution.—Savoy, Dauphiny, Provence, Corsica, Northern Italy, Tyrol.

Fritillaria Meleagris L. Common Fritillary.

Stem about a foot high, with 3 or 4 linear, thick, channelled leaves, and a single terminal drooping flower (rarely two), dull red, spotted with purple and yellowish white, or rarely white with greenish spots.

Damp meadows, but scarcely attaining the sub-alpine region of Switzerland or France. April.

Distribution.—Most of Europe, from France to the Caucasus and northwards to England and Scandinavia.

VERATRUM L.

Rootstock creeping. Stems tall, robust, leafy. Leaves oval, with very strong nerves. Flowers in branched panicles. Capsule of 3 carpels united, many-seeded. Acrid and poisonous herbs.

Veratrum album L.

Stem simple, 2-3 feet high, erect, robust, leafy, covered below with pubescent leaf-sheaths, thickened to a bulb at the base, scaly or somewhat floccose like the flower-stalks, with large sessile leaves regularly creased at the base, and bearing a paniculate inflorescence. Leaves entire, creased, veined, sealed on long sheaths, glabrous above, downy beneath, the lower ones oval, obtuse, the uppermost lanceolate, acute. Flowers numerous, greenish white, in large panicles. Perianth-segments longer than the flower-stalks.

Abundant in grassy Alpine and sub-alpine pastures. July to September; up to 8200 feet.

Distribution.—Carpathians, Riesengebirge; Eastern, Central, and Western Alps; Jura, Vosges, Cevennes, Pyrenees, Caucasus, Siberia, Japan.

The leaves resemble those of *Gentiana lutea*, and both plants are avoided by the cattle and the mowers.

Veratrum nigrum L.

Flowers very dark red or purplish, smaller than the last. Perianth-segments as long as the pedicels.

Alpine and sub-alpine meadows and pastures; rare. July, August.

Distribution.—Tessin (Monte Generoso), Eastern Alps, Maritime Alps, Eastern Europe, Western and Northern Asia.

COLCHICUM L.

Flowers usually solitary, springing from a fleshy corm. Leaves radical, appearing after the flowers. Flowers with long tube like those of *Crocus*. Stamens 6. Ovary underground, but within the lengthened tube of the perianth. Styles 3, very long and thread-like. Capsule 3-valved.

Colchicum autumnale L. Autumn Crocus.

No leaves at time of flowering, but appearing later. Corm ending in a sheath of brown scales enclosing the base of the flowers, whose tube rises 3-5 inches above the ground, with 6 oblong segments, pinkish lilac in colour, rarely white. In spring the leaves attain a length of 8 or 10 inches, by an inch or more in breadth. The large capsule is then raised above the ground by the lengthening of the peduncle, and the leaves wither away.

Moist meadows and pastures in hilly districts. August, September.

Distribution.—Central and Southern Europe, rare in the north, but abundant locally in England and Ireland.

Colchicum alpinum Lam. et DC.

Resembling the last, but smaller, and the sepals are narrower. The leaves are also narrower and only 2 in number instead of 3 or 4.

Alpine meadows at about 5000–6000 feet, much less common than the last, but sometimes growing with it. July, August.

Distribution.—Valais, Tessin, Western Alps, Sicily.

In *Alpine Plants of Europe* it was incorrectly stated to grow in the Department of the Var and in Corsica. In Corsica it appears as a still smaller variety called *C. parvulum* Ten.

BULBOCODIUM L.

Bulbocodium vernum L.

Flowers rose-lilac, the colour of *Colchicum*, or rarely white, appearing with the lanceolate-concave root-leaves. Perianth-segments spreading, united at the throat by small scales. Stamens 6. 1 style trifid at the top. Bulb ovoid, in a brown tunic. Capsule oval, acute.

Alpine and sub-alpine pastures; rare. April to June.

Distribution.—Western Alps, Pyrenees, Caucasus. Very local in Switzerland (Valais, Mont Vuache, etc.).

TOFIELDIA Hudson.

Small plants with creeping rootstocks. Leaves grass-like, chiefly radical, flattened vertically, and sheathing like the leaves of an *Iris*. Flowers small, yellow, in terminal spikes. Perianth of 6 segments, persistent round the capsule, which is small and 3-lobed. Stamens attached to the perianth-segments.

This small genus is chiefly North American.

Tofieldia palustris Huds.

Leaves radical, linear, sword-shaped and stiff, 3-nerved; leaf-stalk without bracts at the base. Flowers small, yellowish, in a spike or raceme at the end of the scape.

Moist Alpine meadows and pastures; 5000–9000 feet.

Distribution.—Eastern and Central Alps, and rarely in the Western Alps (Mont Cenis and Monte Viso), Northern Europe, Arctic regions. British.

Tofieldia calyculata L. (Plate XXIII.)

Leaves longer, many-nerved. Leaf-stalk hidden by bracts at the base. Stems simple, sometimes a foot high, with a spike of yellowish flowers. Commoner than the last, but not attaining so great an elevation. June to August.

Distribution.—Alps, Jura, Pyrenees, Central Europe.

JUNCACEÆ

Usually stiff herbs with narrow, grass-like leaves and small herbaceous or dry flowers in terminal clusters. Perianth regular, dry and calyx-like, of 6 segments. Stamens 6, or rarely 3. Styles single, with 3 stigmas. Capsule 1 or 3-celled, opening in 3 valves. Seed small. A family spread over the whole of the globe.

JUNCUS L. Rush.

Leaves stiff and glabrous, usually cylindrical, at least at the tips, or grooved. Flowers usually in irregular panicles, unequally branched, with a dry, sheathing bract under each branch, cluster, or flower. Capsule 3-celled. Seeds numerous.

Nearly 200 species, dispersed over the greater part of the globe.

Juncus filiformis L.

Rhizome creeping, throwing up many tufts. Stems 6–18 inches long, wiry, filiform, pale green, faintly striate. Cyme few-flowered, crowded, pale, small, halfway up the stem. Perianth-segments lanceolate, exceeding the turbinate, obtuse, mucronate capsule. Stamens 6.

Wet, stony places, margins of lakes, etc., in the Alps and sub-Alps. June to August.

Distribution.—Alps, Vosges, Cevennes, Pyrenees, most of Europe; Northern Asia, N. America. Rare in Britain.

Juncus bufonius L. Toad-rush.

A very variable and often quite small annual Rush, pale-coloured, with many stems, often in dense tufts from 1–10 inches high, branching and flowering almost from the base. Leaves chiefly radical, slender, and rather short. Flowers solitary or 2 or 3 together with short leaf-like bracts. Perianth-segments narrow and pointed, pale green, with scarios edges, the 3 outer ones longer than the others. Capsule oblong, shorter than the perianth.

Wet places, spread widely over most of the globe from sea-level to the sub-alpine zone, and flowering all the summer. Abundant in Britain.

Juncus compressus Jacq.

Stems 6–18 inches high, erect, slightly compressed at the base, with few leaves near the base, and shorter than the stem, and 1 or 2 leaves higher up, all very narrow and grooved. Flowers singly or in small clusters in a rather loose terminal panicle, shining brown in colour. Perianth-segments obtuse, short. Capsule obtuse, ovoid, with a very short style.

Wet, marshy places, roadsides, etc., up to 6000 feet. June to August.

Distribution.—Europe and Northern Asia. British.

Juncus squarrosus L. Heath Rush.

