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American Ferns

How to Grow and Use Them

Edith A. Roberts

I. Introduction

The appreciation of American ferns in their native habitats has led to an increase in their general use in gardens and their special use in fern gardens. These garden ferns have been obtained in many instances by transplanting them from their natural locations. It is desirable to increase their use in gardens without decreasing their numbers in the open.

This study in the growing of ferns from spores has been undertaken to aid their conservation. The means for carrying on the study have been provided by the Clara F. Stillman Research Fund. Ferns were selected because they represent a small group of American plants whose contribution to the beauty of the plant world is without question, and a group whose conservation needs attention if an increase in their use is to continue without a decrease in their numbers.

Many ferns are associated in our minds with refreshing and restful moments in the out-of-doors; moments, when their beauty, be it of form, color or texture has delighted us. Those most appreciative of this beauty are the ones most reluctant to gather a sufficient number of plants to reproduce even a semblance of the fern effect of the woods. Such persons can grow ferns from spores. In this way they may have ferns for the garden while leaving untouched those places where the ferns were first enjoyed, and which may be revisited with the same pleasure. Those who are more interested in having ferns in their own gardens than in conserving natural beauty may also be encouraged to grow their own plants, for the growing of them has its own interest. Thus the loveliness of the woods may be left intact and new places of enjoyment created at home.

The pleasure derived from the ferns in the open may not have been entirely due to the beauty of the fern plants themselves. The environment may have made its contribution. The environment also has much to do with the growing of the ferns.

II. A Method of Propagation of Ferns from Spores

In order to propagate ferns from spores the fronds must be collected when the spores are ripe. The time when the spores of each fern are ripe will be indicated in Table XI. The fronds upon collection should be placed immediately in packets made of paper with a smooth surface, for the spores will cling to a rough paper. There is an advantage in having the spores slide to the bottom of the packet where they may be collected for sowing. These packets

must be kept in a cool, dry place such as the tool room of a greenhouse, but the place must not be too cool or too dry.

In our study some of the spores were started as soon as collected; but after trying some each month, it was found that there was little difference in the percentage of germination for the first six months, except in the case of the *Osmundas,* the spores of which should be sown immediately. Consequently, the spores need not be sown at once. They should, of course, be started in time to develop the young sporophyte plants to such a stage that they may be placed out-of-doors in late spring. The time may be estimated by referring to Table XII, which shows the number of weeks taken from the time of germination of the spores until the development of the young sporophytes.

In all the species so far experimented with, the growing of the spores on a modified Beyerinck solution has proven to be the simplest method. The plants develop faster than when the spores are sown directly on soil. The modified Beyerinck solution is made as follows:

Ammonium nitrate	0.5 gram
Monobasic potassium phosphate (KH_2PO_4)	0.2 gram
Magnesium sulfate	0.2 gram
Calcium chlorid	0.1 gram
Ferric chlorid	trace
Distilled water	1,000 cc.

To any one wishing to try this out and not finding it convenient to obtain the chemicals, I would be glad to send enough for one thousand cc. or one gallon of solution.

A half pint of this solution is put in pint fruit jars, a cap made of non-absorbent cotton, the glass top placed lightly on top of this, and the jars sterilized as for canning. A number of these jars may be prepared at one time and kept for use as needed.

To start germinating the spores, hold a small knife in a flame until hot in order to sterilize it; when cool, dip as many spores as can be held on the tip of the knife from the bottom of the packet, remove the cotton plug from the pint jar and, by tapping, spread the spores over the surface of the liquid. Replace the cotton and glass top, label, and place in a warm, shady place.

The spores gradually develop into flat, green bodies called thalli, and on these are formed the sperm and egg. After the egg has been fertilized it begins to grow into an erect, fern-like plant which is called the sporophyte.

When the young sporophytes have developed into tiny, erect plants with roots which can be seen, they are ready to be transplanted. With a hooked wire, fish out the plants and transfer them to small pots filled with a good fibrous mixture. Any good water-holding humus will do. Embed the small pots in larger pots or flats of peat. Cover with a glass or paper, as the plants are very delicate and have just come from the very moist environment within the jars. Water once a week with a weak solution of potassium permanganate (a solution of pale, wine-red color).

The critical stage which must determine the establishment of these ferns, or what is known as "ecesis" in ecology, comes as the young sporophyte develops the various characteristics typical of each species of fern, its root habit, the structure (morphology) of leaf and stem, together with the mode of functioning (physi-

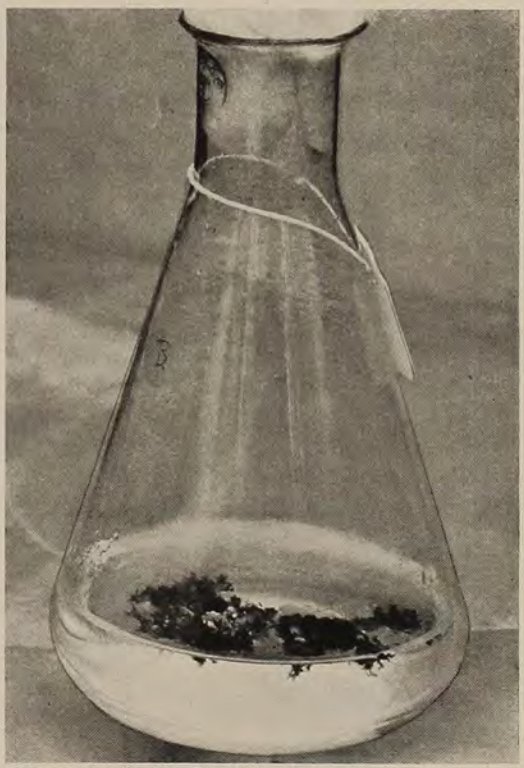
ology). The extent to which the developing ferns can adapt themselves to different habitats offers interesting problems yet to be solved; but if the young ferns are put in the environment to which the parent plant was accustomed they will thrive.

III. The Ecology of Ferns

Ferns are like all other plants, in that each fern has a certain habitat in which it grows best, and where it is associated with the same group of plants. Any group of plants growing together in a like environment of light, temperature, moisture and soil conditions is called in ecology an "association of plants." The various combinations of light, temperature, moisture and soil conditions producing these so-called associations in which ferns are found in the central northeastern part of America are:

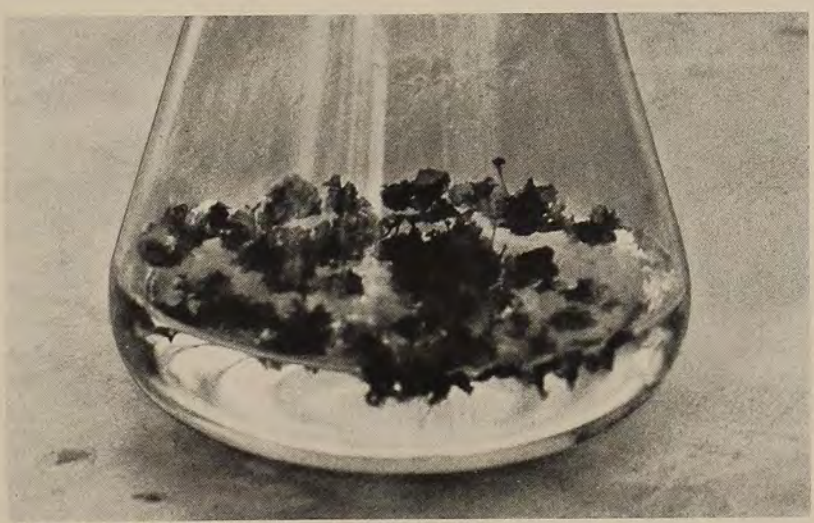
The Upland Associations:

1. The Open Field Association.
2. The Shrub Association.



Margaret DeM. Brown

The thalli developed from spores of Asplenium platyneuron on modified Beyerinck solution



Margaret DeM. Brown

Young sporophytes of Woodwardia virginica ready to be transplanted to small pots

3. The Juniper Association.
4. The Gray Birch Association.
5. The Pine Association.
6. The Oak-Hickory Association.
7. The Beech-Maple-Hemlock Association.

The Lowland Associations—

Lakes and Ponds:

1. The Sedge Association.

Bogs:

1. The Low Shrub Association.

Rivers and Streams:

1. The Marginal Association.

In general, in the growing of ferns, if the conditions of its natural environment are maintained as nearly as possible much better growth will be obtained. Do not expect or try the impossible. A plant adapted to a dry sunny situation may tolerate situations with less light, but do not expect maidenhair to thrive or look well in a sunny, exposed position. Note the associations, for it will give a clue to the treatment to be used. Ferns are found in as great a variety of environments as any other plant. There is no such thing as one type of place for ferns. Certain ferns grow in moist, shady places, and these are often called "fern habitats" in consequence; but, such places are not suitable for all ferns.

Each fern in this article will be discussed in the association where it is most often found as indicated in Table I. It may be found and may be made to grow in other associations of an entirely different environment. If its relationship to the environment best for it is known, and how to grow it in one place, the same principles will apply to its use in other situations.

IV.

Table I

The Distribution of Ferns in Associations

	Upland associations						Lowland associations			
							Lakes and Ponds	Bogs	Rivers and Streams	
	Open Field	Shrub	Juniper	Gray Birch	Pine	Oak Hickory	Beech Maple Hemlock	Sedge	Low Shrub	Marginal
Adiantum pedatum L. Maidenhair fern							×			
Aspidium cristatum (L.) Sw. Crested shield fern								×		
Aspidium Filix-mas (L.) Sw. Male fern						×				
Aspidium marginale (L.) Sw. Marginal shield fern						×				

	Upland associations					Lowland associations				
								Lakes and Ponds	Bogs	Rivers and Streams
	Open Field	Shrub	Juniper Gray Birch	Pine	Oak Hickory	Beech Maple Hemlock		Sedge	Low Shrub	Marginal
Aspidium noveboracense (L.) Sw. New York fern					×					
Aspidium spinulosum (O. F. Müller) Sw. Spinulose wood fern					×					
Aspidium Thelypteris (L.) Sw. Marsh fern									×	
Asplenium acrostichoides Sw. Spleenwort						×				
Asplenium Filix-femina (L.) Bernh. Lady fern	×									
Asplenium platyneuron (L.) Oakes Ebony spleenwort			×							
Asplenium Ruta-muraria (L.) Wall rue			×							
Asplenium Trichomanes (L.) Spleenwort					×					
Camptosorus rhizophyllus (L.) Link Walking leaf					×					
× The association in which the fern is first established.										
Cystopteris bulbifera (L.) Bernh. Bladder fern						×				

	Upland associations							Lowland associations			
								Lakes and Ponds		Bogs	Rivers and Streams
	Open Field	Shrub	Juniper	Gray Birch	Pine	Oak Hickory	Beech Maple Hemlock	Sedge		Low Shrub	Marginal
Cystopteris fragilis (L.) Bernh. Bladder fern							×				
Dicksonia punctilobula (Michx.) Gray Hay-scented fern	×										
Lygodium palmatum (Bernh.) Sw. Climbing fern											×
Onoclea sensibilis L. Sensitive fern	×										
Onoclea Struthiopteris (L.) Hoffm. Ostrich fern											×
Osmunda cinnamomea L. Cinnamon fern											×
Osmunda Claytoniana L. Interrupted fern											×
Osmunda regalis L. Royal fern											×
Pellaea atropurpurea (L.) Link Cliff brake						×					
Phegopteris dryopteris (L.) Fée Oak fern						×					
Phegopteris hexagonoptera (Michx.) Fée Beech fern						×					

	Upland associations						Lowland associations			
							Lakes and Ponds	Bogs	Rivers and Streams	
	Open Field	Shrub	Juniper	Gray Birch	Pine	Oak Hickory	Beech Maple Hemlock	Sedge	Low Shrub	Marginal
Phegopteris polypodioides Fée Beech fern							×			
Polypodium vulgare L. Polypody			×							
Polystichum acrostichoides (Michx.) Schott. Christmas fern				×						
Pteris aquilina L. Brake	×									
Scolopendrum vulgare Sm. Hart's tongue							×			
Woodsia ilvensis (L.) R. Br. Woodsia			×							
Woodsia obtusa (Spreng.) Torr. Woodsia						×				
Woodwardia virginica (L.) Sm. Chain fern								×		

V. Ferns of the Upland Associations

The upland associations, as the name indicates, are those associations of plants found in high places. In this instance emphasis is being placed only upon the ferns found on the tops of hills and down their slopes merging into the lowlands.

1. The open field association. The open situations readily fall into two types: the dry upland and the lower part of the upland where it merges into ponds, streams or open meadows. The soil and the moisture conditions

may vary greatly, but the light is strong and there is little vegetation to modify the influence of the temperature. The following ferns are found in the open field association:

Asplenium Filix-femina, lady fern
Dicksonia punctilobula, hay-scented fern
Onoclea sensibilis, sensitive fern

No two dry uplands are exactly alike, but these ferns have the same general possible uses, and interesting combinations will suggest others for the particular situation one is working with.

Margaret DeM. Brown

Lady fern two months old

Asplenium Filix-femina
Lady fern

The lady fern will grow anywhere and everywhere. It is most aggressive and may be found in any association. Its light green, finely-cut fronds are arranged like vases and may vary in height from twelve to thirty-six inches. If one desires an all-over effect this should be used freely. It will bring all other plants together and give the feeling of ferns everywhere just by its sheer spread.

Distribution of lady fern

Margaret DeM. Brown

Lady fern fifteen months old

It will, however, take possession if given a chance. It is up in May before the grasses and may crowd out less resistant plants. It lasts until September. If cut in August, when covered with masses of deep mahogany spores, it will spring up again with another mass of fresh light green fern bouquets which will last until late fall.

The spores may be gathered all through July, August and September. They will germinate in a week, the sporophyte will develop in two and a half months, and in a year plants over twelve inches high are developed. They should be planted two or three feet apart. The spores retain their vitality for at least a year.

Margaret DeM. Brown

Lady fern—Asplenium filix-femina

Dicksonia punctilobula
Hay-scented fern

The very softness of this delicate, tapering, lace-like fern with chestnut brown stipes that spread in all directions prevents it from giving a spotty effect even when placed here and there in dense clumps in an open field. New fronds arise all summer and form light-green, fluffy masses from May through September or until the first sharp frost which kills all the fronds. It may be used to soften the effect of some striking boulder as the plant grows tucked about the edges. The oil in the glands on the fronds gives off a fragrance which is like new mown hay.

The minute spores may be gathered in July and August and they will start to develop in sixteen days. In three and one-half months or earlier the sporophyte will show, the forked stems will develop in one year, and mature plants may be had in three years.

For localities where a green cover is desired the fern may be lifted in mats, like sod, for the rhizomes are small and near the surface. It increases rapidly and if planted eight inches apart will soon make a ground cover.

Distribution of hay-scented fern

Margaret DeM. Brown

Plants one year old showing the characteristic whorl

Dicksonia punctilobula *Hay-scented fern*

Onoclea sensibilis
Sensitive fern

This is a hardy type, twelve to thirty-six inches tall, erect, rigid, and soft green with a russet stipe. The broad, triangular, sterile fronds stand out smooth and satiny. New ones appear first in May and continue to form throughout the summer. The fertile fronds appear in mid-summer and these light-green, beaded stalks arise from the center of the plant like ornamented markers. This fern, like the lady fern, will form an entire new growth if cut over in mid-summer. The deep brown, fertile fronds are decorative in winter as they stand above the snow. Spores may be collected in September or October. They germinate in a week and in four months the sporophytes are formed. In a year's time the plants will be a foot high.

The plant has a rootstock that branches in all directions and is difficult to hold in check, but if an extensive area or a bank needs a high covering *Onoclea sensibilis* has its use. It gives a very good foothold for some less sturdy plant. It multiplies by underground runners and if planted one foot apart will soon form a dense and extensive community.

Sensitive fern four months old

Distribution of Sensitive fern

Margaret DeM. Brown

Margaret DeM. Brown

Onoclea sensibilis *Sensitive fern*

Of the ferns for the dry upland, the sensitive fern can well be used for the lower portions, coming out into the open from any streamside shrubs. The lady fern may be used for the higher places, extending into the sunlight from a hillside woods. Masses of the hay-scented fern may be used here and there, outlining a pathway or any chance tree or boulder in the open field, or it may be used to give a unifying effect to the open spaces. While these suggestions apply to the larger open spaces, these ferns may be used for smaller open areas provided the growth of each fern is kept in control.

All of these ferns are effective during May, June, July and August, but by September interest in them will lessen unless they have been cut. If cut all of them will develop a second growth which has a delightful freshness and will be good until late frost. The fertile fronds of the sensitive fern are interesting until the new fronds appear the following spring.

TABLE II

Season during which the ferns of the open field association are green

Name of fern	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Asplenium Filix-femina Lady fern	----	----	----	----	----	----	----	----	----	frost		
Dicksonia punctilobula Hay-scented fern				----	----	----	----	----	----	frost		
Onoclea sensibilis Sensitive fern	----	----	----	----	----	----	----	----	----	frost		

2. The shrub association. As the shrubs encroach upon the open field the situation changes. There is less direct light and less exposure to drying winds, and the falling leaves of the shrubs make more humus than the grasses. Here the brake, *Pteris aquilina,* gets a firm hold. This is the only fern commonly found in this association.

Pteris aquilina

Brake

This fern sends up strong, erect stipes, chestnut brown in color and one to eleven feet in height. These hold aloft deeply-grooved leaf surfaces. The rhizome creeps twenty or more feet a year. It is hard to start, but equally hard to check, although a foot-path will stop its spreading.

It begins to grow the last of April and by late August the spores are ripe. The latter may be collected from August through September. They will develop thalli in eight weeks and sporophytes in six months. In a year they will develop into a small plant. They grow best where there is good drainage and will cover large areas to the exclusion of all else.

This fern can vie with the shrubs and not get lost. It is rampant and can best be used in large areas, perhaps to outline in undulating masses the boundary of an open sunny, shrub-bordered space.

It makes a splendid transition from margins of large sunny areas to shrub borders, outlining them very definitely with its stiff stipes supporting triangular fronds. The foliage is good from May until October.

Distribution of brake fern

TABLE III

Season during which the ferns of the shrub association are green

Name of fern	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Pteris aquilina Brake fern					---	---	---	---	---	---		

Margaret DeM. Brown

Pteris aquilina *Brake fern*

3. The juniper association. The environment of the juniper association is less variable than most of the others. The area is usually rocky and well-drained, the rocky outcrop giving an exposed surface, but with so many crevices that the ferns can be tucked in as individuals or groups. Nearly all of the ferns that grow best in such places are the kind that have such interesting qualities that they should not be used in mases. Large groups may be used, however, if not too closely planted to lose their individuality.