Stem rigid, 8–12 inches high, with a terminal compound panicle. Flowers usually quite distinct. Perianth-segments rather broad, shining brown, with broad scarious borders. Capsule trigonous, barely longer than the perianth. Leaves nearly all radical, numerous, usually not half the length of the stem, very narrow, stiff, but spreading.

Moors and damp heaths from sea-level in England to the Alpine region of Switzerland, often in great colonies. July, August.

Distribution.—Central and Northern Europe, and Northern Asia. Also as a mountain plant in Southern Europe. British.

Juncus alpinus Vill.

Stems 1–1½ feet, slender, erect, leafy, jointed, usually cylindrical like the leaves. Leaf-sheaths sharply keeled. Cyme with erect branches. Perianth-segments all about the same length, blunt, outer ones mucronate, purplish brown. Capsule glossy black, obtuse, but mucronate, rather longer than the perianth.

Moist meadows and marshy Alps and sub-Alps; 4000–6500 feet; and rarely descending to the Swiss plains. July to September.

Distribution.—Alps, Jura, Vosges, Cevennes, Corbières, Pyrenees, Central Europe, Western Asia, N. America, N. Britain.

Juncus articulatus L., *J. lamprocarpus* Ehrh. Jointed Rush.

Extremely variable in size and habit. Stems 4–18 inches high. Rhizome short. Leaves sheathing the stem below, hollow and cylindrical upwards, divided inside by cross partitions of pith which give a jointed appearance. Flowers in small clusters of 3–10 arranged in compound, terminal panicles. Outer bracts usually end in a short, fine leaf. Perianth-segments either all pointed or the inner ones obtuse. Capsule rather pointed, either shorter or more usually longer than the perianth.

Wet, and especially wet stony places; abundant. June to September.

Distribution.—Europe, Asia, Africa, N. America. British.

Juncus triglumis L.

A small species 3–6 inches high. Leaves radical, short, and grass-like, sheathing the base of the stem. Flowers brown, in a single terminal cluster of 2 or 3 and rarely 5. Perianth-segments obtuse, scarious at the edges. Capsule obtuse, longer than the perianth.

Mountain bogs and wet Alpine pastures, from 5000–8000 feet.

Distribution.—Alps, Pyrenees, Central and Northern Europe; Northern Asia and America. Rare in Britain.

LUZULA DC. Wood-rush.

Perennial herbs, differing from *Juncus* in their softer, flatter, grass-like leaves, often fringed with silky hairs, and in their capsules not divided into cells, and with not more than 3 erect and much larger seeds. They mostly grow in drier places than Rushes.

Luzula lutea DC. Yellow Wood-rush. (Plate XXI.)

Plant 2-10 inches high. Leaves short, yellowish green, glabrous, linear-lanceolate, shortly acuminate, broad for their length. Cyme of dense clusters, spreading. Flowers pale yellow, sessile. Perianth-divisions equal, shortly mucronate. Capsule oval, acute, shorter than the perianth.

Common in damp pastures and on slopes of débris; 5000-9000 feet. July, August. Prefers siliceous soil.

Distribution.—Tyrol, Switzerland, Western Alps as far south as Provence, Italy, Spain, Pyrenees.

Luzula flavescens Gaud. (*L. Luzulina* Dalla Torre).

Rootstock stoloniferous. Leaves with silky hairs. Flowers yellowish, in ones or twos, at the end of spreading branches, forming a loose terminal cyme.

Shady fir woods on limestone; 2500-6000 feet. June, July.

Distribution.—Alps, Pyrenees, Corsica.

Luzula Forsteri DC.

Rootstock tufted. Stems 9-18 inches high. Leaves broadly linear, silky. Outer perianth-segments acute; inner ones obtuse, mucronate. Capsule broadly ovate-conical, about the length of the perianth.

Woods, from the plains to the lower mountains. May, June.

Distribution.—Central and Southern Europe, Western Asia, N. Africa. British.

Luzula pilosa Willd. (Plate XXXII.)

Stem slender, rather shorter. Leaves broadly linear; stem-leaves shorter and narrower. Pedicels reflexed after flowering. Perianth-segments lanceolate, acute, shorter than the obtuse, conical, and shortly mucronate capsule.

Woods; very common. April to June.

Distribution.—Europe, temperate Asia, and N. America.

Luzula sylvatica Gaudin.

The largest species 1-3 feet high, with strong, thick stems and broadly linear leaves ($\frac{1}{2}$ inch or more broad) a foot or more long and very hairy at the borders. Flowers in small clusters of 2 or 3, in a large loose compound panicle. Capsule about the length of the perianth.

Mountain woods, especially on limestone, up to 5000 feet. May, June.

The writer recently observed stunted specimens of this plant on the extreme summit of Carrantual, the highest mountain in Ireland.

Distribution.—Europe, Asia Minor, Caucasus. British Isles.

Luzula nivea DC. (Plate XXIII.)

Stems $1\frac{1}{2}$ –3 feet high, bearing a beautiful silvery white panicle of flowers; many flowers in a cluster. Capsule trigonous, globular, shorter than the perianth.

Mountain woods, clearings, and sub-alpine slopes; common. June, July.

Distribution.—Alps, Jura, Cevennes, Central France, Corbières, Pyrenees.

This plant is well worth cultivating in gardens, for it is quite handsome. The seed is easily collected in August.

Luzula campestris DC. and its var. *multiflora*, *L. nemorosa* E. Meyer, and *L. spadicea* DC. are also often seen in the lower Alpine region of Switzerland.

NAIADACEÆ

Plants usually growing in water. Leaves sheathing at the base, often floating on water. Flowers green, bisexual or unisexual. Perianths 3–4 lobed or 0. Stamens hypogynous. Ovary of 1–4 carpels. Style 1. One seed in each carpel.

POTAMOGETON L. Pond-weed.

Leaves floating and opaque or submerged and translucent, stipulate or not. Perianth-segments 4, small, green. Stamens 4.

A rather large genus spread almost all over the globe; but with only one or two representatives in the high Alps.

Potamogeton filiformis Persoon.

Stem branching from the base. Leaves linear-filiform, 1-nerved. Spikes on long stalks. Fruit globular, with very short beak.

Alpine lakes, and rarely lower. It is abundant at the shallower end of the Lake of Mont Cenis (6300 feet) and in several Alpine lakes in Switzerland. It flowers in July; rare.

Distribution.—S. Tyrol, Switzerland, Western Alps, Central and Northern Europe. British.

Potamogeton alpinus Balbis (*P. rufescens* Schrad.).

Stem simple, cylindrical; submerged leaves narrow-lanceolate, sub-obtuse, translucent; floating-leaves, when they exist, coriaceous, oblong-spathulate, reddish. Stipules large. Fruiting-spike

2-4 cm. long, cylindrical, compact, on longish peduncles. Carpel compressed, keeled at the back, with distinct beak.

Stagnant or slowly running water, especially in the mountains.

Distribution.—Europe, N. and N.W. Asia, N. America. British.

Many of the British species of *Potamogeton* are found in Switzerland, but chiefly in the plains.

JUNCAGINACEÆ

A small family of about 12 species, inhabiting temperate and cold regions of the Old and New Worlds. The characters resemble those of Naiadaceæ, but the leaves are erect and rush-like.

TRIGLOCHIN L.

Tufted herbs, with linear, fleshy, more or less cylindrical, radical leaves, and leafless flower-stems, bearing a slender raceme or spike of small green flowers without bracts. Perianth of 6 nearly equal segments. Fruit of 3 or 6 1-seeded carpels, each bearing a feathery stigma. About 10 species, chiefly maritime, inhabiting temperate regions.