The soil in the many pockets is very spongy. In fact, little soil can be shaken out of the fibrous mass of roots which usually form a blackish mixture. The Junipers shade the ferns well at times during each day giving them a fairly dark situation, while at other times they are in full light. The temperature beneath or about the junipers is appreciably less than that of the open situations near at hand. With this environment in which the changes are not rapid, there are four ferns that may be used. All are evergreen. The seasonal changes in the ferns in such an association are less marked, for the new growth is not so noticeable. This constancy adds to the attractiveness of this association. The following ferns are found here:

Asplenium platyneuron, ebony spleenwort

Asplenium Trichomanes, spleenwort

Polypodium vulgare, polypody

Woodsia ilvensis, woodsia

Asplenium platyneuron
Ebony Spleenwort

Perky is perhaps the term which best expresses the effect of the ebony spleenwort. The black-purple, shining stipe of the fertile fronds, which are from eight to twenty inches high, stand stiffly erect among the tufts of sterile, six-inch fronds. All of these fronds are but two inches wide. These tall wands give the fern its summer aspect. In winter the fertile fronds drop off and the plant is recognized by the auricled pinnae of the sterile fronds. The auricled pinnae differentiate it from *Asplenium Trichomanes.*

Young ebony spleenwort

The spores may be gathered from August until late fall and will keep, at least, for a year. They will develop thalli in three weeks from the time of sowing, and in two and one-half months the young sporophytes will have good roots.

Distribution of ebony spleenwort

Asplenium platyneuron can be well used in a rock outcrop where there are numerous rock pockets. To really appreciate this fern one must get a frequent glimpse of the close, rosetted, vegetative fronds securely embedded in the rock pockets. They need to be set off by the rock background which balance the wand-like, fertile shoots.

They should be at least six inches apart and have plenty of good porous soil in which to have their thick mass of fibrous roots get a foothold. This fern can be used in the house in winter, but had best be put out of doors each spring and brought in, in the fall.

Margaret DeM. Brown

Asplenium platyneuron *Ebony Spleenwort*

Asplenium Trichomanes
Spleenwort

If any spleenwort should have the popular name of "ebony" this one should, for the dainty rosettes of bright, wiry stipes, purple-black in color, standing out in spreading tufts, are its outstanding characteristic. The roundish, shiny pinnae do not conceal the ebony stem nearly as much as do the pinnae in *Asplenium platyneuron*.

There are many fronds of equal length, from four to six inches, coming out at the surface thus giving the plant a spread from eight to twelve inches. The plant always appears airy and dainty. It has not the denseness of *Asplenium platyneuron* whose pinnae are packed on the stipe. This plant is found all over the United States, but is rare in appearance if not in distribution.

Spores may be collected from late August through September and if sown immediately will develop thalli in seven weeks and sporophytes in six months.

The two year old fronds should be cut off as the pinnae drop off and leave the bare stems, for there is always enough new growth to give a luxuriant mass of foliage. The plants may be tucked into as many crevices or nooks as one has available.

The plants should be planted at least six inches apart for each one is a unit. Furthermore, they should be planted in a place where there will not be too much moisture. This fern, too, may be used as an indoor winter fern and treated like *Asplenium platyneuron*.

Distribution of Spleenwort

Asplenium Trichomanes *Spleenwort*

Polypodium vulgare
Polypody

Another evergreen fern of the juniper association is the polypody. This fern offers enough substance in color and form to cover large areas, especially capping boulders and even sharing attention with the boulders themselves. The plants rest on the surface of the boulder in the rich, black earth which has been formed from the wash of the rains and their own decay.

The sturdy, fertile fronds are like the sterile ones and they arise in close series on the wide-spreading, creeping root stock. The thick, leathery fronds are from four to fifteen inches long. They come above the ground line in early spring and reach maturity in July. New fronds appear in succession during the spring and summer. They spread flatly, close to the surface, curling up when it is dry but quickly reviving again when it is moist. The cold of the winter has much the same effect upon them as lack of moisture.

The spores may be collected from the first of July until October. They keep their vitality for at least a year. In fifteen days from planting they will develop thalli and in six months the sporophytes will have been formed.

Polypody has the same firmness, the same definiteness of line as the well-known Christmas fern, but forms a lower, springier mass.

The polypods always give the feeling that the ferns are off on a picnic and are just coming together for lunch. They, too, may be used for an all-year-round fern for the house.

Distribution of Polypody

Polypodium vulgare *Polypody*

Woodsia ilvensis
Woodsia

Woodsia ilvensis is the fern to use on the sunnier rocks of the juniper association. It forms a whorl of fuzzy fronds which are from two to six inches long. The fuzziness is due to the small brown hairs on the under side of the leaves. After a rain or on a moist day, the fronds unfold showing their upper sides which are gray-green.

This fern makes a transition from the gray stone to the greener and more luxuriant ferns of the association. It harmonizes with the junipers for it has much of the gray-greenness of the juniper leaves.

The spores are ripe in July. They are more difficult to culture than most fern spores, as they very often are infected.

The plants are easily transplanted and require little soil to become established.

When using woodsia on dry, exposed rocks, plant at least eight inches apart and do not cover the upper portion of the crown.

No two rocky outcrops are ever the same, so one can use a rather extensive area and still not be at a loss for worthwhile variation in fern plantings. *Aspidium marginale,* though most at home in the oaks, can best be used in interrupted plantings

to define the juniper association as a whole. With boulders or stone walls this fern offers a variety as a boundary. Walls may be used on two sides and the fern on the other two as the area blends into another association. *Pteris aquilina* has a use in such a place as an outlying plant in the stretches between the juniper-capped, rocky outcrop and open sunny ledges.

Margaret DeM. Brown

Young woodsia

The ferns of the juniper association have several interesting combinations. *Asplenium platyneuron,* with a sprinkling of *Asplenium Trichomanes,* always offers a surprise. One's first reaction is that *Asplenium Trichomanes* is a young *Asplenium platyneuron,* but thicker rosette masses, as well as the detail of the frond itself, distinguish it. *Asplenium platyneuron* without its stately, fertile frond often passes for *Asplenium Trichomanes. Woodsia ilvensis* can well share honors in adding interest to a choice juniper group. A sunny situation can be given to it. It is more often a question of not having enough of a juniper area in which to use the ferns, rather than having too little fern material that may be grown there.

Distribution of woodsia

Woodsia ilvensis *Woodsia*

TABLE IV

Season during which the ferns of the juniper association are green

Name of fern	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Asplenium platyneuron Ebony spleenwort	----	----	----	----	----	----	----	----	----	----	----	----
Asplenium Trichomanes Spleenwort	----	----	----	----	----	----	----	----	----	----	----	----
Polypodium vulgare Polypody	----	----	----	----	----	----	----	----	----	----	----	----
Woodsia ilvensis Woodsia	----	----	----	----	----	----	----	----	----	----	----	----

4. The gray birch association. In the gray birch association the light sifts through, except in late summer when the foliage of the birch shades the ground; so the amount of light varies with the season from quiet full light in early spring to fairly good shade in late summer. The temperature of this association varies very little from that of the surroundings. The soil, in most instances, is thin and water is poorly retained. The thin grass or moss covering receives much of the water that falls in the form of rain or snow, but does not retain it for long.

The two ferns which will establish themselves in this environment are:

Polystichum acrostichoides, Christmas fern.

Pteris aquilina, brake.

Pteris aquilina has already been discussed in the shrub association. *Polystichum acrostichoides* seems at home here, but doubtless was originally established when the area now covered with birches had been, at some time, in pines. When various associations are established their very establishment changes the environment. The light becomes less, the shade from the plants of the association holds the moisture of the atmosphere, and a new association of plants becomes established. For instance, the gray birches are usually followed by an association of pines, hence when the pines are cut off the light becomes comparable to the condition when the birch first came in; but the Christmas fern, being there, is able to continue in the environment made by the birches.

Polystichum acrostichoides

Christmas fern

This evergreen fern with its long fronds of firm, leathery texture, coming up in circular clumps at the end of stout rootstocks, is one of our most conspicuous ferns. The young fronds are covered with silvery-green scales and are quite in contrast to the shiny, dark-green, fertile fronds and broad, sterile ones. The young, light-green whorls match the color tones of the developing birch leaves. The soft sheen on the leaves of fern and tree helps to give to the birch association a well-kept, clean appearance.

The spores may be collected any time from August until late fall. It is best not to wait until too late for the spores will have fallen off. In less than four weeks after the sowing of the spores the thalli are of good size and in four months the sporophytes are well developed.

This fern responds readily to cultivation, but the crowns when planted must be placed just at the surface of the soil.

Polystichum can be used as a high ground cover. It does not give the compactness of most ground covers yet it gives lightness and can define green pathways through the white tree trunks of the birch planting. By gradually thickening the planting the fern can be made to drift away to the outer boundaries of the birches into the pine association. *Polystichum*, with its evergreen and shiny surfaces, emphasizes the whiteness of the birch stems and plays up the sheen of their leaves. It has been well used on a birch hillside against a rock bank massed with this fern.

Should a drier portion of the gray birch blend into a sumach planting, *Pteris aquilina* will form a transition undergrowth. Its firmness of frond and its definiteness of stipe blend the birch with the blackness of the sumach stems.

The Christmas fern is effective throughout the year so any place in which it is used holds the design as long as it is not covered by snow. The simplicity of this association gives it singular dignity. The greenness of the fern and the whiteness of the birch, brushed with black, make a picture which is cool without being cold, dainty without being fragile, and dignified without stiffness.

Young Christmas ferns

Distribution of Christmas fern

TABLE V

Season during which the ferns of the gray birch association are green

Name of fern	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Polystichum acrostichoides Christmas fern	----	----	----	----	----	----	----	----	----	----	----	----

(*To be continued*)

Polystichum acrostichoides *Christmas fern*

Collecting Plants Beyond the Frontier in Northern British Columbia

PART V

Mary G. Henry

June of 1932 came and with it a great longing on my part to revisit the wonderful, unmapped mountain wilderness of the North. Several telegrams to K. F. McCusker, D.L.S., and a trip was hastily arranged. In a few days I was on my way again, accompanied by my daughter, Josephine, and her six-month-old collie pup. This trip was my ninth visit to the Rocky Mountains, ranging from southern New Mexico to northern British Columbia.

The first time I went West, like many tourists, I did not leave the well beaten highways. My next seven trips took me far into the mountains. I always travelled on horseback with a pack outfit ,and anyone who has journeyed thus through that wonderland of North America, the far-famed Rocky Mountains, well knows it is the only worth while way to go in order to see and appreciate their magnificent and awe-inspiring beauty.

The long train journey west is never monotonous to me, for my mind is always thrilling with the exciting anticipation of unknown adventure ahead.

On July 13th, after six days en route, Josephine and I alighted in Dawson Creek, the end of the railroad, about 2 A. M. The town was very small, very dark and very muddy. Several weeks earlier there would have been no real dark period during the night at this latitude, but now the sun set a trifle earlier and rose a trifle later, so there was a brief period of darkness. It was but a short walk to the primitive little hotel, where with only "Come on girls," we were ushered to a room by a sleepy proprietor.

Almost any discomfort can be put up with for a short time, but we were ready and glad to breakfast four hours later, at six. McCusker joined us and we left soon after by motor car, glad to be on our way. Our only voluntary stop was at the office of the Chief of Police, where Josephine and I each obtained a free miner's license.

We covered the 48 miles slowly, owing to the condition of the road, when we came to Taylor's Flat. The place, which consisted of one small four-room inn at the foot of a bank on the Peace River, was of sufficient importance to be marked as a town on the map!

After a lunch of moose meat we embarked in an open skiff, equipped with an outboard motor, and set out on our way up the river. We made poor time over the 42 miles, for we had to buck the current of the swiftly flowing river all the way.

It was dusk when we came to the mouth of the Halfway River, about 11 P. M., where our outfit was encamped and waiting for us. The men who accompanied us were McCusker, Canadian Government Topographer, our outfitter; Smoky, horse wrangler, and Ben, an Indian; all of whom were with us in 1931, also Jack, a cook. These four, our two selves, 21 horses, and the dog formed our little party.

Our tent was already staked out overlooking the river. In a few minutes we had unpacked our sleeping bags and

K. F. McCusker

In the pass north of Robb Lake
Jo and Lou to the left, Chum and I to the right

belongings, and in a few more minutes Jo and I were comfortably stowed in them for the night with Pepper, the collie, cosied between us. And so I slept as I like to sleep, with Mother Earth for my bed and only a strip of canvas between the stars above and me.

We awakened early, rejoiced to see a good day, and listened for that pleasant sound, the jingling of the coming horses' bells. Soon we heard them tinkling in the distance and then came the rush of their galloping feet, accompanied by Smoky's loud hah! hah! and so our day began.

We hurried into our clothes and joined the others at breakfast. I was simply overjoyed to learn that Chum was again to be my "running mate" and could hardly wait to feel his big black body swaying beneath me as, covering mile after mile, we wended our way into the mountains. Lou, Jo's favorite horse of the previous year, was there, too, for her to ride. We were delighted at the prospect of renewing our acquaintance with these faithful and entirely efficient four-footed friends.

I was again collecting herbarium specimens for the Royal Botanic Garden, Edinburgh, also the Academy of Natural Sciences, Philadelphia, and this season Jo was collecting insects for the Academy.

After breakfast came the great question where to go. My own mountain, Mt. Mary Henry that I longed so utterly to visit, was not for me this summer. Not for me to wander near her base, beneath the trees so tall and slim and darkly green, nor to gallop gaily over her blooming meadows. Not for me the flowers that bloom far, far up her sides with all a mountain flower's wild, sweet ecstacy. The misty, splashy waterfalls that must be leaping down her sides from melting ice and snow, the spray that shows a thousand rainbows and helps to form the stream below, and the deep, clear pools into which I long to plunge, were not for me this summer.

We had no exciting goal in view, nor a so-called "Tropical Valley." This was just to be a quiet little trip to enable me, for a short time, to again taste the joys and vicissitudes of life in the wilderness and to breathe a breath of mountain, Rocky Mountain, air. It could not be a very long trip, but I thought I could accomplish some collecting and do a little exploring in about five weeks. So when McCusker asked me where I would go, I remembered the vast uncharted jumble of mountains west of Redfern Lake, that I had seen in the distance last summer, and then and there decided what we would do.

The map of the country around this section did not extend west of Redfern Lake, so I knew I should find what I wanted, and as for the flowers, I had only "scratched the surface," as far as they were concerned, in 1931.

There is always much sorting over and adjusting of packs to be done the first day, so I had time to get out my plant press and gather in a few specimens while waiting, and Jo managed to get some grasshoppers, etc., into her gas bottle.

When I saw chum all saddled, waiting for me to tie on my equipment and mount, and thought of the exciting weeks ahead, I was thrilled to the core.

The day had become very warm and the sun seemed to shine with an extra brightness after our seven days of travel. We started off on our little expedition at 11 A. M., July 14th, 1932. After crossing a meadow we climbed a steep hill where *Erigeron caespitosus* was growing abundantly on the warm slope. This pretty plant is a dwarf compact grower, about 4-5 inches tall and

B. H. Chandlee

Redfern Lake and the uncharted mountains beyond

bears comparatively large, many rayed, pale lavender, sometimes pink, flowers. On the level hilltop were thousands of large clumps of *Linum Lewisii* in full bloom. They were neatly spaced, about a foot or more apart, and the pretty pale blue flowers on 12-inch stems were all swaying gently in the breeze. Not quite so plentiful, but growing in amongst the linum, the deeper blue bells of *Campanula rotundifolia* made a pretty contrast. It was all so ineffably lovely, I was glad to loiter a few minutes to place some in my press.

We rode all morning along the dry rolling hillside just northeast of the Halfway River, and the view about us was indeed a fair one, as the river was constantly in sight.

But we, our horses, and the poor dog were hot and dry inside as well as outside, for we were far above the river and did not cross a stream, so we ate our sandwiches on horseback, without a drop to moisten them.

About 6 P. M., at the end of 21 miles, we came to Cameron Creek. By that time we felt as if we could drink the creek dry! After satisfying our

Mary G. Henry

Pepper with the "snowshoe" rabbit under his foreleg

thirst, we forded the creek and camped for the night.

The place was familiar to us as we had camped there the previous season. The small log cabin of a rancher named Campbell was nearby.

Smoky caught and brought to us a young "snowshoe" rabbit, which showed no resentment when it was placed in Pepper's care. The dog, being a well brought up Blue Merle collie, allowed it to snuggle against him.

We received several callers, from nearby outlying ranches, who stayed late into the night.

We arose early next day, packed hurriedly and started off without delay. Bill Beckman who was with us in 1931 joined us for the day's ride. *Shepherdia canadensis* was growing in half shade in protected places near the river. The berries had not yet ripened, but later in the season, with their ripe red fruits, clustered plentifully, close to the branches among the dark green leaves as they usually are, it will then be one of the prettiest northern shrubs.

In the dry meadows *Geum triflorum* was coloring large areas with its pretty pink seed plumes, *Delphinium scopulorum glaucum* was in bloom in moister soil, and *Rosa acicularis* was nearly everywhere. *Viola rugulosa* was at its height, its pretty lavender white faces looked up at us from almost every dark place in the forest and from open sunny spots in many meadows, too. *Linnaea borealis,* my favorite flower, when as a child of seven I first learned to love the forests, was just as sweet as it always is, and clumps of *Cypripedium passerinum* were frequent in shady places.

The sun was high and morning was almost noon when Pepper, who had been following us nicely, gave a cry of distress. Bill's horse had kicked him, and the pup limped painfully. Jo had one of the men hoist him up and so she carried him across the bow of her saddle. The extra weight was hard on the horse and hard on Jo, too, and we were badly puzzled to know what to do. We had noticed that the trail we

Mary G. Henry

The covered wagon in real life

were travelling on was a wide one and had recently been cut over. We were riding through a thick forest when we came to a clearing, and there, we could scarcely believe our eyes, were two covered wagons!

I had thought the day of the covered wagon was gone forever, but not so, for here they were, large as life, and with all their picturesque accompaniments. A woman was cooking over a little iron stove set on the ground between the wagons, several small but happy, healthy children were playing nearby with a puppy, a calf was tied to a tree, and crates of chickens were piled high on one of the wagons. The sight amazed us. We dismounted and greeted them. Their men were ahead cutting trail, and their horses and cows had been turned loose to graze. I climbed up on one of the wagons and saw an infant asleep in a bed which had been fixed crosswise at the front of the wagon. I was told that a baby was sleeping in the other wagon too. Each couple was on its way to occupy a "claim." The pioneers who are settling in the Peace River region are a splendid type of people. It is wonderful to see what they are doing. Canada is a country of rich promise and unquestionably has a great future. The ranchers of the Peace River region hold many world records for crops, and I have heard the soil is so rich that the use of fertilizers is unknown. There are big opportunities undoubtedly waiting for bold souls who, tired of a humdrum existence, want to set out on a real adventure in a new world. It is a great life, but it takes a brave father to take his wife and young children

Mary G. Henry

Where the Graham River joins the Halfway River

into the wilderness. They are doing it, however, with unbounded courage. May they all reap a rich reward.

Mrs. Simpson, one of the women, was sympathetic about the dog, said she would gladly take him, and that he could travel with them in their wagon. Their cows gave plenty of fresh milk, she added, and Mr. Simpson frequently went hunting and would bring in meat.

We were most grateful for this unexpected kindness, and as Pepper's leg was broken, we had no choice, so we left him in their care, wished them luck and went downheartedly on our way.

At the end of the nineteen miles we camped on an Indian reservation on the Halfway River. We enjoyed our swim and, as usual, dressing in the warm sunshine was pleasurable. After supper we took a walk, as we so frequently did, Jo with her bug net, gas bottle and camera, and I with my press, trowel and my camera.

Many of the plants I had seen in 1931 were in flower, and as we were several weeks later I found many I had not seen before, which was most gratifying. *Mertensia paniculata* was about over at this altitude, but *Delphinium scopulorum glaucum* and *Aconitum delphinifolium* were blooming in all their regal glory. Afterwards we played the Victrola beside the camp fire, while we sorted our various specimens which always took quite a while so that it was late, as usual, before our work was done.

The next few days passed uneventfully, as we continued our way along the Halfway River.

Oxytropis viscidula, a pretty little

Mary G. Henry

The Indians emerged from the woods

plant with flowers in tones of purple, grew quite plentifully on dry banks. *Lonicera glaucescens* with handsome orange and flame colored flowers in dense clusters, was a compact growing shrub 3-6 feet high in dry sunny meadows, while in moist or shady places it was of semi-climbing or straggling growth. *Symphoricarpus albus pauciflorus,* a minute snowberry only 5-10 inches tall in sun or shade, could often be seen in dry grounds. *Salix Barclayi* made fine bushes 4-8 feet high in meadowland, and *Aquilegia brevistyla,* never plentiful but always very lovely, grew both in full sun or half shade.

On July 18th we camped on Cypress Creek opposite the last ranch beyond Hudson Hope. The owner, his full blooded Indian wife, and their children came to see us that evening. They seemed to enjoy the Victrola, and I enjoyed holding in my arms the first papoose I ever held. It was quite small and was tied tightly to a board. The outside covering was of black velvet and laced neatly up the front which made it look more like a small living mummy than anything I can think of. The Infant looked very clean and seemed contented and happy.

The next day, as usual, we started off rather early. But Jack, our cook this year, did not often call us before 5:30, whereas, Cliff, who ruled the meal tent in 1931, often called breakfast at 4, sometimes even about 3:30, and no one thought of disputing.

We soon were riding through one of those meadows that were so beautifully and abundantly strewn with delphinium, aconitum and polemonium. Before us was a forest and as we approached, two Indians on horseback emerged from the trees. They were picturesquely clad with much color in their costumes and their horses, caparisoned with elaborately studded and decorated bridles, were fine well bred appearing animals. The Indians waved their hands, smiled pleasantly and passed on.

Later in the day while riding down a dry, sparsely wooded hillside, large patches of *Castilleja fulva,* new sp.*

*Pennell, ined.

Josephine Henry

The sapphire blue spikes of Pentstemon procerus

were nearly everywhere. The flowers, in shades of tawny orange, bright orange and yellow, appeared almost like flames of fire darting from the dull, half shaded undergrowth.

A ride of twenty miles brought us again to the banks of the Halfway River, where, on the far shore, were about a dozen or more Indians. The water in the river was fairly swift and reached part way up our saddles, but the bottom was firm, so it was an easy ford. We turned westward along the north bank, the Indians all falling in line behind us. They followed us about a mile when we came to their encampment. There were about eighteen large lodges, or tepees, set up, and many Indians of all sizes overflowed from each one as the entire population came forth and stared at us quite frankly. Mostly their looks were friendly and many waved their hands. About 75 horses and many huge "huskies" were wandering about among the tents.

We had expected to camp here ourselves, but now, of course, we had to move on. So we continued our way for about two hours, when we reached a small creek near the base of Pink Mountain, where we stopped for the night. Jo and I crossed the stream by ourselves, and rode into a big meadow beyond, where we dismounted. There were many pretty flowers, and numerous beautiful butterflies were hovering above them which she wanted to catch. We decided to have our tent put up over here so set to work to unsaddle our horses. While busy at this occupation an Indian suddenly appeared from somewhere. He came right up to within an arm's length and then looked fixedly at us with wide open eyes. He looked as thought he thought we must have fallen from the skies. He was rather short and very dark skinned and carried a high powered rifle. He may or may not have been able to speak a few words of English, but all I could elicit, after

doing my best to be sociable, was a series of grunts, and we were glad he moved on.

There were some very large ant hills on a nearby hillside facing south. The largest one was triangular in shape and measured about 9 feet by 9 feet by 12 feet and was about 4 feet high.

We did not move on, the following day, for we had come 127 miles in six days and the horses needed a rest. Besides that, as we had been living on very simple fare, Jack needed to bake bread, and also wanted to show us what he could do in the way of fancy cooking. It took Jo and me a good part of the morning to get our now many specimens dried and in order.

Jack worked hard, there was ample proof of this at lunch time, and we could not begin to even taste all the elaborate dishes he had so diligently prepared. There was cold salmon, cold ham, hot baked beans, fried potatoes and string beans, hot biscuits, a freshly made mince pie, some tarts, delicious little pastries called "brownies," and an excellent fruit cake with white icing! We were greatly impressed, for we had never before seen a meal like it in camp.

After lunch Jo and I noticed no one was stirring and everything seemed very quiet in the big tent, so we slipped off by ourselves to climb Pink Mountain. We were of course heavily laden with our various paraphernalia. We crossed the stream, waded through some muskeg and then went on upward through a thick spruce forest. There were many game trails crossing each other in every direction, bear, moose, deer, etc. Soon we came to a growth of *Populus tremuloides*. These, before long, became more and more scattered and diminished in size rapidly until we were above timberline, and the mountain flowers, I was seeking, were blooming all around us. Great masses of *Rosa Woodsii* bearing small but bright pink very fragrant flowers, covered wide patches. Beyond these in dry stony ground, *Astragalus adsurgens,* 6-10 in., with flowers of a true blue, was abundant and a white variety was almost as plentiful as the type. *A. aboriginorum,* less attractive, was also in evidence. *Zygadenus elegans* was everywhere, holding up its 8-18-inch graceful panicle of creamy white liliaceous flowers. *Lupinus arcticus* and *Oxytropis saxi-montana* had both finished blooming.

The sun was beating down its warm rays against the dry baked slopes. We each carried a burden and the steep climbing made us warm. We were high above the trees. What a glorious feeling to be so far away from the rest of the world that we could do as we pleased. The sun and air felt good. We climbed around and lingered so long that, upon returning, we found we were late for supper.

The following day several Indians joined us, for a while, on our ride. After crossing Quarter Creek, our way was through a wide open valley which contained much fine pasture grass and some scattered dwarf willow and birch. *Pentstemon procerus* was raising its small, but very pretty sapphire blue flower spikes in every direction, amongst them some pretty pinks. I dug up some of these and then we went on our way, winding up and down hill, through pine, spruce and poplar forests, and every now and then a beautiful meadow. It was a warm sunny day and we at our lunch, a sandwich and a piece of chocolate, in the saddle.

Near the top of a small hill we passed a rough cream colored rock, the headstone of a grave. The name

Mary G. Henry

The grave of Angus McDougal, July, 1898

Angus McDougal and the date, July, 1898, was carved on it. Evidently on his way to the Klondyke, with a glittering, dazzling goal of goal before him. Alas! he fell, and this was the end of the trail for him. So, with this bold adventurer, along with others, it was all or nothing and the gravestone told the story of the end. May he rest in peace.

Some got farther on, some much farther, but, I have been told, none lived to reach their destination.

We found deserted sledges on the trail in 1931. These were a sad sight, for a deserted sledge in the wilderness, like the wreck of a ship at sea, usually means its owner has crossed the "Great Divide."

We camped shortly beyond, and next morning were awakened by the sound of large "snowshoe" rabbits hopping heavily on the ground, and we soon saw the black shadow of a nose poking against the tent. We arose to a glorious morning and

started off, soon after our breakfast of beans, bacon, flap-jacks and cocoa. After several hours we left the trail we had been following, and over which we had come in 1931, and turning west, we rode along the valley of the upper Halfway River for several days. We were constantly rising higher and the weather was brilliantly clear. We followed up the valley with its flowery meadows and fast flowing river, and then far ahead of us could be seen the beautiful mountains, many with snow on them, for which we were aiming.

The aconitums in the meadows were simply entrancing, with their quaint richly colored hoods, and grew so thickly it seemed, almost, as if a great blanket of richest royal purple had descended, in some miraculous way, to beautify the earth.

It was July 23rd, and although it would indeed have been hard to find a more enjoyable ride, the day had been a peaceful and uneventful one.

We soon came to some bad muskeg and somehow, while we struggled to get safely through the bogs and after that across the river, the pack outfit, which was behind, lost us and wandered off in another direction. After waiting for quite a while, the missing horses came in sight.

We soon left the river and rode high up along a mountainside until we commanded a magnificent view of the valley with the Halfway River far below us, and mountains rising up about us in every direction. McCusker, who was ahead, suddenly glanced around and in his quiet way said, "Goats." Jo and I were close behind and as we climbed a few feet higher we saw about twenty mountain goats, on the crest of a ridge, running up the mountain. Simultaneously the same idea came to us obth. We kicked our horses and in a few seconds we were chasing the goats as fast as Chum and Lou could carry us. Our horses seemed to enter into the spirit of the race and they tore over the ground as fast as their legs could go. We rushed right through the stiff scrubby growth of betula and salix, at top speed, and, scarcely turning aside for anything, we jumped rocks, gulleys, and any obstacle that happened in our way. Now and then I caught a fleeting glance of a bright scarlet castilleja or a yellow oxytropis.

It was great fun, and after an exciting run we reached and rounded up the goats and then dashed right among them, scattering them in all directions again and again. We each held our camera in one hand and our reins in the other, and we only seemed to touch the high spots as we fairly flew over the rough, uneven ground. We *did* snap a few, a very few, pictures, but that phase of this particular ride was not a success. We had a grand time, and the horses did, too, but I am not so sure about the goats. Mountain goats, however, while apparently no faster, last longer than horses, running up a mountain, and when we thought Chum and Lou had had enough we pulled them in, for, although panting and their sides heaving, they were so excited they still wanted to continue the chase. The goats went on up the mountain, except one old Billy who went down and swam the river.

Our pack horses soon caught up and in about an hour we stoped for the night. Next morning the temperature was but 26 degrees and everything possible was frozen hard, including towels, toothbrushes, bathing suits, shoes, etc., and all the vegetation was sparkling with frost. Jo and I started out after breakfast to collect specimens, while the men saddled the horses.

A beautiful deer, the lightest colored one I ever saw, almost a cafe-au-lait, stood on a high rocky bank not far off. With a background of dark spruces, and the river just below, it made a pretty picture.

Under foot the ground was hard and dry and there were countless mats of a dwarf form of *Antennaria rosea* which bore flowers of an especially deep color, in fact they were a real crimson and were most attractive little plants. The dwarf, singularly pleasing rosettes, composed of small strap shaped leaves and yellow, tassel like flowers, of *Crepis nana* were abundant on stony river bars, the crimson clusters of *Castilleja miniata* were plentiful in moist peat, and the large lavender, very showy, freshly opened flowers of *Erigeron salsuginosus* grew in rich well drained meadows and hillsides. The cream white blossoms above the pleasing mats of foliage of *Saxifraga tricuspidata* decorated the rocks, the pretty pink rose like flowers of *Rubus acaulis,* usually growing in moss, showed up in the shade, while growing in a dry meadow *Botrychium lunaria, Potentilla dissecta* and *Aconitum delphinifolium,* but 6 inches high, sprang from pale gray green lichen.

A four and a half hours' ride brought us to Robb Lake, altitude 4,300 feet, the source of the Halfway River. About one mile long and a half mile wide, this small lake, nestled so prettily in the mountains, is a real gem. It is, in fact, a Redfern Lake in miniature.

The water was delightfully clear and a narrow beach of whitish pebbles formed the shore. Fine spruce trees growing in deep moss sprang up beyond the pebbles. Several strikingly handsome specimens of *Mertensia paniculata* grew in isolated splendor in the pebbles, and the crimson blooms of *Pedicularis sudetica* dotted their mossy couch beyond. *Senecio indecorus,* whose dark crimson buds turned into orange flowers, was everywhere in grassland, along with bright blue *Veronica wormskjoldii. Salix glauca acutifolia,* an attractive dwarf willow, about three or four feet, grew near the edge of the lake.

It rained off and on all evening which always made it hard to handle my press, for it was almost impossible to keep the blotters dry, and during a wet spell of weather mildew was difficult to avoid.

The next day, July 25th, however, dawned bright and clear and, as quickly as possible, I looked over and watered my living plants, and put my drying specimens in order, by placing fresh blotters between them. The horses were to have a day of rest and we were to have a day on foot.

Jo, accompanied by Smoky, who was dubbed assistant bug collector, went off over the mountains. We always divided up so we could cover twice the amount of territory so, McCusker, and I went in another direction.

With difficulty and some discomfort we pushed our way through the pathless, heavy, dense growth of spruce trees that skirted the lake until we reached the far end where a beautiful waterfall about 500 feet high dashed down the mountain. We started to climb up right beside it. Most of the way was extremely steep, in fact, when I looked up at the waterfall it looked almost perpendicular and it seemed impossible to climb up this way. The rocks were often quite sheer and there was scarcely any foothold, or handhold either. There were a few rocky shelves but it was especially hard to make our way over

Josephine Henry

Saxifraga tricuspidata at 5,800 ft. elev.

these, for scrubby birches and willows were growing there firmly and the water and ice, coming down the mountain had bent them, so they all pointed downward, and it was difficult to climb up against them. Where there were balsams it was even worse. These places always made me think of the

Mary G. Henry

Waterfall at end of Robb Lake, where I climbed July 25th. Jo with her insect net

poor insects that become trapped in the hollow leaves of the pitcher plants, in which the stiff hairs all point downwards, making it impossible for them ever to escape.

Most of our way, however, was just straight up and up climbing, and we used our hands as much as our feet. Sometimes I started along a narrow ledge wondering if I could reach the other end or not before I fell, and occasionally it was necessary to jump over an empty space with scarcely any place at all to land. It was arduous work and the plant press, swinging from my shoulders, had grown quite heavy, was bruising my back and had, on more than one occasion, when it caught in a rock, almost unbalanced me. I was not thinking much about the flowers for I was in a hurry to get to the big alpine meadow that lay between the mountains above us.

A sudden blaze of vivid scarlet flashed against the sheer grey rocks, fairly took my breath, and made me stop short. It was *Aquilegia columbiana* growing happily in this rugged spot with all the fairy grace of its kind, but with such a sprightliness of blossom, and such an intensity of color as I had never seen in a plant of this family before.

The flowers were red, all red, and the sepals stuck out at right angles with with almost mathematical precision. They were just newly opened, and, borne on threadlike stems, were held high above the drooping buds and the beautiful maiden-hair like foliage.

Those who say there is no such thing as perfection in this world should climb the mountains of the Rockies. For beauty, that is perfect, beauty that is ravishing, lurks in these high hills. No precious gem so daz-

zling as one of these simple flowers. No setting so splendid as the magnificent mountain on which it dwells.

Not long after this I found myself in one of those great alpine meadows that I love so well. There was a parapet of high, rocky peaks surrounding it and snow lay in the hollows.

We followed along the stream that fed the waterfall. Flowers of course, in a gorgeous array were blooming on every side. *Pedicularis capitata,* crimson, and *P. oederi,* yellow, grew at about 5,000 feet. *Myosotis alpestris* was in great numbers, as usual, in rocky places, at about an altitude of 5,500 feet, and so was *Aconitum delphinifolium. Draba incerta,* dwarf and pale yellow, *D. alpina,* vivid yellow, *D. fladnizensis,* cream color, and *D. longipes** white all grew in moist stony peat, in full sun at about an altitude of 6,000 feet. *Gentiana prostrata,* but 1 inch high, so tiny and yet so marvelously beautiful with its gem like flowers of a perfect sapphire hue, could often be seen amongst them. *Saxifraga marshallii, S. adscendens, Arenaria Rossi columbiana,** *A. verna pubescens* and other small white things were abundant also.

We went up the valley until we came to a big bank of snow, altitude 6,200 feet, where from a small dark cavern, the real birthplace of the Halfway River, flower a tiny trickle.