Triglochin palustre L.

Leaves semi-cylindric, channelled, succulent, varying from 3-8 inches long, sheathing at the base. Flower-stems 6-12 inches high, bearing a terminal slender spike of small greenish yellow flowers, which are at first sessile, but very shortly pedicelled when mature. Carpels 3, united, but separating on maturity. Fruit linear-fusiform.

Marshes and damp meadows in the plains and mountains. May to September. It extends upwards to at least 8000 feet in Dauphiny and Savoy; though in England it often grows in swamps at sea-level with *T. maritimum*.

Distribution.—Europe, Central and Northern Asia, N. America.

SCHEUCHZERIA L.

Dedicated to Scheuchzer, a Swiss botanist of the eighteenth century. The genus comprises one species only. It differs chiefly from the last genus in the stem being leafy. Flowers in racemes, small, green, bracteate, on leafy scapes. Leaves slender. Fruit composed of 3 inflated carpels.

Scheuchzeria palustris L.

A rush-like plant, 8-12 inches high. Leaves few, linear, sheathing at the base, then narrowed and almost cylindrical; the upper ones passing into short, sheathing floral-bracts. Flowers few, rather small, shortly pedicelled, yellowish green, forming a short loose, terminal raceme on a curved scape. Perianth of 6 reflexed segments.

Stamens 6. Carpels 3 (rarely 4, 5, or 6), divergent, ovate, apiculate, 2-seeded.

Peat-bogs and marshes, especially in the mountain and sub-alpine region; local. May to July.

Distribution.—Switzerland (rare), France, Jura, Alps, Central Pyrenees; Central and Northern Europe; Russian Asia, N. America. Very rare in Britain.

CYPERACEÆ

Herbs, often resembling Grasses, but usually stiffer, with solid stems and the sheaths of the leaves closed all round. Flowers in little green or brown *spikelets*, which are either solitary and terminal or several in a compound cluster, spike, or panicle. Each spikelet is in the axil of a scale-like *outer bract*, and consists of several scale-like *glumes*, each containing one sessile flower. Perianth composed of bristles or small scales or none. Stamens usually 3 or sometimes 2. Ovary 1-celled, the style being divided into 2 or 3 linear stigmas. Fruit a small, seed-like nut, flattened when the style is 2-cleft, trigonous when it is 3-cleft.

A large family of at least 2500 species, distributed all over the globe, and especially in moist places and near water. Chiefly represented in the Alps by numerous species of *Carex* (Sedge).

SCIRPUS L.

Rootstock creeping. Spikelets solitary and terminal or in irregular panicles, heads, or clusters. Glumes imbricate. Perianth-bristles 1-6 or 0, shorter than the glume. Stamens 3. Fruit a compressed or trigonous nut.

A large genus, widely spread over the globe, many species growing in or near water. Very few attain any height in the mountains.

Scirpus alpinus Schleich.

Rootstock creeping and stoloniferous. Stem 5-12 inches high, glabrous like the whole plant, very slender, simple, stiff, rough to the touch, trigonous, furnished with several sheaths at the base. Spikelets small, 5-6 mm. long, with 8-12 flowers. Bracts obtuse, yellowish brown, with a central green nerve. Perianth-bristles white. Fruit compressed, trigonous, 1 mm. long.

Marshes and borders of mountain lakes, from the plains up to at least 8100 feet, as, e.g. by Lac Savine at Mont Cenis. July, August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Northern and Western Asia; N. America.

Scirpus cæspitosus L.

Stem 6-12 inches high, round, stiff, densely tufted, and covered at the base with several imbricated sheaths, the outer ones brown,

the inner ones green, with narrow leafy tips. Spikelet about the size of that in the last species, with 6-8 flowers. Outer bracts obtuse, green, as long as the spikelet. Perianth-bristles 4-6, longer than the fruit, which is brown, slightly trigonous, 1 mm. long, mucronate.

Turf bogs and marshes in the plains and mountains up to at least 8100 feet, as by Lac Savine. Often in large quantity. May to August.

Distribution.—Eastern, Central, and Western Alps; Europe, except the Mediterranean Coast; Corsica, Algeria, India, N. America, Arctic Europe, Asia, and America. British.

Scirpus compressus Pers. (*Blysmus compressus* Panzer).

Rootstock creeping, stoloniferous. Stems 6-8 inches high, glabrous, round below, trigonous above, leafy. Leaves grass-like, slightly channelled. Spike terminal, brown, about an inch long, consisting of about 10 oblong spikelets, sessile on opposite sides of the axis. Outer bract broad, brown, glume-like, shorter than mature spikelet. Glumes usually 8, imbricated round the spikelet. Stamens 3. Stigmas 2. Bristles 3-6, twice as long as the ovoid, tapering, or mucronate nut.

Marshes and wet, grassy places from the plains up to at least 8250 feet, as on the Aiguille du Goléon in Dauphiny. June to August.

Distribution.—Eastern, Central, and Western Alps; Caucasus, Europe, Western and Russian Asia, Himalaya.

ERIOPHORUM L.

Characters and habit of *Scirpus*, except that the bristles finally protrude far beyond the glumes, forming white, silky or cottony tufts, and hence the English name of Cotton-grass. The style is usually 3-cleft.

Only about a dozen species are known, restricted to the temperate and cold regions of the northern hemisphere. Several are frequent at considerable elevations in the Alps and other mountains.

Eriophorum alpinum L. Alpine Cotton-grass.

Rootstock creeping, branched, putting up solitary culms, but no tufts of leaves. Stems tufted, 6-10 inches high, with imbricate sheaths at the base; the inner ones with short leafy tips. Spikelets small, brown, and terminal. Glumes obtuse. After flowering the bristles form a white, silky tuft, nearly an inch in length. With the exception of these silky hairs the plant closely resembles *Scirpus cæspitosus*, the Tufted Scirpus.

Turfy Alpine, sub-alpine, and Arctic bogs, descending to the plain; local. May to July.

Distribution.—Carpathians; Sudetic Mountains; Central and Western Alps; Black Forest; Jura; Russian Asia, Arctic Europe,

Asia, and America. Extinct in Britain(?), it having formerly been found near Forfar.

Eriophorum vaginatum L. (Plate V.)

Like *E. Scheuchzeri*, but taller and with more numerous leaves which are rough at the edges, while those of that species are soft and smooth. The root is not stoloniferous, and the stems are in compact tufts and furnished with broad sheaths at the base, with only a very short blade. Leaves linear, almost subulate, shorter than the stem. Spikelet solitary, terminal, ovoid, of a deep olive-green. Silky bristles very numerous, at length forming white, cottony tufts about an inch in diameter. These tufts are nearly globular as in the last species.

Turfy bogs and wet places from the plains up to the high mountains. May to July.

Distribution.—Northern and Central Europe; Caucasus; Siberia, North America. Common in the British Isles.

Eriophorum angustifolium Roth. (*E. polystachyon* L. part.).

Stem 1-2 feet high. Root creeping, stoloniferous. Leaves few, shorter than the stem, channelled, and more or less triangular. Flowers in a terminal umbel of several spikelets, some almost sessile, others stalked and drooping. Outer bracts rather leafy. Silky bristles very numerous, forming oval, cottony tufts, 1-1½ inch in length.

Bogs and wet places, from the plains up to the lower mountains. May to July.

Distribution.—The commonest species in Europe, Northern Asia, and North America. British.