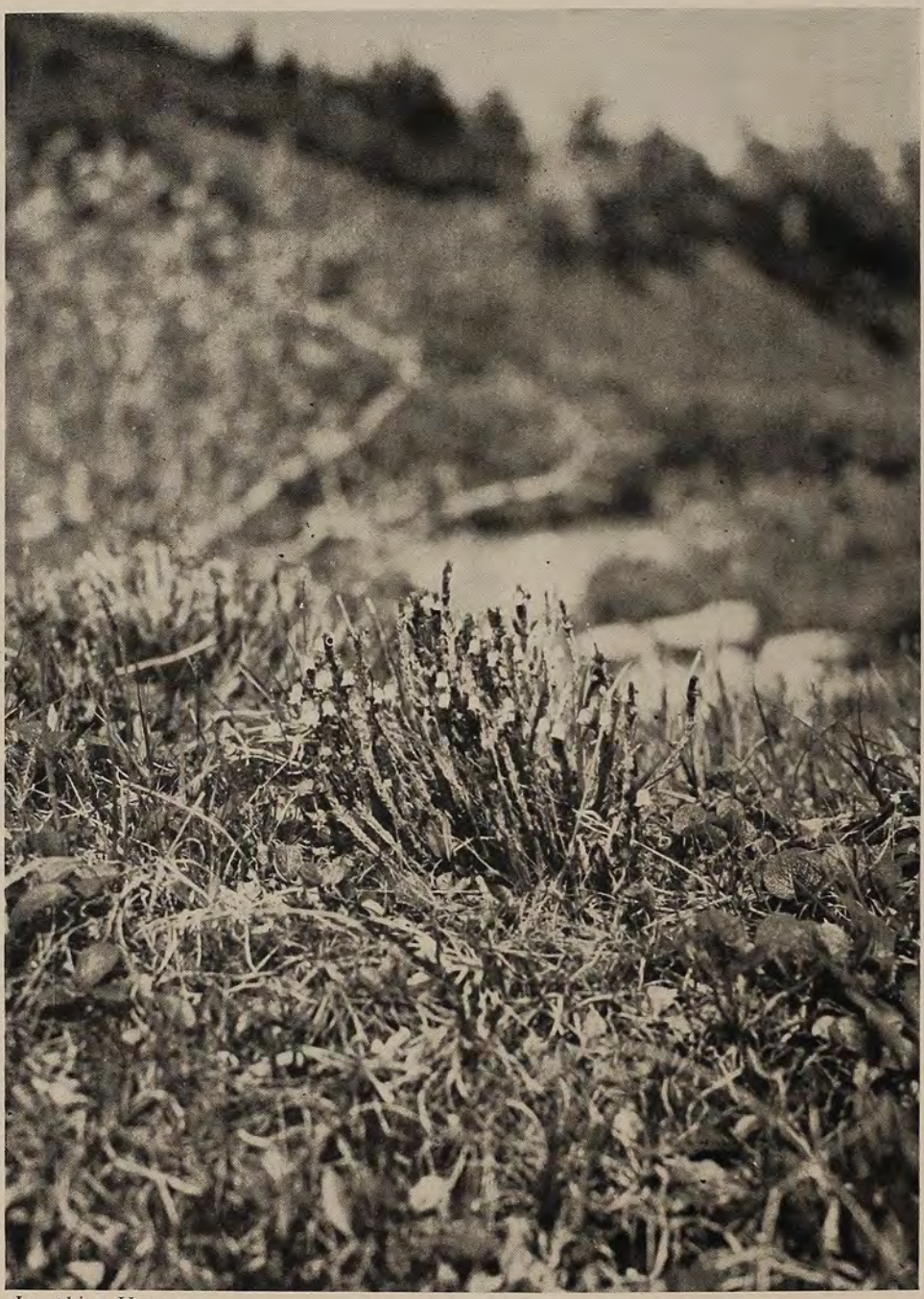
We found a dry rock and sat down and ate our sandwich. At least, I sat down for three or four minutes. I never could sit still in a place so wild and beautiful as this was. So I wandered about in search of hidden treasures. However, the treasures were not hidden here, but just lying around waiting for someone to enjoy.

This was the home of *Cassiope tetragona,* a small but very beautiful little shrub, only 4-10 inches high, and each of its tiny branches was hung with exquisite small white bells. Hundreds and hundreds of them were growing here, right up to the melting snow. *Phyllodoce empetriformis,* with flowers like miniature pink rhododendrons, another one of the most beautiful dwarf Alpine bushlets, was plentiful too. These two stand near the head of the list of American Alpine dwarf woody plants, and it always gives me a thrill to see these lovely little bushes on their native heath. *P. glanduliflora* grew among them, a lesser beauty. *Antennaria alpina,* a dainty everlasting but 1 inch tall was blooming near the snow and so were *Erigeron unalaschkensis* and *Caltha leptosepala.*

It was icy cold and we only remained about fifteen minutes, when we turned westward, for I wanted to climb the high mountainous rampart that bounded the valley. We soon came to a small glacier, it was steep and the ice was slippery and we had to go up it sideways, like crabs, but it did not take long to climb over it.

Unfortunately the sky soon clouded over and it started to rain. We kept on our way and soon we were at the foot of a very steep slope. By this time it was raining heavily, the wind was blowing hard and the rocks and sliding stones were so slippery it was almost impossible to make any progress. Sometimes, after a scramble, I found myself farther behind than when I started. The rain continued to descend in sheets, which precluded any possible view, and there was not a flower to be seen on this bleak, windswept slope. The blotters in my press were sopping wet and seemed to be on the verge of disintegration, and besides this, were growing heavier and heavier every minute. Night was not

*New sp., Raup.
**New var., Raup.



Josephine Henry

Cassiope tetragona

Mary G. Henry

Early morning mists at Robb Lake

far off and there was but one thing left to do. We turned.

We fell several times on the way down, for we were going as fast as we could and the ground was very rocky and uneven. When we came to wet, grassy slopes, they seemed just made to slide on, so I descended on these in a sitting position which was really lots of fun.

We soon came to the waterfall and we slid part of the way down near this, too. I stopped and dug up several *Aquilegia columbiana,* for which I had been saving two empty cans. By this time we were quite warm again.

In a little while we were beside the lake and in a few minutes more I was removing my wet clothes, in the tent.

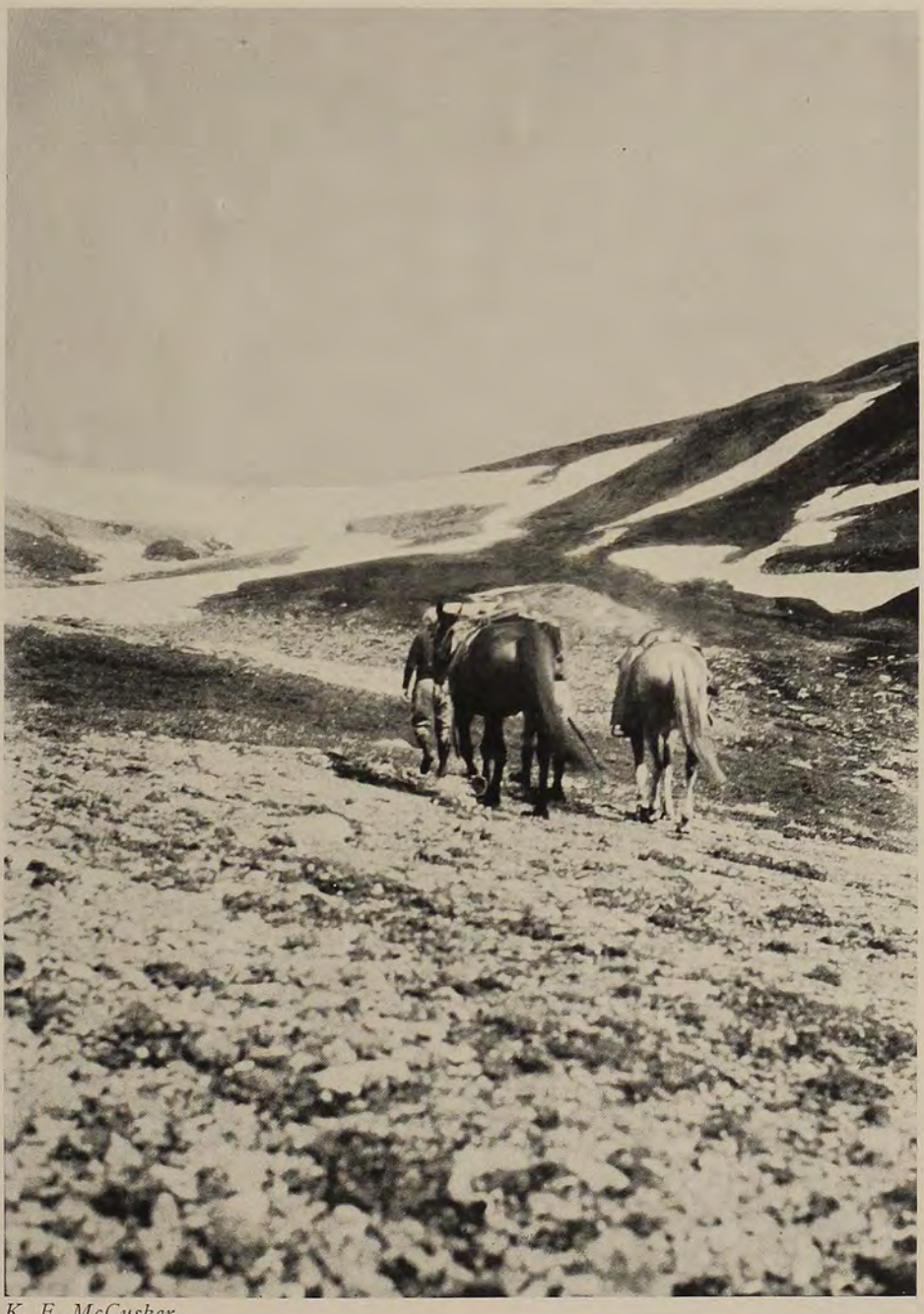
Jo soon came in. She and Smoky had climbed a high pass. They got numerous insects and saw three sheep. We took a swim in the lake, and although it was cold and rainy we found it most refreshing and enjoyed it very much.

Next morning we made an early start and together with McCusker we rode over a high pass north of Robb Lake. The way was very rocky, so we sent the pack horses by a different route. As we rode up the mountainside we looked down on the lake, now far below us. It was very beautiful, for the morning mists were rising but the sun was not visible, as it was a cloudy day.

There was a very faint old Indian trail in places, but most of the time there was no trail at all. We were soon above timber line and well on our way to the Pass. There were mountains on each side of us, and before long we came to where snow lay

Mary G. Henry

Lupinus arcticus against the snow; alt. 6,300 ft.



K. F. McCusker

Snow blocked our way over the pass north of Robb Lake

Josephine Henry

Anemone narcissiflora; about 15 inches high

Josephine Henry

Dodecatheon frigidum

in patches. It was all very wild and very beautiful as are, indeed, all high passes.

Large and small mats of *Dryas integrifolia* were everywhere and great patches of *Lupinus arcticus,* whose showy blue flowers formed a striking note of color even against the snow. Low, soft gray mounds of *Oxytropis arctobia,* studded generously with pale purple blossoms, were too lovely for words. *Braya Henryae** grew here a pretty little tufted plant with cream white flowers, 4-6 inches high, *Saxifraga tricuspidata* frequently draped wet rocks, and *Arnica obtusifolia acuta,*** in yellow, grew in wet grassy places. *Myosotis alpestris* was beautiful as usual. We went on up to where the snow was very deep. McCusker thought it impossible to take the horses farther, so we retraced our steps for a few miles when we joined the trail that went north over the Caribou Pass. There were a few showers but these did not spoil our pleasure. We ate our sandwiches in our saddles as we rode slowly up the long slope

*New sp., kindness of Dr. Raup.
**New var., Raup.

Mary G. Henry

The home of Primula egaliksensis; white dots are flowers; alt. 5,500 ft.

that we came down in a snow storm the year before. Almost every foot of ground was now abloom with scarlet paintbrushes, yellow paintbrushes, blue lupines, pink roses, purple monkshoods blue delphiniums, and yellow sedums (*Sedum stenopetalum*), etc. Everywhere, for miles, the mountainside was a blaze of color, the most spectacular I ever saw in my life.

We climbed on up, the bright array of flowers continuing on every side. In a hollow, altitude 5,200 feet, I first saw *Anemone narcissiflora*. It grew in clumps 12-18 inches high and bore very large broad-petalled flowers of most perfect form, colored a rich soft cream, undoubtedly one of the very loveliest flowers I ever saw.

Higher and higher up we went until we were almost on the summit of the Pass. The day had cleared and a beautiful bright blue sky was overhead. Everywhere I looked were thousands and thousands of brilliantly colored flowers. It was a glorious sight with the snow laden mountains for a background. As always in these enchanting places, I was on foot, scanning every inch of ground, but never forgetting to glance every other minute at the marvelous panorama of mountains around us. I went on as slowly as I dared, bearing in mind the distance we still had to go before night.

I thought of the blizzard we encountered in 1931, but the world up

Josephine Henry

Primula egaliksensis
About natural size

here surely was smiling for us now.

Suddenly I spied a most handsome small plant. It was *Dodecatheon frigidum,* a little 3-inch bright crimson beauty. At first there were only a few of them and then in a few minutes there were countless thousands. They were growing along a narrow raised rocky ridge, that was moistened by the big snowbank a few feet above them. We lingered here a bit for this was the sumit of the Pass, and then we went on our way northward.

In about half an hour we came to timberline, altitude 5,500 feet, where we found our men unpacking the horses beside a little stream. It was a poor camp site for there were only a few small stunted trees and, in consequence, very little fuel. But the ground was fairly level and covered with a thick soft lichen, which would make a comfortable bed. Two small plants, *Solidago decumbens,* a pretty 3-inch golden rod, and *Gentiana glauca,* more interesting but a less attractive plant, grew in the dry moss near our tent.

With difficulty I struggled through a dense shoulder high growth of *Betula glandulosa,* to the little stream just below. There was a soft drappery of dark green overhanging moss, except, that, where the stream turned, a small gravel bar had formed. And then I saw a little flower I did not know existed up in these high hills. I could scarcely believe my eyes, as I looked at a tiny primrose growing in the deep moss. It was *Primula egaliksensis.* The exquisitely shaped little flowers, less than half an inch in diameter, were of palest lavender and grew singly or in pairs. They were held only 2 or 3 inches high and the little basal tuft was composed of 3 or 4 leaves each about one inch long, or less.

In the damp gravel bar there were many little plants in bloom, whose total height was less than 1 inch and whose breadth was about the same.

Had I seen no more than this one tiny flower, the trip this summer would have been well worth while to me.

(To be continued)

Grass

Opal Hays Glascock

It is a fact of life, is it not, that many things of every day existence are to a very large degree scantily appreciated. Things abundantly given are rarely highly prized. This is attributable, except among the truly ignorant, to pure thoughtlessness.

Year by year as the imagination and genius of man have contributed more and more to our comfort and joy of living, we have come to accept almost everything, except perhaps adversity, as a matter of course, until it requires little less than a miracle to evoke a cry of wonder or a round of applause. Years of experimentation are behind not only the mechanical invention but food products as well and in a larger measure than perhaps you may realize, food is grass.

People will go into ecstacy over a rare orchid and pass unnoticed the lowly grass creeping about the door step. Yet many people have never seen an orchid. It is just one of nature's beautiful ornaments while grass is life.

People in the world's great metropolitan areas where for square miles one scarcely sees tiny blades of green shooting up in the spring many times forget their dependence upon grass, but there are many to whom it is the first consideration of their lives.

There still remain hundreds of thousands of pastoral peoples who follow their flocks and heards from pasture to pasture, and the farmers whose problems for years have been among the most perplexing to the economists of recent times and still loom upon the political horizon today.

In a book entitled, "Grass," Meriar Cooper tells the story of how tribes in Persia, numbering one half million souls, twice a year toil over a great mountain range, up, up, into the very everlasting snows and down again to the life-giving grass. The drought of the last summer in the United States focused the eyes of the world on the plight of the farmer. Problems of crops as you will see are to a very large degree problems of grass.

No one knows the origin of grass. In the story of the creation we are told that the first thing brought forth upon the earth was—grass. After God had created the heavens and the earth and separated the water from the dry land He said, "Let the earth bring forth grass, and it was so."

Imagine if you c a n a grassless world! Without the closely woven net work of tough grass roots binding the soil in their tenacious grasp there would be no sure abiding place for man. The whole world would be nothing but a constantly changing scene at the mercy of wind and shifting sand. What is here today might be gone tomorrow. The tallest building could easily be completely buried and lost. There would be no solid ground in which even the mightiest trees could sink their roots. One familiar with the sea shore or the desert knows that a region of sand dunes never remains the same.

Grasses form the most important family of the vegetable kingdom. Of all plants they are the most common and the least commonly known.

Grasses are most universally dif-

fused of all flowering plants, there being no place where they are not found.

There is never a day the whole year round that grasses are not blooming somewhere. The grass flowers rival those of any plant in variety and brilliance of color. The infinite variety of form, size and color, the almost geometric precision of design in some of the micriscopic flowers are a wonder and a delight. With their swaying stems, drooping leaves and delicate structure, some as fragile and exquisite as old lace, the grasses are exceedingly —graceful.

From the bamboos some of which tower to a height well over one hundred feet the grasses scale down to some so tiny that their highest blossom is but a few inches above the ground. Some have stems as delicate as a thread and break at the slightest touch, others are so sturdy that they can support the great weight of heavy snow without scarcely bending.

The greatest number of species is found in the tropical zone but the greatest number of individual plants of a given species is found in the temperate zone, where they form great areas called turf.

Regions that afford ideal conditions are the great prairies of the United States and Russia, the steppes of Siberia, the pampas and llanos of South America and Africa. On steppes and savannas grasses form scattered tufts. As the colder latitudes are reached grasses become relatively more numerous. They grow closer to the ground and have a mossy appearance. In the Arctic and Antarctic regions they are the leading plant family.

The natural vegetable covering of the soil in most regions, it is therefore evident is grass. Even where dense forests or other growth exist, if a little sunlight penetrates, some sort of grass will grow.

Even on salt marshes hay can be grown and on dry hillsides wiry grass grows which sheep and goats crop. Great ranges that produce practically nothing and in passing appear to be almost deserts maintain droves of sheep and goats.

In the far west many such ranges may be seen from the train windows. So dry are they that when the animals are being herded great clouds of dust roll up, and almost obscure them from view. When the animals are still, they are scarcely discernable being the same color as the landscape. It is a desert indeed where not even a goat can live.

On the farm, land left uncultivated, will revert quickly to grass. Pasture land has always been an important part of the farm. The different species of grasses are now being carefully studied with a view to improving pasture and the "laying down" of arable land where farming has not paid.

"Laying down" means sowing grass artificially. Usually a mixture is sowed. Many varieties will die, but the naturally suitable will increase and form what is called the sole of the pasture. Over one hundred species of pasture and hay field grasses are classified by botanists in Great Britain. There are many more besides these but there are only about a dozen of real value and perhaps six of great importance. The mixture of seeds prepared for laying down is called a prescription.

In the United States thirteen hundred species are indigenous and many thousands of others are found. It is interesting to know that one half of all the grasses classified in the United States are found in Texas. The term grass is popularly applied to green

herbage on which cattle and other beasts feed. It thus includes many plants which are not botantically related to the true grasses such as clover and alfalfa which are frequently referred to as artificial grasses, while it excludes many of the true grasses such as the cereals.

The true grasses of which there are between 3,500 to 4,000 varieties constitute the botanical family "Gramineae." They are divided into thirteen tribes. In Mexico up to the present time grasses of all thirteen tribes have been classified. One hundred and five genera are represented and four hundred and fifty-seven species.

Naturally it would be impossible to discuss even a considerable number of these varieties. No attempt what ever will be made to treat the subject scientifically or technically. The aim of this paper is to give a general survey of the subject and help the listener to gain some idea and appreciation of the enormous comprehensiveness of the term grass.

Before proceeding further it is well to say something of the—structure of the grasses. The stem with few exceptions such as Indian corn, sugar cane, etc., are hollow and jointed. The joints are called nodes and the portion between the joints are called internodes. When grass is blown over by the wind or beaten down by the rain the side of the node next to the ground lengthens in an effort to force the grass up-right again. Grass stem have a large amount of silica which serves also to keep them firm and erect. With the vegetable matter burned away from the stem a perfect skeleton is left. It is said that wheat straw without the addition of any other material whatsoever may be melted into colorless glass and barley straw into glass of topaz yellow.

The leaves grow alternately on opposite sides of the stem. For part of their length they are wrapped tightly around the stem forming what is called the sheath. Leaves of some varieties roll tightly in dry weather or soil or when the sun is very hot to prevent as far as possible an excessive loss of moisture.

Many grasses spread in all directions by strong runners or root stocks which are in reality underground stems consisting of a succession of joints from which the true roots grow and hold them to the ground. These types travel a long way from the parent plant and rapidly take possession of the soil This is also a means of assuring a continuation of the species. Bermuda grass, which may be a blessing or a perfect nuisance depending on where it is encountered, is a familiar grass of this type. Other types form tufts.

Grass seeds are stored with nutriment. They have great vitality and for that reason are well fitted for wide distribution. One can scarcely imagine the many methods which grasses have developed for transportation to new fields. Bur grass has thormy seeds which catch on to passing objects, some seeds are sticky and adhere to moving things. The panicles of some species when dry roll like tumble weed scattering their seeds along the way. Twisted awns of some seeds twist during dry weather and hold them where they fall. When it is damp they untwist forcing the seed into the soil like a cork screw. Experiment have been made by putting this type of seed into sand that is watered and dried alternately. The awns on certain grass seeds will bury them several inches beneath the soil. Terrel grass by thick corky scales floats its seeds upon the streams near which it grows. Beach grass refuses to let the sand bury it. It keeps pace with the rise of the sand

dune, sinking its long roots down to the base.

Grasses are put to a great variety of uses. Oil is made from some such as lemon oil and citronella which offer a defense against the torment of insects such as the Cuernavaca gnat. One variety is used to thatch the roof of the Malay archipelago, one stops the hemorrhages of negroes of Western Africa. Others provide stimulants and cosmetics in various parts of the tropics. Canary grass, a native of the Mediterranean region provides bird seed. Bird seed is also produced in Mexico.

Grasses have attained such importance that it may be stated truly that man may be housed, clothed and fed solely by the grasses.

Housing or sheltering suggests building material. Under this grouping let us consider bamboo, cane, rushes, reeds, and strange as it may seem papyrus.

The distribution of tropical bamboo of which there are several hundred species is very interesting. The species are about equally divided between the Indo-Malayan region and tropical America with only one species common to both. There are very few bamboos in Africa and none in Australia. One species reaches as far north as Virginia. In the Andes one variety attains the truly remarkable elevation of 15,000 feet which is almost the level of perpetual snow.

All of us are familiar with the little bamboo and cane houses, thatched with grass which are common throughout the tropical sections of Mexico. With necessary variations they are more or less the same throughout the tropical world. Among the more primitive people bamboo provides a large part of the household furniture and utensils as well. In Java natives uses bamboo for irrigation pipes. Intricate appliances for spinning are made from bamboo as well. The Japanese and Chinese have made an art of their creations with bamboo.

The United States government is experimenting with some 275 varieties on a farm in Georgia. Around $2,000,000 worth of bamboo is imported each year and it seems best to find which economic species is adapted to the country. The grove was started from Japanese plants imported by a Cuban. Mr. Lathrop of Chicago bought it and gave it to the government more than a decade ago. Experiments are being made in making paper, tooth brush handles, yacht masts, fishing poles, radio aerials, furniture, etc. One of the recent and increasingly important uses in America has been the use of bamboo shoots. The shoots sliced, peeled, boiled, and served with butter sauce, have been an expensive oriental dish which Americans took to at once.

Rushes and canes contribute thatch, fishing rods, materials for chair bottoms, pitch for wicks in open lamps, etc. One variety of rush called Dutch rush contains such a large proportion of silica it is used for scouring metals and other hard surfaces. A reed of Palestine belongs to a genus closely related to the canes of the United States. From this grass the heroes of Homer are said to have made their arrows, and with it to have thatched the tent of Achilles.

Everyone associates papyrus, now extinct, with writing material but how many have known of it as a building material? As you know it was a sort of reed or bulrush. Priests' sandals were made of it. It provided the principal material in the construction of light skiffs suitable for navigation on rivers. Art sculptures of the fourth century represent men building a boat with stems of the papyrus. The As-

syrians called in the reed of Egypt, and there is little doubt that when Isaiah spoke of "vessels of bulrushes upon the water," he referred to boats, built of papyrus.

Some credence may be given to the tradition that the miniature ark in which Pharoah's daughter found baby Moses tucked away among the bulrushes was made of papyrus. Perhaps it may not be too wild a flight of fancy to imagine that arch enchantress, Cleopatra, floating along the Nile on a barge of papyrus, working her wicked wiles on some Roman Emperor, fanned by slaves with fragrant fans made in India from root stocks of aromatic grasses; hidden from view by screens made of the entire plant which dampened and put in a current of air perfumed the breeze.

The rolls of papyrus on which history and literature were written are now called papryi. Under the Roman Empire papyrus was universally used, not alone for books, correspondence, legal documents, but to supply common household needs. So indispensable did it become that during the reign of Tiberius, due to a failure of the crop, it became so scarce and dear, that there was danger, according to Pliny, of the ordinary business of life being deranged. That it even touched ancient ettiquette may be inferred from the fact that in the fifth century Augustine apologized for sending a letter on vellum instead of papyrus.

So much for the practical side of uses in construction. Grasses also touch the aesthetic. Orpheus found reeds growing at the river's side. From them he fashioned the pipes of Pan with which he charmed the Dryads. One day a noted Divine was wandering over the hills of Palestine. He heard strains of sweetest music. Walking to the brow of the hill he saw a little shepherd boy seated on a rock playing on a reed instrument. He offered to buy the instrument. The lad refused the money but seemed happy to give it to him. Near by was a rude hut. Among its scanty furnishings was a vessel of oil with a piece of flax for a wick.

The little instrument was carefully packed away. When taken out in London for inspection, it was found to be slightly damaged. It was carried to various places in London and New York to be repaired, but never played so sweetly again. This is the story of the "bruised reed and the smoking flax." From these simple beginnings have developed the reed instruments which contribute so great a part to our mighty symphony orchestras of today.

Man may be clothed. It has been told how the earth is clothed. You all recall this little poem:

"Great, wide, beautiful, wonderful world,
With the wonderful waters around you curled,
With the wonderful grass upon your breast,
World, you are beautifully dressed."

It has already been stated that the grasses can cover you a house with thatch. They also can cover your thatch with a smart hat—the señor may look quite handsome in an expensive panama, and many a coquettish miss has made eyes from beneath a drooping leghorn or a smart Milan. In this charming land of mañana we have the ever-present sombrero.

Styles and expressions change. You are assured they are slenderizing. or they do a lot for you. Down in the lands of the warm southern seas when woman decided to dress up, grass skirts supplanted the fig leaf in her fancy. Today, a fetching grass skirt, is "the" thing there in feminine ap-

parel, not so slenderizing perhaps, but it does a lot for her.

In Japan and Formosa and right here in Mexico, grass raincoats are a common sight.

Man may be fed.

As stated previously, cereals are not popularly included in the term "grass," but they are true grasses, and make an enormous contribution to the life of man.

The word cereal is derived from Ceres—the name of the goddess of the harvest who searched with torches for the grain carried off by the winter frost. Bertha is the Ceres of German mythology. To the old peasantry of Russia and Germany corn spirits still haunt the fields under forms of wolves and goat-legged creatures. The grass wolf or the rye wolf is abroad when the wind passing over bends the grass and ripening grain. The last sheaf of rye is occasionally left as a shelter for the rye wolf.

Barley, in the opinion of Pliny, is the most ancient aliment of mankind. No less than three varieties have been found in the Lake dwellings of Switzerland, in deposits belonging to the stone age. One is the sacred variety of antiquity, ears of which are frequently represented plaited in the hair of Ceres, besides being found on old coins.

It is the accepted modern view that maize originated solely in America although a drawing of maize was found in a Chinese work on natural history, dated 1562. Some hold the view that it originated from the common Mexican fodder grass teosinte. Among those is Professor Pandurang Khankhoje, who, after eight years of experimentation here in Mexico, has arrived at this conclusion. Professor Khankhoje has bred corn down to teosinte, but has not been able to breed teosinte up to corn (except with the half of corn). His belief is that it developed by mutation. Last year, in an address before the Pan American Round Table, Dr. Morley, the eminent archeologist, said that some scientists advance the theory that corn is a cross between teosinte and some plant that is either now extinct, or growing in regions so remote that it remains undiscovered at the present time.

We know however, that North Americans Indians cultivated it years before the coming of the white man.

Oats and rye also have been found in the remains of the Swiss Lake dwellings, and probably date back to the bronze age. The ancient Germans made bread of them. The straw of rye is used in making hats, being especially prized for its length. The grain is extensively used for distilling. Rye whiskey has long been a famous beverage on the market. Possibly from its potency is derived the expression, "wry face."

Rice originated in India. It has been cultivated from time immemorial in tropical countries. A ceremonial was established in China by the Emperor Ching Ming 2800 B.C., in accordance with which the Emperor himself sows the rice. It is the staff of life for Asia's teeming millions, and gives sustenance to more people than perhaps any other food that grows. It grows wild along the shores of lakes and rivers in North America. The Indians gather it for food and serve it with wild duck. His white brothers, as well, regarded it as quite a choice dish.

Lastly, the most important cereal is wheat. It is the most widely diffused of the cereals. Its original home is thought to have been in Mesapotamia. Humboldt mentions that it was accidentally introduced into Mexico

with rice brought from Spain by a slave of Cortes.

Wheat straw is used extensively in the neighborhood of Florence as plaiting straw for hats.

Wheat farming, with all its ramifications, is an enormous industry. Bonanza farms in the Dakotas and Minnesota may contain from 3,000 to 10,000 acres. The smallest agricultural implement is a plow, the largest an elevator. Offices on these farms are connected by wire with the principal markets, and during the selling season, quotations arrive hourly. Fortunes are made and lost in the great wheat pits. Steamboats and railroads vie for the transportation of wheat. National prosperity is sometimes measured by wheat futures.

Sugar cane, while resembling more the bamboos, must be considered as a food grass. It is not known as wild plants, nor is its native country known. It probably originated in India, or some other part of tropical Asia, where it has been cultivated since great antiquity. Throughout Europe it continued to be a costly luxury and article of medicine only, until the increasing use of tea and coffee, in the 18th century, brought it into the list of food staples. Today it is regarded as a necessity to healthful living.

In a recent book on medicine just off the press, entitled, "Medicine Marches On," Dr. Edward Podolsky states: "Sugar is not only the most valuable of foods for the human body; it is one of the greatest of all medicines."

We have discussed grasses so far, mainly from the standpoint of food, shelter and raiment. They also have a place in art and literature. The Japanese have long used grass most effectually in prints and embroidery. The finest example of grass in art that I have ever seen was a screen exhibited in the Japanese Building at the Pan Pacific Exposition. It portrayed in solid embroidery a lion and lioness emerging from tall jungle grass. The figures were almost life size, so real and of such amazing workmanship, that coming upon them unexpectedly, one was actually startled. A small table in my sala is inlaid with what appeared to be heads of wheat.

Here in Mexico, many quaint and charming things are made of straw, such as, beautiful bags, baskets and mats, pictures of all sizes, even tiny designs suitable for place cards, remarkably well executed. Don Quixotes of the Sombrero, astride gallant chargers, await conquest and adventure. They conquer the hearts of the children and thereafter never want for adventure.

References to grass in literature are too numerous to be mentioned, except at great length. However, of all the books I searched to obtain the information contained in this paper, scarcely one failed to quote the Old Testament. This is readily understood for the Old Testament is the story of a pastoral people who owed their very existence to grass, who thought, cursed, exulted and philosophized in terms of grass.

I searched out some for myself, and they are so apt and so beautifully fitted to the subject, that in closing, I cannot refrain from quoting some of them.

Travellers who are familiar with the Holy Land say that the more arid parts of Mexico, like Guanajuato and the region round about, are very similar to Palestine. All of us who are familiar with little mud huts, with grass growing on the roof and from every little chink and crevice, can appreciate how realistic is this curse: "Let them be as the grass upon the housetop, which withereth before it groweth up,

wherewith the mower filleth not his hand, nor he that bindeth the sheaves his bosom."

Here is another. "He shall turn the rivers far away, and the brooks shall be emptied and dried up, and the reeds and flags shall wither—the paper reeds by the brooks."

Even way back in those times, those who cherished the age-old longing for social justice, cried out in terms of grass: "Let the brother of low degree rejoice in that he is exalted but for the rich in that he is made low because as the flower of the grass he shall pass away, for the sun is no sooner risen with burning heat but it withereth the grass and the flower thereof falleth, and the grace of the fashion of it perisheth."

Grasses even touched the crucifixion. We are told that when Christ was hung upon the cross, a reed was put in his hand. He was smitten with a reed and a reed was put into vinegar to give him drink.

The reed was also a measure. Dimensions were given as so many reeds. In Revelation a shining angel is envisioned, measuring with a golden reed the Holy City, which lieth four square.

As stated at the beginning of this paper, no attempt whatever has been made to treat the subject of grass scientifically. The grasses have not received the attention they deserve. Although the most important of the plants they have been quite neglected. The sole aim of this paper has been to give a general survey of the subject and to convey a faint idea of the vast importance of the grasses and man's dependence upon them.

In conclusion I can think of no more comprehensive or appropriate words with which to summarize than those of the prophet Isaiah: "Truly, all flesh is Grass."

Plant-Hunting in Old Mexico

PART I.

ERIC WALTHER

Photographs by the author

To the real gardener and plant-lover fate can grant no greater favor than a first visit to a foreign clime whence came some of his garden-friends. Few regions of the Earth have yielded more ornaments for our gardens than has Old Mexico, as is testified to by such names as *Cosmos, Dahlia, Fuchsia, Lantana, Tagetes, Cuphea,* Tuberose, etc. Largely Mexican, too, in distribution, is *Echeveria,* often more familiarly known as Hen-and-chickens. Having been engaged in an intensive study of the genus for some time, the writer long dreamed of a visit to its native haunts; and finally this became possible. Our excursion aimed not so much at the discovery of new species as a clearer understanding of old but imperfectly known ones, for which purpose a visit was planned to as many as possible of the recorded type-localities. Most of the early collecting had been done in the vicinity of Mexico City, hence an investigation of this locale promised greater results.

How much simpler and easier such journeys have become nowadays, at least as concerns the time-element, is shown by the fact, that, leaving Los Angeles Airport at 4:30 A. M. Pacific time, we actually arrived at Mexico City that same day before 7 P. M. Central time, or less than 13 hours elapsed time. Aside from the great saving of time, fully justifying the slightly greater cost, one has the unequalled thrill of flight over a new and strange land, with the advantage of a comprehensive birds-eye-view of its topography, etc. Most picturesque is undoubtedly the stage between Mazatlan and Durango, our route leading over a succession of deep barranca's rivalling the Grand Canon, if not in size, then in plant-life, as they are densely covered with vegetation from base to top. What matter if the ruggedness of the terrain is reflected in rough and bumpy air above; the 180-mile-an-hour speed of our plane, the latest model Lockheed Electra, soon leaves this behind; and tonight we shall sleep in a first class hotel, getting a better rest than we ever could hope for in the finest of Pullman cars.

Our first day in Mexico falling on Sunday and so unsuitable for making any calls, etc., was perforce devoted to sightseeing. Naturally a city with such a romantic past offers almost a surfeit of archeological, historical and cultural monuments; and its many glimpses of a foreign civilization constitute a most colorful pageant. For instance, the important 2-day holiday of All-Saints coming in the following week, one sees everywhere on sale immense floral wreaths 6 to 8 feet in diameter, in rather garish designs of silver and gold, blue, purple and orange, composed of such materials as *Vinca*-blossoms, marigolds, magnolia-leaves, etc. Peddled on every street corner at ridiculous prices are big bunches of orchids, at this season large *Laelia autumnalis* from the lowlands.

The famous floating gardens, so-called, at Xochimilco, well known to tourists, were thought worth a visit

Flower market in Mexico City, selling wreaths for All-Saints' Day

and furnished an hour or so of welcome relaxation while one is poled about the still canals among the flower gardens, listening to native music, catching a glimpse of our first wild *Cuphea,* etc. Returning by way of Villa Obregon, the finest specimen of *Cupressus Benthamii* we ever hope to see was photographed, and must have been fully 120 feet tall. Nearby on a recent, thick surface lava-flow, we found growing several salvias, and of course gathered seed since they were new to us. *Salvia mexicana* L. looked very promising, with its 6-foot tall thyrses of deep blue, 1 inch long flowers.

Next day, while making arrangements for trips, etc., an incidental visit was paid to the Bosque, or Park, of Chapultepec. Here are located the Herbarium and Library of the "Instituto Biologia." Sr. Ochotorena, its director, with Sr. Laguna and Senorita Bravo, Botanists, proving most helpful to our plans. Chapultepec Park, while only about 300 acres in extent, is very well laid out along naturalistic lines. It contains many fine trees; the most impressive of these are the numerous examples of *Taxodium mucronatum,* the Mexican swamp cypress, many of which exceed 100 feet in height and have trunks to 10 feet in diameter. A surprising discovery was that Mexico City's most commonly planted street tree is *Ligustrum lucidum.*

Next day we started on the first of numerous 1 to 4-day excursions that were undertaken. While largely concerned, of course, with visiting type-localities of Echeveria species, no one could or would remain indifferent to the floral wealth everywhere in the first full flush of Spring.

Cupressus Benthamii Endl., at Villa Obregon

Salvia mexicana Linn.