SCHÆNUS L.

Stiff and rush-like herbs. Glumes in 2 opposite rows. Spikelets in compressed terminal bracteate heads. Flowers few, bisexual. Bristles 1-6. Stamens 3.

Schænus nigricans L.

Tufted with stiff, rush-like stems, 12-18 inches high. Leaves short, stiff, almost radical, with dark, glossy brown sheaths. Spikelets dark shining brown or almost black, sessile, in compact, terminal heads, with 2 or 3 broad, brown bracts, one of which has a stiff, erect needle nearly an inch long. Glumes pointed, keeled, and rough at the border.

Marshes, in a variety of situations, and mountain bogs. May, June.

Distribution.—Europe, Caucasus, Western Asia, N. Africa. British.

Schæenus ferrugineus L.

A smaller plant, 6–12 inches high, with fewer and smaller spikelets of a rusty brown colour, whose bracts are shorter and barely the length of the whole spike. Leaves much shorter than the stem, very fine and pointed.

Marshes and mountain bogs, usually in colonies. May, June.

Distribution.—Switzerland, France, Central and Northern Europe.

RHYNCHOSPORA Vahl.

Several spikelets in one or more clusters, forming axillary or terminal heads. Spikelets oblong, pointed. Glumes imbricated round the axis, the lower and shorter ones without any flower. Stamens 3 or rarely 2. Bristles 6 or more, shorter than the glumes. Nut globular or flattened, tapering into a bifid style.

A large genus spread over most of the globe, but with few European species.

Rhynchospora alba Vahl.

Stems 6–12 inches high, slender, in tufts. Leaves chiefly radical, short, and subulate. Bracts barely longer than the flowers. Spikelets nearly white, in a small terminal cluster, often with 1 or 2 smaller clusters on fine peduncles in the axils of the stem-leaves. Spikelets with 1 or 2 flowers and several empty glumes below. Bristles about 12.

In colonies in bogs in the plains and mountains. July, August.

Distribution.—Europe, except Mediterranean, Western Asia, N. America. British.

Rhynchospora fusca Aiton.

Rootstock elongate. Spikelets dark brown. Bristles 5 or 6, barbed upwards, twice as long as the obovoid fruit. Very like the last species except in colour.

Bogs and marshes; rare. May to October.

Distribution.—Switzerland, France, England, Ireland; Western, Central, and Northern Europe. N.E. America.

CAREX L.

Monœcious, rarely diœcious herbs, with Grass-like leaves, chiefly radical or on the lower part of the stem; mostly perennial. Spikelets solitary or several in a terminal spike, or the lower ones distant, or sometimes forming a short compound spike or panicle. Glumes imbricate. Male flowers with 3 or rarely 2 stamens, but without perianth-bristles. Female flowers enclosed in an inflated sack or *utricle*, contracted at the top, from which projects a style with either 2 or 3 stigmas. Fruit a compressed or trigonous nut enclosed in the perigynium.

A very large genus of about 800 species, spread widely over Europe, Northern Asia, and North America, extending into the mountain ranges of the tropics, and reappearing in the temperate regions of the southern hemisphere. Many species, and most of the large ones, grow in wet places.

In order to correctly determine many kinds, it is necessary to have specimens with more or less ripe fruit.

In the European Alps about 20 species reach the upper limit of Alpine pastures, or about 8000 feet; and at least another score are found between 5000 and 7000 feet. At Mont Cenis alone the author collected 33 species of *Carex* from above 6000 feet in July and August, 1907.¹ It is probable that in the whole of Switzerland so large a number could not be found at that height; though Switzerland yields about 88 species and sub-species, or a few more than are found in the British Isles.

In the present work it is only possible to give brief descriptions of some of the most characteristic species commonly found in sub-alpine regions.

Carex pulicaris L. Flea Sedge.

A small tufted species, 4–8 inches high, with narrow leaves shorter than the stem. Spikelet terminal and solitary, male in the upper half, the lower flowers being female. Stigmas 2. Fruit ovate, sessile and erect when young, becoming oblong and pointed and horizontal or reflected when ripe and resembling fleas.

Marshes and wet meadows in the plains and sub-Alps. May, June.

Distribution.—Most of Europe from Scandinavia to the Caucasus. British.

Carex microglochin Wahl.

A somewhat similar species in habit and size. Spikelet 10–12 flowered. Fruit with a long, green bristle at the base, ovate-lanceolate, 5 mm. long, dark brown. Leaves setaceous, channelled.

Alpine and sub-alpine marshes and bogs; rare. June.

Distribution.—Switzerland (Grisons, Valais, etc.), Mt. Cenis, Savoy, Central and Northern Europe and Asia; Greenland.

Carex pauciflora Lightfoot.

A small slender species, with long creeping runners and slightly branched stem, decumbent at the base, occasionally tufted. Leaves narrow, the upper ones sheathing the stem to the middle. Spikelet solitary, pale brown, with a few flowers, the male being uppermost. Stigmas 3. Fruit narrow and pointed, spreading or reflexed when ripe, nearly as long as the spikelet.

¹ H. S. Thompson, *Liste des Phanérogames et Crypt. vasc. recueillis au-dessus de 2440 mètres dans les districts du Mont-Cenis, de la Savoie, du Dauphiné et des Alpes-Marit.* In Bulletin d'Acad. de Géograph. Bot. (1908).

Swamps and peat bogs from the plains to the Alps. May.
Rare in Switzerland and common in the Jura.

Distribution.—Central and Northern Europe, Northern and Arctic Asia and America. British.

Carex dioica L.

A slender dioecious species, 6 or 8 inches high, with creeping rootstock. Leaves very narrow, setaceous, tufted and shorter than the stem. Spikelets brown, solitary, the male spikelets being linear and the female shorter and ovoid. Fruits ovoid, with long mucro. Stigma 2. Glumes oval, margined.

Peat bogs and marshes up to about 5500 feet. May, June.

Distribution.—Alps, Pyrenees, Jura, etc., Central and Northern and Arctic Europe; Northern and Arctic Asia and America. British.

Carex disticha Hudson (*C. intermedia* Good.).

Stems 1–3 feet, leafy, trigonous. Rootstock creeping. Leaves broad, flat. Spikelets in an elongated head, sub-distichous, 1–2 inches long, pale brown, sometimes compound at the base, the upper and lower spikelets usually wholly male. Stigmas 2; bracts small, never leafy. Nut ovoid, ferruginous.

Wet meadows, marshes, and river-sides in the plains and sub-Alps. May.

Distribution.—Europe, Northern Asia, N. America. British.

Carex leporina L. (*C. ovalis* L.). (Plate XXII.)

Rootstock short, horizontal. Stems attaining a foot in height. Leaves much shorter, about 3 mm. broad. Spikelets 4–6, sessile, distinct, but very close together, ovoid, brownish green and glossy, consisting chiefly of female flowers with a few males at the base of each spikelet. Outer bracts like the glumes. Stigmas 2. Fruits flat, winged.

Damp meadows, pastures, and waste places from the plains to the Alps. May, June.

Distribution.—Europe and Northern Asia. British.

The figure gives a young, immature state of the plant.

Carex stellulata Good. (*C. echinata* Murray).

A small, tufted species 6–9 inches high, with leaves rather shorter than the stem. Spikelets 3 or 4, the 2 uppermost closer than the rest, oval-oblong at first, but on maturity the long-beaked fruits spread and give an almost star-shaped form to the spikelet. The male flowers occupy the lower half of the top spikelet and part of the base of the others. Stigmas 2. Fruit oblong, tapering into a long beak, not winged.

Marshes and peat bogs from the plains to the Alps. May, June.

Distribution.—Europe from Italy and Spain to the Arctic regions, Northern Asia, North America. British.

Carex canescens L.

Stems tufted, at least a foot high, with long, narrow leaves. Spikelets 4-6, slightly distant, of a pale green. Male flowers usually very few, at the base of most of the spikelets. Stigmas 2. Fruits not longer than the glumes, rounded at the top, with a small point, but not tapering into a beak like the last.

Bogs and marshy meadows; less frequent in the Alps than in the plains. May, June.

Distribution.—Europe from the Arctic regions to the Caucasus; N. America. British.

Carex remota L.

A slender, leafy, green sedge with stems a foot or more high and very long, narrow leaves. Easily known by its small, pale green spikelets at considerable distances from each other, and the outer bracts of 3 or 4 lowest spikelets being very long and leaf-like. The spikelets are mixed, male at the base, but the lowest is almost entirely female. Fruits tapering to a point.

Woods, hedges, and shady places; common. May, June.

Distribution.—Europe, Central and Northern Asia. British.

Carex Goodenowii Gay.

A very variable species. Stems 6-18 inches high, rigid, rough above. Leaves very narrow. Spikelets 3-5, sub-sessile, erect, close or rather distant. Inflorescence composed of chiefly female spikelets below, and a more slender male spikelet above. Glumes imbricate, dark, obtuse, with green midrib. Beak very short. Terete, smooth. Stigmas 2. Fruit orbicular, rarely triquetrous.

Damp places and marshes; common up to the Alps. May, June.

Distribution.—Europe, Western and Northern Asia. British.

Carex flacca Schreber (*C. glauca* Scop.).

A very glaucous plant with creeping rootstock. Stems round, 9-18 inches high, varying like the leaves, according to the habitat. Leaves variable in length but always glaucous, often as long as the stems. Male spikelets usually 2 or 3 at the top, stalked; female spikelets 2 or 3, more compact, broader, on longer stalks and more or less drooping when mature, and the sheaths of the leafy bracts are very short. Glumes dark brown. Stigmas 3. Fruits ovoid, with 3 obtuse angles, not beaked.

Pastures (both wet and dry) and waste places; very common and extending to the lower Alps. May, June.

Distribution.—Europe, extending eastward to the Caucasus and northward to the Arctic regions; N. America. British.

Carex claviformis Hoppe.

Considered by some a sub-species of *C. flacca*. It is usually greener, larger, and more robust, with thick, knotted stolons. Female spikelets loose near the base, denser and rounder at the apex, which makes them almost club-shaped. Fruit often reddish.

Damp Alpine and sub-alpine pastures and marshes, rather rare except in Switzerland. May to July.

Distribution.—Switzerland, Savoy, Mt. Cenis, and elsewhere in the Italian Alps, Tyrol, Carinthia, Carniola.

Carex pallescens L. Pale Sedge.

Stems tufted, slender, leafy at the base, about a foot high. Leaves narrow and pointed. Terminal spikelet male; female spikelets 2 or rarely 3, shortly stalked, usually slightly drooping, oblong, shorter than the male one and all at short distances below it. Bracts leafy, with a short sheathing base. Stigmas 3. Fruits obtuse, glabrous.

Damp mountain pastures and woods; widely spread. May, June.

Distribution.—Europe, Northern and Arctic Asia, N. America. British.

Carex sylvatica L. Wood Sedge.

Stem 1–2 feet high, slender, tufted at the base. Leaves and leaf-bracts flaccid, the latter with long sheaths. The leaves are broader than in any of the previous species. Terminal spikelet male, about an inch long, lower spikelets 2–4, usually all female, slightly longer, loose-flowered on slender stalks and at length more or less drooping. Glumes very pointed. Stigmas 3. Fruit glabrous, with a long beak.

Woods and shady ravines, widely spread.

Distribution.—Europe and Russian Asia, except extreme North. British.

Carex strigosa Hudson.

Closely resembling *C. sylvatica*, but the female spikelets are longer (at least 2 inches long) and more slender, and the peduncles are much shorter and almost hidden in the long sheaths of the bracts. Glumes lanceolate, green. Fruits tapering to a point, but not in a long beak as in the last species. Stigmas 3.

Mountain woods; scarce but widely spread; rare in Switzerland. May, June.

Distribution.—Central and Northern Europe from France, Denmark and the British Isles to the Caucasus.

Carex capillaris L.

A small, slender plant 3–6 inches high, with extremely slender, rounded stems scarcely longer than the leaves. Terminal spikelet

male, small. Female spikelets 2 or 3, lower down, on long capillary peduncles, so that they are nodding, distant, and lax. Female spikelet of 5-10 flowers, but the spikelet is very small and short. Bracts shortly leafy, the lower bract having a long sheath. Glumes scarious at the margins. Stigmas 3. Fruit trigonous, not nerved, tapering into a short beak.

Damp and sandy Alpine pastures, borders of springs and wet rocks in the Alps and sub-Alps, up to 8200 feet at least. July. Often growing with other Carices.

Distribution.—Alps; Pyrenees, Caucasus, Arctic Europe and Asia; North America; North Britain.

Carex alba Scop.

A slender species 6-12 inches high, with narrow linear leaves with yellow-brown sheaths. Stem erect, rough at the edge, bearing 1-3 female, long-stalked spikelets, the upper one usually extending above the white, male spikelet. Stem-leaves are usually no more than long sheaths surrounding the base of the flower-stalks. Bracts oval, acuminate, whitish, as long as the trigonous, greenish fruit, which is finely nerved and beaked.

Mountain woods, especially in limestone districts, as, e.g. near Engelberg. May, June.

Distribution.—Alps, Eastern and Southern France, Cevennes, Corbières; Central Europe, N. America.

Carex ferruginea Scop. (Plate X.)

Rootstock creeping, stoloniferous. Stems slender, about a foot high, sometimes more. Spikelets dark brown. Lowermost spikelets usually pendent on longish, delicate stalks. Glumes rusty brown. Fruit elliptical, flat in the anterior part, glabrous, with a short bifid beak.

Shady places in the Alps from about 4000 to 7000 feet. June.

Distribution.—Alps, Jura, Eastern Pyrenees, mountains of Central Europe.

Carex flava L. Yellow Sedge. (Plate XXII.)

Densely tufted and leafy, from 4-12 inches high, and often yellowish in colour, especially the fruiting spikelets. Leaves flat. Terminal spikelet male. Female spikelets 1-3 sessile or shortly stalked and near the male, and often there is one female spikelet much lower down on a longer stalk. Bracts leaf-like and sheathing at the base. Stigmas 3. Fruits ovoid, distinctly nerved, with a prominent beak.

Damp meadows, peat bogs, etc., in the plains and lower mountains. May to July.

Distribution.—Europe from the Mediterranean to the Arctic regions, Russian Asia, N. America. British.

There are 2 sub-species found in Switzerland :

Carex æderi Retz., with shorter stems and smaller fruits with short beak ; and *C. lepidocarpa* Tausch., with longer inflorescence, male spikelet with long stem, female spikelets distant and fruits with longer beak.

GRAMINEÆ. (The Grass family.)