Strange as it may sound, in Central Mexico October is really the vernal month for most flowers, due to its being practically the end of the rainy summer season, and the beginning of drier and sunnier, if cooler, months. To see growing wild by the wayside such old friends as *Bouvardia, Begonia gracilis, Salvia patens* and *coccinea, Ageratum, Dahlia, Lantana, Camara, Eupatorium ianthinum* was a continuous temptation to forget one's real purpose. However, our first longer excursion took us to Pachuca, well known, not only for its silver mines, but also as the original source of many old-time garden plants, sent hence to Great Britain as much as 100 years ago. Here were first found *Echeveria secunda* and *elegans, Sedum moranense,* etc. Place names as Real del Monte, Regla are familiar to students of botany; and we were actually following in the footsteps of such well known travellers and collectors as Alexander von Humboldt, Hartweg, etc. Incidentally, one purpose bringing us here was to gather, if possible, specimens of *Arctostaphylos pungens* HBK., near its type-locality. According to some authorities, this species was supposed to range all

Taxodium mucronatum Ten., in Chapultepec Park

Subalpine meadow near Pachuca, with Abies religiosa, Juniperus mexicana, an occasional Bentham's cypress and Gentiana adsurgens

the way to the Golden Gate at San Francisco, on the face of it rather improbable. To settle the question, we hunted for Humboldt's plant near Real del Monte, and soon were rewarded by finding our first plants. Occurring with *Abies religiosa, Juniperus mexicana, Pinus leiophylla,* etc., these were root-sprouts springing up after a recent fire. The Mt. Tamalpais species never does sprout from the roots, but regenerates solely from seed, so that this fact alone serves to distinguish the species in question. Flowering plants found later furnished material by means of which Miss Alice Eastwood was able to once and for all prove the validity of *A. montana.*

Mention of firs, pines, junipers and manzanita scarcely sounds like Mexico, supposedly lying within the Tropics; but in fact all of this Central plateau rises to well over 1 mile in altitude. Mexico City proper is located at an elevation of 7,350 feet above sea level, many of the neighboring ranges ascend to 9 or 10,000 feet without reckoning the highest peaks, so that it need not surprise us to find the nights frequently rather chilly, and a warm overcoat welcome. The impress of the scenery and vegetation, at the higher levels, is really decidedly more subalpine than tropical. At about 9,000 feet *Abies religiosa* is dominant, forming almost pure stands, and in places attains a height of 200 feet. The lower temperatures and greater precipitation of this level also favor such associated plants as madrone, *Arbutus xalapensis, Comarostaphylis arguta, Fuchsia minutiflora, Acaena elongata,* etc. On the road to El Chico a meadow look-

Waterfall edged with Sedum confusum, in woods near El Chico

Pinus patula Schiede near Real del Monte

Echeveria elegans Rose in Park at Pachuca

ing truly alpine surprised us by displaying in full flower a pale blue, trailing gentian, *G. adsurgens,* scarcely what we had expected to see here in Mexico.

In the pine woods, *Pentstemon Hartwegii* was common, of interest to us as it is one parent of our common garden pentstemon, *P. gloxinoides.* A few other plants noted here may be mentioned, as *Vaccinium confertum, Symphoricarpos microphyllus, Baccharis* in variety, several oaks, including *Quercus microphyllus,* only about 1 for tall, *Salvia coccinea* and *patens, Buddleia cordata,* the last common throughout this region, *Verbena ciliata,* etc., all of which indicates that this region belongs into the humid transition zone. What seems to be typical *Echeveria secunda* Booth was here found growing on the north slopes of cliffs rising out of the woods; and near by the ground is carpeted with the arborescent form of *Sedum moranense. Sedum confusum,* too, is common here, and shows its liking for moisture by hugging even here the very edge of a waterfall. L. Praeger admits of no definitely known locality for this species in his monograph on *Sedum.*

Common at somewhat lower altitudes were two pines not unknown in California, and the South of England, i. e., *Pinus patula* and *montezumae.* Our photograph of the former shows a nearly mature tree; and an idea of its height may be gathered from our 6-foot guide, Mr. Otis McAllister, posed in the foreground. Even at this lower elevation we find an even more showy gentian, the deep purple-blue *Gentiana spathacea,* which might perhaps be more successful in

Farmyard at Omitlan, with Echeveria elegans in background

our dry California rockgardens than its more difficult high-alpine congeners.

One of our finest, most decorative and also fairly hardy *Echeveria* is unquestionably *E. elegans* Rose, by Dr. Rose stated to have been collected in the "Mountains above Pachuca." We hunted for this in vain, seeing nothing of it near Pachuca except a patch growing in a Park. Planted in form of a tortoise this patch was strangely reminiscent of the effigy-mounds built by the Indians of the Upper Mississippi Valley, and may possibly owe its conception to the same mysterious religious impulse. Similar designs can be seen frequently, sometimes taking the form of an alligator. Echeveria flowers are used to decorate wayside crosses and shrines, in preference even to other flowers, possibly because of their lasting qualities. By the ancient inhabitants of Mexico they are said to have been used as a token of remembrance; and that they are popular today is shown by our photograph of a farmyard at Omitlan, its boundary walls, etc., literally covered with masses of *Echeveria elegans* glistening in the sun like so many jewels. Spotlessly clean, this homestead was really a charming spot, with its ferns and flowers, cages of song birds and neatly paved yard. The lady of the house told us that the real home of the species was on the "Pena de Jacal" near Huasca, distant from Pachuca at least 150 miles. It was with reluctance that we turned back towards Mexico city, time being unavailable for a visit to the peaks in question.

(*To be continued*)

Plant Collecting in the Colorado Rockies

KATHLEEN N. MARRIAGE

Photographs by the author

We're setting out for a few days collecting of alpines on the Continental Divide, selecting one of the high passes from which several peaks may be reached. We pack up the Aphid—our green Ford cabriolet—the conveyance par excellence for collecting. When the top is folded back it is easy to see everything on perpendicular hillsides without making a corkscrew of one's neck, and it's light to lift out of holes in the rotten bridges encountered on forgotten roads.

Our equipment consists of spade, flower-press, camera, each collector's pack containing alpine trowel, geologist's pick and paper sacks of various sizes; canvas duffle bags, several metal boxes containing wet newspapers; food, sleeping bag, botany books and lens—for identification of new things at our lunch time stop.

We slip up late evening to Camp Aspen—our log cabin in the spruce forest on the north slope of Pike's Peak. Leaving there at six a.m., we drive to Wilkerson Pass where suddenly the whole panorama of the Divide appears. This view associates itself closely, pungently and pleasantly with wood smoke, coffee and bacon, for this is our breakfast stop. Sitting on this high ridge at seven o'clock on a summer morning in air so clear and thin that each sound, sight and smell is clarified, it is joy complete to sip one's coffee and look across to Princeton, Yale and Harvard peaks, Mt. Massive and the rest of them sixty miles away and to pick out just the spot on Massive where those pinkest *Primula Parryi* grow, and on Mt. Lincoln that valley where we found *Ranunculus Macauleyi* last year.

Fortified we set off across South Park through miles of sheep pasture, and meadows seamed with irrigation ditches which later will flaunt along their banks whole blue drifts of *Gentiana elegans* — Rocky Mountain Fringed Gentian—and on hummocks the white stars of *Parnassia fimbriata.*

By nine o'clock we are nearing the source of the South Platte and climbing we leave behind the Lodge Pole Pine, *Pinus contorta,* Blue Spruce and Douglas Fir, exchanging these as we go higher for the tall slender spires of Englemann Spruce, the rugged forms and bright green of Foxtail Pine, *Pinus aristata.*

Soon we are on top of Hoosier Pass, 11,000 feet above sea level where we leave the highway and take to an old mining road. The revival of gold mining saves us several miles of "packing" for now we can often coax the Aphid away up to 12,000 and 13,000 feet above sea level where mine shacks perch on one hip against bare rock slides.

Our first collection stop is in a moist squidgy valley where among the Englemann Spruces grows a wealth of *Trollius albiflorus, Primula Parryi, Anemone zephyra, Lewisia pygmaea, Sedum integrifolium, Arenaria aequicaulis, Viola bellidifolia* and *Gentiana acaulis*—and alpine form of *G. elegans. Trollius albiflorus* and *Anemone zephyra* have such clear cool unruffled mien—I wonder would we if we lived in their habitat! *Viola bel-*

Englemann Spruce and Foxtail Pine near Oliver Twist Gold Mine, Colorado

lidifolia is such a neat "little Miss Muffett." *Lewisia pygmaea* is a shy thing of lovely rose pink and literally a pigmy.

Around the turn just ahead is a grassy slope, a ravishing sight—blue-green grass thickly dotted and splashed with the clearest blue *Polemonium coeruleum,* aptly named for it is a truly heavenly blue. In about three acres of this there is one little patch of polemonium bearing flowers of clear ivory white—an unusual break. Here we stop to get a picture or two and a few plants, making a note to return next month for seed. Both note and later journey of no avail for polemonium as the mountain had meantime been what is locally known as "sheeped," a pernicious habit sheep owners have of grazing the high mountains in summer. What plants the sheep don't eliminate by eating all trace of flowers and seed—and don't they graze close?—they dig with their sharp trotters making erosion sure everywhere as they go down the steep mountainsides.

Now we are getting up to where the only timber is stray cup-and-saucer Englemann spruce and dwarfed wind-twisted pines. Soon even the shrubby mountain willows peter out. But alpines are beginning in earnest. From timberline to the summit is a progress of delight. The Aphid is left in a field of *Arenaria sajanensis* while we go on to the top, one of us up a rocky slide, another along the stream, puzzling how these streams from melting snow keep on even near highest summits, months

Trollius albiflorus (*above*), *Polemonium coeruleum* (*below*)

after all the snow has disappeared! Is it any wonder that alpines sulk in gardens where their feet are dry and their heads sprinkled every day? Along this stream there is a lush growth of *Cardamine cordifolia, Elephantilla* (Pedicularis) *groenlandica, Saxifraga arguta, Mimulus Hallii, Caltha rotundifolia, Ranunculus eximia, Castilleja sulphurea, Erigeron compositus,* and whole smoky rose pink drifts of *Castilleja Haydenii.*

The way over the rock slide is fragrant with the woolly round heads of *Gilia globularis.* This and *Rydbergia grandiflora* are plentiful. Both seem to have strayed up the mountainside and look out of place with their big gnome-like heads on short stems among the low spreading mats of typical alpines. Why does Rydbergia turn away from the sun instead of towards him as sunflowers do? (I'm taking Tom Moore's word for the sunflowers' behavior). Here too grow *Phacelia sericea,* an ugly unwashed looking wretch, *Lloydia serotina, Parynachia pulvinata, Anemone parviflora, Erigeron uniflora, Draba densifolia, Trifolium dasyphyllum,* and the ubiquitous *Silene acaulis.*

Now it's steep climbing up the scree slope and the mats of alpines become lovelier. *Phlox condensata* is fairest of them all this day, spreading about and flowing over rocks, pouring out its glistening white stars lavishly. It is one of the loveliest of the Rocky Mountain alpines, a tantalizing hussy difficult to transplant successfully and unwilling in the matter of seed—a scant crop and so slow to mature that it's nip and tuck to catch it ripe before snow. Young plants smaller than two inches in diameter have been less homesick than older ones but they are finicky about conditions and resent anything suggestive of a garden. In artificial scree containing no apparent soil, with live water flowing below their toes they condescend to grow and even to bloom. The ultimate achievement will be to get this to spread out naturally and to bloom happily.

Cheek by jowl with this is *Eritrichium argenteum.* Farrar's description is not one bit too glowing. It is the perfect alpine but a wild thing, intolerant of gardens. It grows and blooms in our artificial moraine under the same conditions as *Phlox condensata* but it doesn't sit up and twinkle as it does in its wild high mountain home.

In moist hollows are flat shrubby mats of *Salix reticulata,* anything but willowy, with its spreading habit and maximum attainment in height three inches. Its deeply lined leathery shiny leaves, dark green above and grey beneath, strike a note of compelling interest in the Rock Garden.

But it is almost dark and we have to navigate this not-so-smooth road. We drop down to the foot of the range for the night where there's a slab cabin camp, a wood stove and the thickest cream. Supper and to sleep to the music of the infant Platte tumbling over two hundred feet of rocky steep. Up again at 5 o'clock, for photographs must be early to be good where midday light is so intense.

There's a report, somewhat thin it's true, that *Aquilegia saximontana* (syn. brevistyla) grows on Mt. Silverheels. This and the story of Silverheels' name, told to us yesterday by an old prospector, draw us thither. The story of Silverheels—tut, tut, this is about plants, no place for stories of ghost mining camps.

The climbing is not difficult, plants give evidence of greater soil acidity

Arenaria sajanensis (above), Erigeron compositus (below)

Phlox condensata

than exists on others of the nearby mountains—more pachystima about timberline and several patches of erythronium at the edge of the highest snowbank. The only aquilegia in sight is *coerulea,* a truly lovely thing but we have several thousand at Camp Aspen so we're rather disgruntled at not finding *A. saximontana.* Pike's Peak seems to be its sole habitat and it's rare there.

Near the base—or should one say instep—of Silverheels is a sun-dried slope on which grow some good species of *Pentstemon humilis, alpinus* and *Crandalli.* This *Crandalli* is a delightful thing—the glory of the June rock garden, with linear almost filiform greyish green foliage, wiry erect six-inch stems holding upturned little faces of clear turquoise blue and producing them lavishly. This is easy to grow if not overfed or overwatered. In our garden it is entirely happy hanging by its toes between rocks in a dry retaining wall racing south, which in Colorado means excessive dryness.

Soon we reach the Aphid and start homewards. Stop! There's an interesting-looking thing on that steep sandy bank. Low neat spreading mats of greyish green tucking themselves in between rocks and snuggling up to them in the happiest way, miniature lupine foliage and lupine flowers. On investigation it proves to be *Astragalus aculeatus* and when someone finds out how to make it feel as much at home in a rock garden as it does there by the roadside near Fairplay, we'll all have another good rock plant.

All our most precious plants:

Eritrichium, Phlox condensata and a few others are in metal boxes lined with moist paper. The more tolerant ones in the paper sacks into which we collected them, several of these to a duffle bag. Some flower specimens are in the press and many more in a tight metal box with a wad of wet moss to keep them happy. All this careful packing is quite necessary for our 100-mile drive home is through air dry enough to cook to a crisp our precious plants if left exposed.

The start home from a collecting trip is usually reluctant for there's always that other little mountain road to follow and the canyon that suggested such possibilities. But the season of alpines is short and glorious and we'll be off to some other mountain next week.

The Culture of the Lake Iris

Wm. H. Atwood

About ten years ago one of my botanical friends told me that the Lake Iris, *Iris lacustris*, one of the rarest and smallest of the North American irises, could not be grown in gardens away from the northern, sandy shores of the Great Lakes. I at once felt a keen desire to see it in its native habitat and to try to make it live in my garden. The next spring I went in search of it.

Lacustris grows in the Door County Peninsula in Wisconsin and in other places along the shores of Lakes Superior, Michigan, and Huron. In Door County it is found only on sandy beach lines which mark the former levels of Lake Michigan. These old beaches are separated by swales in which water stands the greater part of the year. The sandy ridges of the eastern shore of Door County are low and remain moist throughout the year. They support a scrubby growth of black spruce and cedar, in the sparse shade of which, *lacustris* grows in moss which may be several inches thick. The sandy soil does not seem to contain enough nourishment to support a growth of grass or weeds. In spots where the moss is scant or absent, the Ram's Head and Yellow Lady slippers grow with the Indian Paintbrush and the Arctic Primrose.

When I studied *lacustris* in its native habitat and noted how definitely it was restricted to its typical environment, I felt sure that it would be a very difficult task to make it grow in my garden; but I was encouraged by the fact that some of the rhizomes which I found were eighteen years old and still alive. Their age was determined by counting the nodes of growth and assuming that one node was made each year. I have since learned that, although these old rhizomes may remain alive and green, they put forth new shoots rarely, if at all, and a slight disturbance causes them to die. I have found living rhizomes over two feet in length, but all new growth is from the growing end. Some of these are not branched at all, indicating slow increase; but in my garden I have counted twenty-five lateral buds from the terminus of a vigorous rhizome.

When wild plants are grown experimentally in a garden, it is usually wise to try to duplicate the conditions of their natural environment as nearly as possible; but if a plant is taken from a northern habitat to a more southern one, it may be advantageous to provide it with much more moisture than it seems to have in the north. This tends to offset the increase in insolation and temperature of the southern garden. I considered this and all of the other scientific principles of horticulture which I knew and planted a small bed of the Lake Iris in my garden. I brought it down from the north the first week in June when it was in bloom and planted it in a bed of sand, made by scooping out a place about four inches deep in clay soil and filling with beach sand. It had noon shade and morning and evening sun. I

watered it faithfully and fought off the grass and weeds. It grew much more vigorously in all of its parts than I had seen it on its northern beaches. In the early fall it sent up several flowering shoots and bloomed!

The next year I planted it in several places in the garden. All of it grew well. One bed was planted in clay in full sun. It grew like weeds, and is still growing. Thus I learned that it does not require shade, sand, or moss for good growth.

The next year I had hundreds of plants and tried numerous cultural experiments. I planted it in pure bog humus, in pure sand, in mixtures of both, and in various clay mixtures. I also planted it close to the north side of a garage where it received good light, but no direct sunlight. I tried acid, neutral, and slightly alkaline soils, each especially prepared. To my surprise, I was unable to detect any difference in its growth in any of these soils, except that possibly it was a little slower in the pure sand, and the plants with the most shade had the longest leaves and the most slender rhizomes. All of it continued to bloom in the fall. Usually fall bloom starts in August and continues until the end of September. It ceases fall blooming well before frost comes.

Once I set a wooden frame about two feet square in the ground and filled it with wood ashes. In this I planted about 100 plants and kept it well watered, but I added sand later to keep the rhizomes covered, because most of the ashes dissolved away. This bed was planted in the fall and grew the same as the others.

Recently, during the drought, I have learned that *lacustris* can not withstand excessive drought and heat. It simply dries up. But if its rhizomes are well covered and are set in clay soil, it can endure as much drought as any of the American irises.

In consideration of the fact that the Lake Iris, as it grows in nature, has a very restricted distribution, it would seem that there is some restraining factor which keeps it in check. I have given much thought as to what this may be. At one time I planted a bed of it and soon found much grass amongst it. I let the grass grow, and it crowded out the *lacustris*. In the sand and moss where Lacustris grows native there is no grass. Therefore, I believe that grass is the enemy which restricts the Lake Iris to the sandy ridges of the northern shores of the Great Lakes. It is able to live there because it can live in soil which has little fertility.