Herbs, with usually hollow stems, except at the nodes, and narrow, parallel-veined, entire, alternate leaves, sheathing at the base ; but the sheaths usually split open on the side opposite the blade, and end in a small appendage called a *ligule*. Flowers in *spikelets*, arranged in spikes, racemes, or panicles. Each spikelet generally consists of 3 or more chaff-like scales or bracts called *glumes*, arranged alternately, with their concave face towards the axis. The 2 lowest glumes are usually empty, but the *flowering glumes* enclose a smaller scale called a *palea*, which usually has 2 longitudinal veins or ribs. The flower is within the palea or between it and the flowering glume. The true flower usually consists of 2 almost microscopical scales called *lodicules* and of 3 stamens (rarely 6) and of an ovary with one cell and one ovule, crowned by two more or less feathery styles. However, the *flower* is generally considered to include the flowering glume and the palea. The fruit is a 1-seeded *grain*, consisting of the real seed and pericarp ; and is either free or enclosed. The embryo or germ is small, at the base of a mass of mealy albumen.

Several other points will arise in any extended and exact study of this large and somewhat difficult family—the Grasses are distinctly more difficult than the Sedges, and they require careful dissection—but the outline indicated above is sufficient for the purpose of the average botanical student.

Gramineæ is one of the largest families, its representatives being spread throughout the globe. At least 4000 species are known to Science. Grasses are found from the burning plains of the Equator towards the North and South Pole as far as any Flowering plants have been seen, and from the coast (several actually growing in and matting together the sands of the sea-shore) to the snow-capped summits of some of the highest mountains. In temperate regions they form the chief green carpeting of the soil, while in tropical climates some species of Bamboo attain the height of tall trees. Lastly, but of most importance, in every country inhabited by man grasses are cultivated as cereals for food. Switzerland in bygone ages knew something of the value of these cereals, for several varieties of Barley were found in Swiss lake dwellings in deposits of the Stone Period.

About 70 species of true Grasses are found in the High Alps of Central Europe, of which number many extend above 8000 feet.

More than 100 others grow in the lower mountains and adjacent plains, but it is almost impossible to say what proportion of the whole are to be found in the sub-Alps, and the number of grasses which are *purely* sub-alpine is extremely small.

The following genera comprise most of the high Alpine species and some of the sub-alpine, viz. *Phleum*, *Agrostis*, *Deschampsia*, *Stipa*, *Trisetum*, *Avena*, *Sesleria*, *Poa*, and *Festuca*.

In addition there are many sub-alpine grasses which belong to the following genera, viz. *Alopecurus*, *Aira*, *Anthoxanthum*, *Milium*, *Sieglingia* (*Triodia*), *Koeleria*, *Melica*, *Cynosurus*, *Nardus*.

In the whole of Switzerland there are, on the authority of Schinz and Keller, 169 species of *Gramineæ* in addition to a few sub-species.¹ In the British Isles there are not more than about 135 species, excluding all varieties, notwithstanding the very long coast-line and great variety of geological formation.

We regret that from want of space it is impossible to give descriptions of the grasses, for any adequate account of so numerous a family would make the volume too large.

¹ *Flore de la Suisse*, by Schinz and Keller. Ed. française par Wilczek et Schinz (1909).

CLASS III. GYMNOSPERMÆ

CONIFERÆ

Trees or shrubs with resinous juice, and usually rigid, subulate leaves, often in fascicles and entire in the European genera. Flowers monœcious or diœcious. Male flowers in catkins, of 1 or more anthers, female flowers solitary or in cones of 1 or more, sessile, naked, ovules, placed on a bract or open carpellary leaf. Fruit a cone or berry.

An extensive family spread over the whole globe.

PINUS L.

Trees with linear or subulate, fascicled leaves. Male catkins in spikes of many 2-celled anthers. Cone ripening the second year. Ovules 2, inverted and adnate to the carpellary leaf.

Pinus montana Miller.

Leaves narrowly linear, flat or channelled on the upper side, convex below, mucronate, scarcely acicular, in pairs within a sheath, persistent. Male catkins long, congregated in whorled spikes at the base of this year's shoots. Female catkins oval or longer, solitary, or 2-6 together, in the first year at the apex of this year's shoot, in the second year lateral from the growth of a new shoot, erect during and after flowering, spreading obliquely or horizontally when ripe, sessile. Scales nearly as long as the carpellary leaves at the time of flowering, and more or less concealing them. Cones ovate or ovate-conical before opening. Scales of cone variously spatulate, compressed, 3-sided; shield within an irregularly 4-cornered or nearly 3-cornered beak.

A tree, with shorter trunk and prostrate or ascending branches in the form known as *P. Mughus*, often covering large tracts in rocky Alpine slopes; 4400-7500 feet. May, June.

The short form is more especially found on limestone; the taller tree grows in the Alps and sub-Alps, and in Swiss peat-mosses descends to 2000 feet above sea-level.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Vosges, Pyrenees, Caucasus; Central and Eastern Europe.

Pinus uncinata Ramd. is a variety of the above with the bosses

of the scales on the lower side of the cone larger than those which are turned towards the trunk, recurved in the form of a hook. It becomes a tall tree in the Valais and in Vaud, but is little more than a shrub in the Jura.

Pinus sylvestris L. Scots Pine.

Cones very shortly stalked, recurved when young, symmetrical, conical. Scales rhomboid, with flat boss and a transverse keel and deciduous point. Leaves in pairs, stiffly subulate, about 2 inches long, glaucous inside. The heart-wood is reddish. Seeds winged, small.

This well-known Pine reaches about 7300 feet in the Swiss (Valais) Alps, where it is rare, and possibly rather higher in some of the Western Alps of France and Italy. May.

Distribution.—Alps, Vosges, Cevennes, Pyrenees, Corbières, Norway, Northern and Central Europe, mountains of Southern Europe, Caucasus, Russian Asia,¹ Scotch Highlands. Usually planted elsewhere.

Pinus Cembra L. Arolla or Siberian Stone Pine.

Stem erect. Leaves in bundles of 5, stiff, trigonous, about $2\frac{1}{2}$ inches long. Cones of this year erect, in groups of 3 or 4 at end of branches, stalked; when ripe, large, sessile, ovate, obtuse. Scales flat, erect, downy, rather spreading at the apex. Shield very small, almost obsolete. Seed not winged, edible. A tree of moderate size. Leaves bluish green when young. Cones solitary or in twos or threes, attaining the size of the fist, dark violet-brown. The seeds are eaten in the Eastern Alps under the name of 'Zirbelnuss.'

Alps from 4400–8000 feet (extreme limits). May, June. Local.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Central and Northern Europe, Siberia. In Switzerland in the Pennine Chain from the Dranse to the Simplon, the Bernese Oberland, and Engadine. It is often associated with the Larch. There are proofs of more elevated ancient limits in many localities.

A beautiful photograph of "A typical Alp or mountain pasture, with the Stone Pine in the foreground (6300 feet)" appears in Dr. Arber's *Plant Life in Alpine Switzerland*, p. 24.

Pinus Strobus L. Weymouth Pine.

A tree attaining 80 feet in height. Leaves in bundles of 5, 2–4 inches long, slender, trigonous, green and glossy on one side, glaucous on the 2 other sides. Cone shortly peduncled, up to 6 inches long, cylindrical and tapering, pendent, chocolate-brown in colour. Scales rather thin, smooth, striated.

¹ In Siberia the Scots Pine reaches lat. $62\frac{1}{2}^{\circ}$ (Seebohm), and in Norway it reaches the North Cape, 300 miles within the Arctic Circle.

Completely naturalised and often cultivated in Switzerland and France, both in masses and singly in the forests. May. Originally from N. America.

Pinus Laricio L.

This southern species is cultivated in plantations, and solitary specimens are occasionally seen in forests, but it is not supposed to be native in Switzerland. The leaves are long and glaucous, the cones ovoid-conical, sub-sessile, the boss of the scales pale yellow. Heart-wood blackish grey.

ABIES Miller. Fir.

Characters the same as those of *Pinus*, but the leaves are solitary and evergreen.

Abies alba Miller (*A. pectinata* DC.). Silver Fir.

Leaves pectinate, 2-5 cms. long, with 2 white lines beneath, disposed all round the fruiting twigs at the top. Cone-cylindrical, reddish violet first, then green, erect, shorter than in *A. excelsa* (8-10 cms.), with prominent bracts. Scales dentate, shortly petioled, and falling with the seeds. Heart-wood light grey.

According to Schinz and Wilczek it reaches a height of 1800 metres in Switzerland, and forms great belts of forest from about 1000-1600 metres, and to 1300 metres in the Jura. According to my own observation in the Eastern Pyrenees this tree forms (with *P. austriaca* and *P. picea*) the chief forests, and in certain districts the forest-belt lies between about 5500 and 6700 feet. May.

Distribution.—Eastern, Central, and Western Alps; Vosges, Jura, Pyrenees, Corsica; Central and Southern Europe, Caucasus, Asia Minor.

PICEA Dietrich.

Leaves (or needles) compressed, 4-angled. Cone pendent, falling in one piece (in *Abies* the scales only fall), the scales persistent on the rachis.

Picea excelsa Link (*Abies excelsa* Poir.). Spruce Fir.

Leaves mucronate, somewhat 4-edged, green, disposed equally all round the twigs. Cone cylindrical (10-15 cms.), pendulous, without bracts. Scales dentate, sessile, and persistent. Heart-wood brown.

In Switzerland it reaches from the plains to the upper limit of trees (1650-1980 metres), except in Tessin, the Grisons and the Valais, where the Larch and the Arolla Pine (*P. Cembra*) are the highest trees (Schinz).

Distribution.—Eastern, Central, and Western Alps; Jura, Vosges, Central and Northern Europe, Siberia. Very often planted.



PLATE XXXIII.

RHODODENDRON AMONG GRANITE BOULDERS ABOVE ARGENTIERE.

LARIX Miller. Larch.

Leaves fascicled, deciduous. Seeds winged.

Larix europæa DC. (*L. decidua* Miller).

A tree sometimes attaining a height of 160 feet. Leaves, or needles, in fascicles of 20–30, slightly channelled, deciduous, bright green, turning yellow-ochre in autumn. Cone ovoid, erect, reddish purple when young, grey-brown when mature, 3–4 cm. long, with persistent scales.

This most useful timber tree reaches 2400 m. (7870 feet) in Switzerland and the Western Alps—the extreme limit of trees, and is almost totally absent from the Jura and sub-Alps. Very fine specimens can be seen just above Saas Fee in Switzerland.

Distribution.—Eastern, Central, and Western Alps. Central Europe, Siberia. Elsewhere planted.

On the Yen-e-say River Henry Seebohm tells us the Larch and Birch extend further than any other trees, viz. to lat. $69\frac{1}{2}^{\circ}$, and the Spruce comes next.¹

In 1910 a book on Tree Limits in the Eastern Alps was published by Dr. Richard Marek² in which a table was given which shows some of Kerner's results compared with Marek's, which were largely based on already published maps and literature. The table is as follows :

District.	Upper limit of trees, Kerner (metres).	Limit of forest, Marek (metres).	Difference (metres).
Central Alps (Ortler).	2307 ..	2192 ..	115
„ (Oetzthal).	2212 ..	2087 ..	125
„ Eastern Tyrol, Salzburg	1991 ..	1910 ..	81
Northern Tyrolese Limestone Alps	1904 ..	1897 ..	7
South Tyrolese Alps	2086 ..	1936 ..	150
North-Eastern Limestone Alps	1674 ..	1622 ..	52
South-Eastern „ „	1833 ..	1793 ..	40
Average difference 82 metres.			

TAXUS L. Yew.

Trees or shrubs with short, linear, evergreen leaves. Flowers mostly dicecious. Catkin very small, with imbricated scales at the base; the males ending in a cluster of stamens; the females consisting in a single erect ovule with a small cup-shaped disk round its base. Fruit a hard seed, partly embedded in a pulpy, berry-like cup.

A small genus, extending round the northern hemisphere.

Taxus baccata L. Common Yew.

A dark, evergreen, much-branched tree, with thick trunk and hard wood, attaining a great age. Leaves not an inch long, inserted

¹ Henry Seebohm, *Siberia in Asia*.

² Marek, *Waldgrenzstudien in den Oesterreichischen Alpen*.

all round the branches, but spreading in one plane in two opposite rows, convex and shining on the upper side. Catkins very small, in the axils of the leaves. Fruits small, but conspicuous by their bright, pinkish red, juicy cups.

Rocks and limestone cliffs and thickets in the plains and mountain region. April, May.

Fruit in August and September. In Switzerland spread over all the geological subsoils in coniferous and ordinary forests; in the hills and sub-Alps up to 1400 m. (Schinz) in the Jura and valley of the Rhone and in Tessin.

Distribution.—Central Europe, mountains of Southern Europe, extending northward to Scandinavia and eastward to the Caucasus and mountains of Central and Northern Asia; Algeria.

Probably native in England on chalk and limestone. In Kingley Vale, near Chichester, there is perhaps one of the finest examples in Europe of a nearly pure Yew-wood.¹

JUNIPERUS L. Juniper.

Shrubs with glaucous, subulate, stiff and pointed or scale-like leaves. Cone berry-like, small, composed of fleshy scales, blue when ripe (in the second year). Ovules 1 or 2 under each scale, erect.

About 30 species spread over the northern hemisphere.

Juniperus communis L.

A much-branched, evergreen shrub, often procumbent, but usually ascending, 2-4 feet high. Leaves in whorls of 3, linear, acicular, 10-15 mm. long, ending in a prickly point, green above, glaucous beneath. Catkins very minute. Berries globular, purplish blue, as large as Bilberries when ripe (the second year).

Dry hillsides and mountain slopes up to the Alpine region. April, May.

Distribution.—Europe, Western and Northern Asia, N. Africa and N. America. British.

It passes insensibly into the variety *montana* Aiton (*J. nana* Willd.), which is always procumbent, with shorter imbricate leaves (4-8 mm.) and larger berries.

The variety is widely spread in the Alps from 5500-8200 feet, and very occasionally as high as 11,500 feet in Switzerland, which gives it the distinction of being the highest woody plant in Europe. Vaccari² actually records it from 3500 m. (11,700 feet) on Monte Rosa. It flowers in June and July.

Distribution.—Alps, Carpathians, Jura, Auvergne, Pyrenees,

¹ A. G. Tansley in *The New Phytologist*, vol. x (1911), p. 288.

² Prof. Lino Vaccari, *La Flora Nivale del Monte Rosa* (1911), p. 27.

Corsica, Cevennes ; Arctic Europe and Asia, Himalaya, N. America, Algeria, rare in England. In Siberia the Juniper reaches lat. 69° (Henry Seeböhm).

Juniperus Sabina L.

Leaves like small rhomboid imbricated scales in 4 rows, or acicular, broadly subulate and spreading. Cone or 'berry' on a short recurved stalk, not so dark in colour as the other. Bark of the branches reddish brown.