I believe that the most ideal conditions for the growth of Lacustris in the garden are as follows: 1. a clay soil because it retains moisture; 2. morning and evening sun and noon shade to avoid excessive heat; 3. Plenty of moisture, especially in July and August; 4. a cover of soil, moss, or excelsior for the rhizomes in winter to prevent them from drying out if there are periods when there is no snow; 5. freedom from grass and weeds.

Some Californian Flowering Shrubs

LESTER ROWNTREE

The wayfarer in the sequestered regions of California develops a strong affection for many of the less colorful shrubs of the chaparral, desert, mountains and coast. It is, however, the more brilliant flowering shrub which arrest the attention of the newcomers, who are generally inspired to possess and grow them. Among these latter shrubs are the "big four," *Romneya Coulteri, Dendromecon rigida, Fremontia californica* and *Carpenteria californica,* all quite worthy of the admiration which they evoke.

Of the four, *Romneya Coulteri,* the Matilija Poppy, is the most impressive. Not only is it a gorgeous thing in the mass, as it ramps about in the canons and the small empty stream beds known as "dry washes," but it well repays closer inspection. In the bud the smooth gray-green sepals release crumpled swan-white petals which slowly unfold a fragrant seven-inch flower. Young blooms keep their crepe-like quality but age erases the lovely wrinkles and before they fall the silky petals are paper-smooth. In the center of the flower the heavily massed stamens poise in a symmetrical golden ball.

One of the charms of the Matilija Poppy is the nice harmony between the flower and the foliage, — large smooth divided blue-green leaves and gray-green stems. The plant is comely all the year round except in the late autumn, when for its benefit as well as that of the grower, the stems should be cut to between six and twelve inches of the ground. The enforced cessation of activity conserves the plant's energies and strengthens its root growth,—sometimes an unnecessary measure, since *Romneya Coulteri* is a rampant grower and if given the chance will claim a whole hillside, thriving in any loose, well-drained soil (but with an antipathy for heavy clay). Sun and aerated ground are its chief needs. Moisture and drought it treats with indifference, associating cheerfully with the flame-tongued *Fouquieria splendens* in the blistering heat and parched sand of the vast inhospitable desert, and equally at home in the shelter of gentle English gardens, where you find it thoroughly domesticated, trained fan-shape up the side of a house, or, refined and poised, making a background for plump blue hydrangeas.

As the seed, fresh or stale, seems to be equally loath to germinate, even when fired, root cuttings, from November to March, make the quickest method of reproduction.

Romneya Coulteri is hardy south of Washington, and as it will stand 10 degrees of frost can often be coaxed through a winter in the colder states.

Its botanical variety *trichocalyx* differs little from the type, seeming not much more than a different form with localized stands here and there in the southern part of the state. It has wider, grayer leaves, rounder and more hairy buds, blooms earlier, is lower growing and more floriferous and is possessed by a more vigorous determination to spread.

The uninitiated sometimes confuse that gigantic prickly annual, *Argemone platyceras,* with the Matilija Poppy. But the flowers of Prickly

Romneya Coulteri—Matilija Poppy

Poppy are smaller and the manner of growth entirely different.

Dendromecon rigida is a near relative of romneya and is a boon companion of the heat and sun-loving species of arctostaphylos and ceanothus. In its natural state it blooms the year round but is a little untidy in the management of its seed pods. While young, these narrow curved fingers are not objectionable, but after the little explosion which releases and discharges the seeds, the two shredded valves hang on, quite useless, for an unnecessary length of time. The flower is a lovely thing, butter-cup yellow with a silken sheen, the pale green leaves are willow-shaped and stiff.

This Tree Poppy, like romneya, has so far withheld from us the secret of speedy seed germination. We do know that loose soil has something to do with it. For while in old remote stands not one seedling may be showing, in the recently dumped soil of new road banks thousands of young will appear, with one accord making this newly disturbed earth a glorious tree poppy garden. These seedlings make haste to bloom and when their small stems are covered with golden buds suggest plants of the English globe flower (Trollius).

The large satiny deep golden hibiscus-like flowers of *Fremontia californica* cluster round the many long flexible branches of this splendid shrub (or small tree). The rough leathery one-inch leaves are rich dark green above and downy underneath, not abundant but increasing when the plants are brought into cultivation. In California gardens, where its use is beginning, the first bloom often appears in January, but unless the rains are early and frequent the wild shrubs which occur singly or in large thicket-like stands on warm hillsides do not flower until May but will go on until July. It will stand about the same amount of frost as the Tree Poppy,—not quite so much as romneya. And if it is used as a garden plant be sure not to overwater. At first the unusual amount of moisture incites the shrub to rank growth and for a year or so it speeds ahead. But before long the excess water will cut short its life and you will walk out one day to find your prized Fremontia a brown and dry derelict.

The variety *mexicana* is used in culture more than the type; the flowers are larger, more deeply colored and beautifully flushed with red-brown underneath; the leaves are more deeply cut, almost like small fig leaves.

Carpenteria californica fills the Californian heart with pride, for it is one of our choicest and rarest endemics. To not all of us is granted the sight of the native stands of *Carpenteria californica*. Happily the shrub is now dependably "in the trade." If you know *Cistus laurifolius* and have seen a good sized bush laden with large white flowers, you have a good idea of what *Carpenteria californica* looks like, but the shrub is narrower, the white-faced leaves narrower and somewhat revolute, the large white flowers (borne also in clusters) are centered with a mass of golden stamens. The bark is silvery gray, and shreddy on aged plants, the shrub long-lived and about as hardy as the other three we have described, which means not hardy in the coldest gardens but possible where the thermometer does not drop below ten degrees.

Carpenteria and fremontia come readily from seed and carpenteria in particular is a quick grower. It is native on the open banks of canons

Fremontia californica var. Mexicana

where the soil is of humus and shale, and like the rest is intolerant of poor drainage.

A close runner-up for this important four is *Styrax officinalis* var. *californica,* one species of a familiar genus of shrubs, many of which are in cultivation. It carries with it the curse of deciduousness, which for those gardeners with the evergreen complex puts our styrax beyond the pale. It is a spring flower with a not very long period of bloom. When crowded up among other shrubs of the chaparral its beauty is lost, but when as often occurs, one shrub escapes from the herd and gains foothold on some abrupt bank, its full beauty of form, leaf and flower is manifest. *Styrax occidentalis* var. *californica* is not far behind the other styrax species in grace.

The white fragrant bell-shaped pendulous flowers, about an inch long, drop from calyces of old gold and expand to show the inner wealth of golden anthers. Later they are followed by little tan nuts. If gently cracked the nuts will germinate quickly but the seedling must be transplanted young, for it resents interference more and more as it grows.

Aesculus californica, the California buckeye, reminds you of the lovely horsechestnuts which make a background for eastern lawns, but ours is wider and looser growing. It is rather more of a tree than a shrub, a very decorative, rather sprawling tree, deciduous, and showing as definite seasonal variations as does any flowering plant in this climate. The buckeye is a help to those of us who can never become accustomed to the lack of these natural demarcations. Almost subconsciously we note "The leaves are off the buckeye, so it must be winter," "The buckeye is blooming, —spring is well under way." And when we see the big glossy mahogany-colored chestnuts thick among the dried palmate leaves under the tree, we know autumn is here.

The heavily scented chestnut-like flowers of *Aesculus californica* are light-colored when they first open in a pointed panicle,—later the flowers turn pink and yellow and the panicle broadens.

From the Sierras comes the Bush Chinquapin, *Castanopsis sempervirens.* Its very name brings to mind the huge granite boulders among which it wanders, crouching close to withstand the wind, mingling with *Quercus vaccinifolia* or forming little colonies at the edge of forests of Tamrac Pine and Red Fir. The dark green azalea-like (though stiff) leaves are neatly veined and a beautiful golden green beneath. The terminal flower clusters have a sickly-sweet scent and are composed of upright catkins an inch long. The nut is shut into a prickly bur, closed in tightly at first, but at maturity lying cupped like an egg in a nest until seized by a squirrel or blown out by the wind. Often a bush will be blooming and fruiting at the same time. When brought into the garden it sulks, grows slowly, longs for the mountain tops and seems so utterly out of place that you suffer pangs of remorse at having taken it from those high slopes where snow covers it in winter and where the fierce light and strong wind of the summers are its springs of life.

The atriplex is one of those genera which seem to divide themselves equally between sea and desert. This habit is so frequent among the native flora of California that you are always trying to answer the questions: What common essential do these desert-ocean plants find? Why does one

Lewis Josselyn

Aesculus californica

Lewis Josselyn (upper) *Harry H. Haworth (lower)*

Castanopsis chrysophylla var. minor
Atriplex canescens (lower)

Isomeris arborea

continually discover the same genera, often the same species, on hot, dry desert exposures and along the coast? Is it the sand? Is it the glare of light? How did they get into two such contradictory places and why aren't they growing in the space between? Even in cultivation, coast species often thrive in the desert and contrarywise.

Atriplex canescens is one of a vast genus having this marked preference for either the coastal stretches or for that sun-baked area east of the southern Coast Ranges. The desert happens to be its choice. It is a wide, brittle, rather round shrub of about four feet, covered with small narrow gray leaves and smelling like a painter's shop. The bark is a yellow tan and the young shoots red spotted with gray. It associates with creosote bush and the glorious parosela species. In late summer it takes on an unexpected splendor when it becomes heavily freighted with golden bracts in long dense panicles, leaning out and downward and smothering the bush in a cloud of glory.

Isomeris arborea is another inhabitant of the seashore and the arid wastes of southern California,—a low shrub with the gray foliage characteristic of so many plants of the coast and desert. The yellow flowers in terminal racemes are showy with con-

Nicotiana glauca

spicuous protruding stamens. These are followed by large inflated and quite decorative seed-pods, which give the plant its common name of Bladderpod. The whole plant has a strong odor something like that of a vegetable soup composed largely of turnips. While I am properly impressed with its decorative qualities, Bladderpod is one of the few native plants for which I can feel little affection. Not because of its strong smell, which after all is its own affair and no worse than that of many another plant but because to my critical eye it seems a bit coarse and a little vulgar, both in flower and seed. However, it has acquired favor in gardens and has the good fortune that I seem to be alone in my prejudice.

Tree Tobacco, *Nicotiana glauca,* is not really a Californian at all, but a native of the Argentine, which long ago invaded the state and which has spread so rapidly that it is often thought an indigenous shrub. And ubiquitous as it is, it is so picturesque that it adds definite charm to the landscape, — a tall slender shrub, loosely branched, with big smooth gray-green leaves and graceful terminal sprays of long tubular yellow flowers. The seed is borne profusely and is so fine that the wind scatters it easily. The dry stream beds and waste lands of southern California fairly bristle with little Tree Tobaccos. It would be used with good effect in landscaping work if it were not such a familiar object.

Beautiful as many of these conspicuous flowering shrubs may be, they have no firmer grasp on the affections of the wanderer in California's uninhabited places than have certain members of the chaparral on desert, seacoast and mountainside. Those two imposing genera, arctostaphylos and ceanothus, have many lovable species; there is the spiraea-like *Adenostoma fasciculatum,* vibrant with the sweet chatter of wren-tits; the other *Adenostoma* species,—*sparsifolium*—a stunning thing when seen against its natural background of boulder-strewn hillsides. There is the dainty *Purshia,* with little white wild rose flowers and leaves like tiny closen hoofs; and all the flowering currants, some of which give us Christmas bloom; the blessed genus rhus, the rhamnus,—and many other pleasant items of California's liberal largesse, the flowering shrubs.

A Book or Two

The Gladiolus. Published by the New England Gladiolus Society, Boston, Mass., 1934. 272 pages, illustrated.

Each year the yearbook of this society is more ambitious and more successful. This year's volume falls into seventeen sections: The New England Gladiolus Society; Aesthetic Viewpoint of the Gladiolus; Gladiolus Development; My Ideal Gladiolus; Outstanding Varieties; Special Culture; General Culture; Open Discussion; Classification; Arrangement; Report of Exhibitions; General Interest to Gladiolus Lovers; Thrips; Color Trends; Wayside Stands; Bibliography; Foreign Notes, Australia and New Zealand. In each section there are several papers.

The pictures are excellent and the texts intriguing and informative. Do not miss it.

Every Man's Garden. By Max Schling. The MacMillan Company, New York, 1935. 106 pages, illustrated. Price $2.00.

This is a general garden book written from the personal point of view of a man buying a home and a garden for the first time. He wanted flowers, and that leads on to garden planning, the building of a summer house, a greenhouse, a rock garden. It is all quite simple, engaging in style and full of sound advice for the novice, and others who might know more.

Old Roses. By Mrs. Frederick Love Keays. The MacMillan Company, New York, 1935. 222 pages, illustrated. Price $3.00.

In this day of the ubiquitous hybrid tea, this book is a particular pleasure for the author has had the courage and the imagination to work backwards from those old roses remaining in gardens known to her, to older roses known only in books or by hearsay, with astonishingly successful results. While many rose growers and gardeners are familiar with such words as Damask, Gallica, Noisette, Brier, Moss, Centifolia, the words themselves too often are mere literary allusions and bring up no experiences in fact. Read the book by all means and then set out to add new beauty to your rose garden.

Garden Handbooks. Nos. 1-10. The Doubleday, Doran Company, Garden City, N. Y. 1935. 50 cents each, any three for $1.25. Paper bound.

In order, Leonard Barron writes Gardening for the Small Place; Ezra C. Stiles, Rock Gardening; William Longyear, Garden Pools; Arthur H. Carhart, How to Plan the Home Landscape; Claire Norton, Spring Flowers from Bulbs; Arthur H. Carhart, Trees and Shrubs; Victor H. Ries, Annual Flowers; I. George Quint, Lilies; Leon H. Leonian, Delphiniums; Adolph Kruhm, Vegetables and Berries.

These are all brief, about 90 pages, written in the "How to Do It" style for beginners. The illustrations are line drawings, some good, some rather dreadful. None proposes to be the last word, but all are excellent for the first steps.

A Handbook of Narcissus. By E. A. Bowles. Martin Hopkinson, Ltd., 23 Soho Square, London. 1934. 248 pages with 24 drawings of narcissus by the author and an index. 12s 6d, postage 9d.

Any book which Mr. Bowles might choose to write would be nothing short

of a boon to gardeners and plant-lovers both here in America and in England; and Martin Hopkinson, Ldt., are to be congratulated upon being able to add this one to their splendid series of garden handbooks which already includes, beside Mr. Bowles' earlier book on the Crocus and Colchium, Dykes' Handbook of Garden Irises, Hall's book on the Tulip and Notcutt's book on Flowering Trees and Shrubs.

Mr. Bowles' qualifications for the present work are stated in the opening paragraphs of his preface: "This book represents an attempt to collect information scattered in the work of earlier writers and to present it in a handy form, correlated with observations made on wild hillsides, in gardens and museums and at flower shows. It embodies the experience gained during over thirty years' work for the Royal Horticultural Society and more than forty years as an active gardener.

"It is intended for those of the garden-loving public who like to know something of the botanical relationships and geographical distribution of the wild species, as well as for those who grow the choice garden-raised varieties for the sake of their beauty." Would that more horticultural writers would give as long a time to the study of their subject before breaking into print.

During that thirty years he has watched many fads and fancies come and go, has seen many a sensation of the season drop back into oblivion while some of the second and third raters slowly advanced to first place. So it is not surprising that he ignores many of the "last words" in daffodildom whose prices are now prohibitive for the ordinary gardener, and will be so for many years to come—should they happen to stand the test of time. It is good to find most attention given to those varieties which have proven themselves to be of recognized garden value and are or will shortly be within the financial reach of the average gardener. To Mr. Bowles, as to all real flower lovers, garden merit does not always mean a perfectly formed perianth or an even distribution of color.

The book is written in a charmingly narrative manner which makes for easy reading through the purely botanical or historical passages. A spirit of romance, as it were, is instilled into it making each page rather like an adventure; which is the way all garden books, which are written with any feeling for their subject, should always be written. Then too the author makes many suggestions of happy combinations both for the garden and for cutting; gives many helpful hints of advice as to special kinds of soil and aspect to be given some of the varieties that are not overly robust in order to keep them in health or to bring out their best qualities.

In this volume, as in the crocus handbook, a "Glossary of Botanical Terms as used for Narcissus" precedes the first chapter which is an interesting resumé of all the various names under which the narcissus has been known until it settled down to the present one. The thoroughness of the author's investigations is shown where he makes what at first was a surprising statement, "In America the name Daffodil is mostly used for double forms." This seeming error upon investigation was found to be correct; for in several sections of this country old gardeners and country people have always called the double forms "Daffodils" and the single ones "Jonquils" and "Narcissus" while in some part the shallow cups are called "Primroses," presumedly a shortening of the old English name Primrose Peerless.

Then follows a chapter on the structure of the bulb and one on the structure of the leaves and the flower. This latter chapter is particularly interest-

ing and instructive and will bear careful reading, especially the discussion of the various theories which scientists have advanced as to the nature and origin of the 'corona.'

The chapter on Classification deals with the troubles the botanists have had (and made) in their various attempts to analyze this fascinating genus. Mr. Bowles considers the most workable classification so far advanced to be that made by the Royal Horticultural Society even though it is from a purely gardening view point. And this is the one he follows in this book; save that he very wisely places the species under the horticultural heading instead of reserving them all for Division XI, and all doubles are treated under the sections for the singles from which they sprung. This arrangement reserves Division XI for only such species which have not entered into the hybridization of our garden daffodils; thus giving a chapter each on Autumnal species and on Bulbocodium.

Among the chapters on the different divisions notice must be called to those on "The Jonquil Group," "Tazetta" and "Tazetta Hybrids." These groups are more or less vaguely known here and the nomenclature is more or less uncertain. But now with Mr. Bowles to guide one it will be possible to straighten out our jonquil species and sub-species and to hope for more of the Tazettas than Paper White and Grand Soleil d'Or for winter forcing. He states that the only Tazetta he has found satisfactory for growing in the open is Grand Monarque and that it "is a fine garden plant for a sheltered bed in front of a wall or hedge." This being the case it would be interesting to try it here—could one but get it—as the reviewer has found Grand Soliel d'Or to have proved hardy for the last six years in the open in southern New Jersey with only a slight covering of haulms of perennial peas applied after Christmas. The so-called species "canaliculatus" turns out to be a trade name only, the true canaliculatus not being in cultivation. One regrets that he did not report on its blooming for here it increases rapidly—but seldom or ever blossoms after the first year.