Dry, stony places up to 8200 feet. Flowers in April and May.

It is a characteristic shrub of some of the hot Alpine valleys and Pine forests in the south of Switzerland.

Distribution.—Eastern, Central, and Western Alps ; Jura, Pyrenees, Caucasus, Siberia, N. America.

EPHEDRACEÆ or GNETACEÆ

Leaves opposite, very small. Flowers unisexual, male flowers with a tubular membranous perianth, otherwise resembling *Conifera*æ. A very small family of chiefly tropical and Mediterranean plants.

Ephedra helvetica C. A. Meyer.

A small diœcious shrub, with opposite branches and no leaves. Stem 1–2 feet high. Female catkins when ripe appearing like red berries, peduncled ; male catkins sessile. The plant resembles certain species of *Equisetum* in outward appearance.

Rocky hillsides ; local. In Switzerland only in Valais (Sion, Sierre, Fully, etc.). April, May.

Distribution.—Valais, Dauphiny, Central Europe.

NOTE.—Conifers possess a power of resistance to extreme cold unsurpassed by any form of vegetation except perhaps the microscopic plants which live in the oceans of Arctic regions. The Siberian settlement of Werchsjanst, in about 68° N. lat., is perhaps the coldest inhabited place in the world. The maximum winter temperature is never less than 76 degrees of frost, and occasionally there are 100 degrees of frost. Yet this settlement is surrounded by coniferous trees.

Dr. Borthwith¹ recently alluded to Kienitz's investigations into the shapes and types of Scots Pine, of which there are two distinct types. The typical Scotch form is a strong-branched, strong-crowned tree. The other is slender and pyramidal, and occurs generally in the Baltic provinces.

¹ *In Address to Bot. Soc. of Edinburgh, November, 1911.*

CLASS IV.—VASCULAR CRYPTOGAMS

IN Switzerland alone there are about 45 *true* ferns (excluding *Botrychium*, *Ophioglossum*, etc.), or just about the number to be found in the British Isles.

LIST OF THE FERNS AND FERN ALLIES OF SWITZERLAND,
based on the arrangement of Schinz and Keller :

POLYPODIACEÆ

- Athyrium Filix fœmina* Roth. (Woods from the plain to the Alpine region.)
 — *alpestre* Rylands. (Alps, sub-Alps, and Jura.)
 Sub-sp. *Cystopteris fragilis* Bernh. (Alps and sub-Alps.)
 — *regia* Bernoulli. (Alps and sub-Alps.)
 — *montana* Desv. (Limestone Alps, sub-Alps, and Jura.)
Dryopteris Phegopteris C. Christensen. (Woods, etc.)
 — *Linnaëana* C. Christen. (Woods, etc.)
 — *Robertiana* C. Christen. (Limestone rocks, etc.)
 — *montana* O. Kuntze. (Woods and pastures.)
 — *Thelypteris* A. Gray. (Peat bogs.)
 — *Filix mas* Schott. (Woods.)
 — *rigida* Underwood. (Limestone screes.)
 — *cristata* A. Gray. (Peat bogs ; rare.)
 — *spinulosa* O. Kuntze. (Woods and bogs.)
 Sub-sp. — *dilatata* C. Christen. (Woods and bogs.)
 — *Lonchitis* O. Kuntze. (Rocky slopes in Alps and sub-Alps.)
 — *aculeata* O. Kuntze. (Mountain woods.)
 Sub-sp. — *lobatum* Schinz et Thellung. (Mountain woods.)
 Sub-sp. — *angulare* Schinz et Thellung. (Chestnut region.)
 — *Braunii* Underwood. (Very local.)
Onoclea Struthiopteris Hoffm. (Rare ; Tessin, etc.)
Woodsia ilvensis Bab. (Rocks in Alps and sub-Alps.)
 Sub-sp. — *rufidula* Aschers. (Grisons, Tessin.)
 Sub-sp. — *alpina* Gray. (Very local.)
Blechnum Spicant With. (Pine forests and pastures.)
Phyllitis Scolopendrium Newman. (Shady places.)
Asplenium Ceterach L. (Rocks, walls, etc.)
 — *fontanum* Bernh. (Sub-alpine rocks ; local.)

- Asplenium Trichomanes* L. (Shady rocks and walls.)
 — *viride* Hudson. (Shady rocks and walls in Alps and sub-Alps.)
 — *septentrionale* Hoffm. (Siliceous rocks.)
 — *Adiantum nigrum* L. }
 Sub-sp. — *nigrum* Heufler } Sub-Alps and lower mountains.
 Sub-sp. — *Onopteris* Heufler }
 — *germanicum* Weis. (Rare.)
 — *Ruta-muraria* L. (Rocks, walls, etc.)
Pteridium aquilinum Kuhl. (Woods, hedges, moors, etc.)
Pteris cretica L. (In Tessin, near Locarno.)
Allosorus crispus Bernh. (Granite Alps.)
Adiantum Capillus Veneris L. (Damp rocks; rare.)
Notholaena Marantæ R.Br. (Walls near Locarno in Tessin.)
Gymnogramme leptophylla Desv. (In Tessin; rare.)
Polypodium vulgare L. (Rocks, walls, on trees, etc.)
 Sub-sp. — *serratum* (Willd. (Tessin and the Rhone Valley.)

OSMUNDACEÆ

- Osmunda regalis* L. (Marshes in trans-alpine Switzerland.)

OPHIOGLOSSACEÆ

- Ophioglossum vulgatum* L. (Damp meadows; rare.)
Botrychium simplex Hitchcock. (Engelberg, Chamonix.)
 — *Lunaria* L. (Alpine and sub-alpine pastures.)
 — *ramosum* Aschers. (Near Altorf, etc.; rare.)
 — *lanceolatum* Augström. (In Grisons.)
 — *virginianum* Sw. (In Grisons.)
 — *Matricariæ* Spr. (Val Onsernone; Chamonix.)

MARSILIACEÆ

- Marsilia quadrifolia* L. (Bonfol, Villeneuve.)
Pilularia globulifera L. (Very rare.)

EQUISETACEÆ

- Equisetum sylvaticum* L. (Woods in sub-Alps and Jura.)
 — *pratense* L. (Woods and pastures.)
 — *maximum* Lam. (Damp, shady places.)
 — *arvense* L. (Fields, roadsides, etc.; common.)
 — *palustre* L. (Marshes and wet places.)
 — *limosum* L. (Lakes, marshes, etc.)
 — *hiemale* L. (Damp woods and marshes.)
 — *ramosissimum* Desf. (Sandy and stony places.)
 — *variegatum* Schleicher. (Sandy places.)

LYCOPODIACEÆ

- Lycopodium Selago* L. (Alps, sub-Alps, Jura.)
 — *clavatum* L. (Mountain and sub-alpine woods.)
 — *annotinum* L. (Mountain forests.)
 — *inundatum* L. (Peat bogs.)
 — *complanatum* L. (Forests, heaths, etc.)
 Sub-sp. — *anceps* Aschers. (N.E. Switzerland.)
 Sub-sp. — *chamæcyparissus* Döll. (Tessin, Grisons.)
 — *alpinum* L. (Alps and sub-Alps.)

SELAGINELLACEÆ

- Selaginella selaginoides* Link. (Alps and sub-Alps.)
 — *helvetica* Link. (Alps, sub-Alps, and rarely in the plains.)

ISOËTACEÆ

- Isoëtes echinosporum* Durien. (Near Locarno, etc.)

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