The chapter on "Autumnal Species" should not be read by American daffodil enthusiasts who have any fear of breaking the tenth commandment, but for those who, for daffodils, would set the Mosaic law at naught it is a wistful delight. Not that any of the fall bloomers are any great splendor; but then any of the daffodil tribe flowering in the autumn would warm the cockles of the heart of any daffodil lover into a blaze.

The advise and instructions given in the chapter on "Cultivation" are excellent and are applicable here as well as in England. The warning as to the care to be taken in the harvesting of the bulbs should be heeded by all growers.

A more satisfactory book on daffodils could not have been written. Nor could it have been better illustrated than with the charming drawings made by the author. These very wisely include only species and varieties of rather recent introduction. As several of the plates are of two or more flowers it would be more exact to state that there are thirty-nine daffodil pictures than to say twenty-four plates.

A. B.

The Gardener's Pocketbook

Jasminum nudiflorum

Said Mr. Sturtevant in his article on the Front Yard "I wish we could grow jasmine in the north." As he uses forsythia instead I presume he means the naked jasmine and the answer is that this far north it succeeds quite as well as forsythia. Mrs. Wilder reports it hardy in Bronxville and sings its praise; here it has endured all sorts of weather without protection. It takes two or three years to establish it but afterwards it is dependable and produces all the new plants anyone could desire by rooting at every tip which touches the ground. During the winter of 1933-34 it was killed back to the ground, but so was *Forsythia viridissima,* which I have had for twenty years and which has never shown any winter injury before. It has grown lustily this season, so well that by this time next year I expect to see it reach its former stature and abundance. The grace of its wand-like growths, its early blooming season, its lustrous, dark green, fine-leaved masses, its tractability, and its freedom from pests make it too valuable to discard because once in ten years or so it bows before an extraordinary winter.

I have it in three different situations. On the front of the house under hanging windows which project two feet and a half from the wall, a perfectly dry and rainless spot with stuff from a gravel pit to grow in, southern exposure. I planted small rooted tips which I had brought up from Virginia and I kept them well watered for two seasons. By that time their roots presumably had grown to a place from which they could extract moisture for since then I give them water only in the driest summer weather, when the whole door yard has to be soaked. The ground is now covered and the wall of the house up to the overhang, the growth being so vigorous as to require much clipping to keep it in bounds. Little bursts of bloom come any warm day after Christmas.

Then I have it along the southwest wall of the garage, in poor soil here also and under the eaves. The wall is shingled; bale wire has been run along the lower edge of the shingle and the growing wands are threaded under it so that the wall is covered. After blooming it is cut back close to the wall but some of the season's growth is always left swinging free, for it is so graceful. The back of this border has always been planted with daffodils, Autocrat, but they come too late for the jasmine and I have been on the lookout for bulbs to bloom at the same time, and I think I have at last found them. This fall the Autocrat will come out and that space will be planted with clumps of that little early yellow trumpet found everywhere in Virginia, a few clumps of the small early white trumpet known as The Nun and as *Narcissus cernuus* but suspected by me of being *Narcissus moschatus,* and every inch of intervening space will be filled with *Chionodoxa sardensis,* whose lusty red growths thrust up so early and whose flowers are a dark and brilliant blue. At the end of next March or the first of April I expect to see here a band of blue and gold touched with white, ravishing to winter weary eyes.

The third situation is along a back fence of wire, shady except for a

little while in early morning and late afternoon, with no protection from the sweep of wind from the northeast or the southwest, a few plants heeled in here temporarily and forgotten. These bloom a week or ten days later than the others, never show winter bloom, and never any kind of winter injury, until the 1933-34 season.

In further praise it should be added that branches brought into the house in winter show color in a few days, and that the vivid green stems thick set with yellow buds touched with a dark coppery red are fully as decorative as when in full bloom.

MARY JUDSON AVERETT.

Chatham, N. J.

Narcissus, Twink (See page 199)

Apparently there have always been differences of opinion about double daffodils and yet in spite of protests from many and various authorities, double daffodils have nevertheless continued in the affections of gardeners. In the oldest gardens in this country are to be found large colonies of the double Von Sion, sometimes yellow, sometimes sadly green with some if not all of the Phoenix tribe in their many hues. In later times, new hybrids have appeared, many of them from the breeding of Mr. Copeland and others from the late Mrs. Backhouse. Among these last is the subject of this note.

In the editor's garden it has given a variable performance. It always flowers, but its blooms have the greatest charm the year after the bulbs have been planted or reset when they seem to have been checked just a little so that they are not quite as double as those from more established plants. This gives them a little looser form and allows the orange red small segments of the doubled cup to show more clearly. In season it is rather earlier than the Phoenix varieties which adds interest to its use, particularly to persons who wish to exhibit collections of flowers in shows and need at least one double to show the variations of the family.

In color, the perianth segments are a creamy white, flushed a little darker at their base. The smaller segments are orange yellow flushed with orange red and make a telling contrast with the paler segments.

In this climate, where even moisture in the spring months is not absolutely dependable, the fact that this sort can develop its flowers perfectly without either blasting or turning green, gives it another advantage over such sorts as Indian Chief which as rarely as the double *poeticus* accomplish their flowering.

Washington, D. C.

Early Lilacs

Under the name of × *Syringa hyacinthiflora,* Mrs. McKelvey discusses the history of the Lemoine cross between the common lilac variety, Azurea plena and *Syringa oblata* and the later crosses in which *S. oblata* var. *Giraldi* and various forms of the common lilac were combined. But in her pages one does not gather all that might be said in favor of these very vigorous hybrids that come into bloom early in life and flower so freely.

The first to open its blossoms here is the variety Lamartine, a very vigorous sort that nearly always is in flower before the great masses of narcissus varieties have reached their prime and considerably before the common lilacs are ready. Like all of its fellows that have been grown here it makes very rapid growth and must be pruned severely to keep it in bounds. Indeed, heavy pruning seems to be necessary for all these varieties

Lilian A. Guernsey

[*See page* 198]

Narcissus Twink

since without it, they make straggling open bushes that do not suggest the familiar contours of the common lilac.

Claude Bernard, a semi-double mauve, and Mirabeau, a single rosy-lilac, are almost as early but for the garden picture it must be confessed that there is a general sameness among the named forms of this group in the matter of color and one cannot select among them with the hope of finding a diversity of hue comparable to that of the *vulgaris* types.

Mrs. McKelvey has a kind word to say in her monumental book, The Lilac, for the reddish hue to be found in the variety Necker, but if my plant is true, the color is not marked. The most conspicuous variant that I have had is the variety Louvois, a single variety with very large individual florets of a deep violet purple color. In this garden, however, it is not as early as some of its fellows, although earlier than most of the *vulgaris* hybrids.

Washington, D. C.

Tulipa Kaufmanniana Regel. (See page 207)

The so-called water-lily tulip comes to us from Turkistan with all its glory to bring a joyous introduction of spring to our gardens and borders. This year, my bulbs were in flower March twentieth in a protected part of the rock garden. Ordinarily they do not come into flower here until the early part of April.

The flowers having a spread of four inches when fully open, are yellowish or creamy white with a clear yellow center on the inside, and yellowish white with a midrib of purplish-red on the outside of the petals. The color effect of the open flowers is yellow, and reddish purple with a border of white when closed. They have the usual mode of protection of most tulips, spreading the petals wide open in the sun and closing at the smallest cloud, any cold blast of wind and at night. To my mind the flowers when cut have a better lasting quality than many other tulips.

In planting *Tulipa Kaufmanniana* in the rock garden, I think a good combination would be with *Scilla sibirica,* the Siberian squill, *Chionodoxa Luciliae* and *Crocus susianus* Cloth of Gold with possibly some *Aubretia deltoidea* variety *purpurea* or variety Lissadel. A succession of bloom might be accomplished by adding *Tulipa Clusiana* the so-called Lady tulip which has somewhat the same color combination but smaller flowers borne on longer stems in May; *Muscari* Heavenly Blue, *Tulipa sylvestris* (florentina odorata) with its cupped blooms of buttercup yellow, *Scilla campanulata* Blue Queen or Excelsior, with *Phlox subulata* Blue Hills or G. F. Wilson for the ground covering foliage effect.

While I have found *Tulipa Kaufmanniana* a very satisfactory bulb in the shade and have often seen it form seed, I have yet to find self-sown seedlings in the most undisturbed places as I have been informed it is so often in the habit of doing If planted in reasonably light soil about six inches deep, in full sun, partial or even deeper shade but with morning sun, the bulbs come up and bloom over a period of several years with some increase that also blooms in time, forming a very presentable clump.

I. N. Anderson.

Ballston, Va.

Rhododendron luteum (See page 201)

This is the Pontic Azalea, known also as *R. flavum* and *Azalea pontica.* It comes mainly from the Caucasus Mountains, the Black Sea region and eastern Europe and is a yellow flowered deciduous species not unlike our

Lilian A. Guernsey

[*See page* 200]

Rhododendron luteum

American Flame Azalea, *R. calendulaceum,* in appearance. Where the Pontic Azalea can be grown it has been considered the equal of the Flame Azalea, but it is surely not so well adapted to American conditions as our native sort. It is one of the parents of the Ghent Hybrid race and, so far as its effect upon its progeny is concerned, has probably been a detriment by making them less useful in America. It has also been much employed as a grafting stock for the Ghent Hybrid azaleas and their allies.

Whether the Pontic azalea is more injured by cold winters or by hot, dry summers is an open question, but the fact remains that it does not generally appear happy when grown in the region of New York City or northward. Its color is a clear spectrum yellow and the flowers in good specimens range from 1½ to 2 inches across. In one of its varieties, *macranthum,* they are said to attain nearly 2½ inches. In the British Isles and Europe this species is highly esteemed and is doubtless of equal usefulness in certain parts of this country, such as on the Pacific Coast. In the East, however, *R. calendulaceum,* in its yellow forms, is recommended as a substitute. The natural range of *R. luteum* extends as far north as Lithuania and it would be interesting to know if seeds collected from its northernmost limits would produce plants better adapted to American conditions than the strains which we possess.

C. G. BOWERS, *Chairman,*
Rhododendron Committee.

Lupinus cytisoides (see page 203)

This is a handsome lupine, with flowers smelling like those of the locust; in fact it is the scent that catches one's nose. Several years ago I grew every lupine I could find in the catalogs, and then forgot about them. Last year, being in Europe, I did not see the flowers, and when in mid-June this year, I smelled this delicious scent, I was delighted to find it came from the very tall lupine with lavender flowers, for the plant grows four to five feet high. It is quite hardy, having lived through the severity of last winter. With me, it is grown in partial shade in a border with shrubs. The flowering panicle is over a foot long and the individual blossoms measure five-eights of an inch. Their color is a pinkish lavendar, with white on the standard. The seed pod is fuzzy and about one-half inch long. The stem is green, round and hairy and the palmetly compound leaves are divided into eight to ten leaflets. Mucronate at the tip. The leaves are smooth. The plant is quite shrubby.

The soil where my plants are grown has been frequently dosed with aluminum sulphate. Perhaps that is not good for them, but it was done for the rhododendrons nearby. I imagine lupines might do very well in a more neutral soil, but they thrive where they were.

Peekskill, N. Y. HELEN M. FOX.

Prunus serrulata Lindl. Oriental cherry. Variety Higurashi. (see page 205)

For some reason not readily apparent this excellent variety is as yet little known outside of Japan. There can be little doubt, however, that in the course of time it will certainly rank among the best of the double-pink group of the Japanese cherries. Even though it bears a certain resemblance to one or two better-known forms such as Tanku-shinju and Kuruma-yama, it has characteristics quite apparent to the observing ama-

Silvia Saunders [*See page* 202]

Lupinus cytisoides

teur, and possesses likewise an individual charm that scarcely can be expressed in words. In naming this variety Higurashi, or "twilight," the Japanese must have had in mind one of those rare evenings when the western sky is all aglow with bands of light and deep pink, broken at intervals by bits of white cloud. Such is the impression one gets in viewing this cherry under favorable lighting.

In habit of growth the tree is more inclined to be upright than spreading, becoming about 18 feet in maximum height, and the bark is smooth and dark gray. The young foliage, usually not in much evidence until the flowers are well opened, is brownish green, and the bud scales are relatively large, and either green or pinkish. Among the mature leaves, normally long acuminate, one often sees examples with rounded tips.

The rounded-truncate flower buds are deep pink, and the narrowly triangular, dull-brown or greenish sepals have long narrow tips that curl over the ends of the buds. The flowers, up to 2 inches wide, are semidouble, with 25 to 30 petals, and are borne on rather short, stout pedicels in clusters of two to four. The centers of the flowers are almost white, while the outer petals, especially at their edges, are shaded deep pink, and a few petals here and there, even toward the center, many show red along the extreme edge.

The flowers of Higurashi, though semidouble, do not open very flat, and toward the end of the flowering period the petals in the center of the flower tend to become bunched, somewhat like those of Kuruma-yama. In common with other free-blooming double-pink cherries, this variety is seen at best advantage when planted with the contrasting effect of a green background.

Higurashi has been reported to be in the collection at the Arnold Arboretum, Jamaica Plain, Mass., and is represented by several trees in the Plant Introduction Garden at Glenn Dale, Md., but it is not known to be growing elsewhere in the United States. It presents no special difficulties in regard to propagation,—like most of the other oriental cherries it can be grafted on piece-roots of mazzard or on roots of Japanese cherry seedlings. PAUL RUSSELL.
Washington, D. C.

Garden Notes

Among the annuals that should be better known, I give high place to *Dracocephalum Moldavica.* It is a sturdy plant thriving under adverse conditions of drought and poor soil. Its spikes of cool, neutral blue flowers make good fillers and foils in flower arrangements. The height is intermediate, about two feet. The foliage is a little sparce, grey-green, with a fragrance distinctly lemon-verbena like. *Dracocephalum Ruyschiana,* a perennial with bright blue flowers in June, has been making progress in nurseymen's lists but is still rarely seen in gardens. There are several more species available for investigation.

The lavender from the Canary Islands, *Lavandula multifida,* may be grown as an annual as it blossoms the first year. My German source of seed lists it as *L. pinnata* from its divided leaves. Its upright growth to eighteen inches with flower spikes like true lavender suggest its ornamental value in the herb or annual garden.

Another German misnomer was *Gerardia hybrida* which proves to be *Pentstemon campanulatus.* While it

E. L. Crandall

[*See page* 202]

Oriental Cherry, Higurashi

may survive mild winters here in central New York, no plants lived through that of 1933-34. As its period of bloom is in late September and October, an early sowing of seed will ensure flowering plants the first year. Its habit is similar to that of its fellow Mexican, *P. barbatus,* though the flowers are larger and rosy-purple. It made a striking October display in a large Long Island rock garden last season.

Another plant of many names is the Texan annual, *Thelespermum Burridgeanum.* It is commonly catalogued as *Cosmidium,* sometimes as variety Orange Crown. Drought is not perilous to its well-being. The plants are covered for a long period with flowers of glowing orange-brown margined deep yellow hiding the fringy foliage. It is a small plant of eighteen inches for the foreground. I once had *Thelesperma ambiguum* from Colorado which was a splash of yellow color admirably sustained over several weeks. It appeared to be annual, also.

The biennial horned poppies are showy subjects. My seed was labelled *Glaucium leiocarpum* and resulted in soft gray rosettes of beautiful design, all of which came through the winter of '34 unscathed, to shoot up in June well-branched stems to two and a half feet with brilliant orange-red flowers with black spots at the base.

An equally hardy biennial is *Hesperis tristis,* the sad sister of the Sweet Rocket tribe. It is a stocky plant growing up to two feet with thick stems. Its flowers are a curious melange of yellow-green and brown with the petals drooping and curling like a Spaniel's ears. They come in May with the tulips when I used them to accompany the brown hued Cottage tulips in contrast with my most brilliant red ones.

BERNARD HARKNESS.

Two New Yellow Trumpet Daffodils

Among the dozen or more varieties of first-class yellow trumpet daffodils that I am growing in my Michigan garden there are two unusually tall varieties that I like especially well, for they are not only excellent show flowers but they have even better garden value. When placed toward the back of the garden their unusual height and size makes them show up well and their bright deep lemon-chrome yellow makes a telling bit of color.

Both *Alfred Hartley* and *Edgar Thurston* were originated by the dean of all hybridizers, Rev. George Engleheart, whose high standards of excellence have never permitted him to put out any but first-rate flowers.

Alfred Hartley was shown at the London Royal Horticultural Show in 1930 and won an Award of Merit. In my garden it opens April 16 to April 22, depending on the warmth of the early spring days, and lasts from two to three weeks in spite of the sudden storms and changes in temperature which often come with our capricious spring weather. The flower is a deep rich golden self of excellent substance, measuring nearly 5 inches across. The large crown is nicely proportioned and striking because it is so deeply imbricated at the brim. The 18 to 20 inch stem is stiff and strong. The variety has a sturdy constitution and is a good increaser.

The second variety, *Edgar Thurston,* was shown at the 1931 R. H. S. Show and also won an Award of Merit. In my garden it opens a day or so later than *Alfred Hartley* and grows to a height of 20 to 24 inches. One year the flowers lasted for quite three weeks. In type and color the two varieties are similar but I find *Edgar Thurston* is a faster increaser.

FLORENCE EDNA FOOTE.

Grand Rapids, Michigan.

Michael Carron

[*See page* 200]

Tulipa Kaufmanniana

Silvia Saunders

Salvia argentea

Salvia argentea

Salvia argentea, silver sage, is a biennial from the Mediterranean region. It excites more comment from visitors than any of the other sages because of its almost silvery, wrinkled, huge leaves which are covered with long silky hairs. It flowers in June but after flowering is less silvery, so if one wishes to keep it odd looking, it is best to prevent it from flowering. This sage is easily raised from seed and likes a well-drained sunny place in the border. The leaves lie flat on the ground in flat single rosette, and measure 6 and three-quarters inches in length and 6 inches across. They are covered with silky, glistening long hairs. The margins are wavy and the whole texture thick. The flowering stalk is tallish, widely branching. The dead white hooked flowers are in whorls very like those of its near relative, the clary-sage, and is three feet high, ridged furry and sticky to touch, and rises from the leaves. There are three on each side of the stem, along a branch subtended by a leafy bract, and they are 1½ inches long and look like warriors because of their helmet-like shape. The calyx is green and furry. The white corrolla is two-parted—the upper one rises up and around like a sickle and is dotted with fine purple hairs. The lower lip is notched and is white too. The plant is not fragrant and its charm is entirely in the strangely silvery conspicuous leaves.

HELEN M. FOX.

Peekskill, N. Y.

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