

# American Rock Garden Society Bulletin



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## BULLETIN

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# AMERICAN ROCK GARDEN SOCIETY BULLETIN

Albert M. Sutton, Editor

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## THE VEGETATION AND FLORA OF ICELAND

DR. HÖRDUR KRISTINSSON, *Akureyri, Iceland*

**Introduction.** The youngest of all European countries is Iceland. The highest age identified in its presently accessible surface layers is 16-20 millions of years, but since the older layers have sunk below the present sea level, the real age of the country must be higher, estimated around 40 millions of years. The flora of Iceland is of special interest, because of the serious effects that the Pleistocene glaciations must have had on it, and because of the long distance of about 800 km, that a new flora had to move over oceans from Europe, in order to get established in Iceland in postglacial time. It is true that Greenland is much closer (300 km), but the species composition of the Icelandic flora does not indicate Greenlandic origin to any great extent.

It is the purpose of this article to draw some general outlines of interest to the vegetational history of Iceland.

**Geology.** The oldest rock formations in Iceland are in the extreme east and west, and consist of tertiary flood basalt layers (Miocene). The age decreases both from east and from west towards the center of the country, where most surface layers are glacial (tuff) or postglacial (lava fields). This center area, which in reality constitutes the extensions of the Mid-Atlantic ridge through the country, is characterized by parallel fissures or rifts, and by its neovolcanic activity. New lava fields are added almost every decade, the most recent additions being the new island of Surtsey (1963-1965), a lava field by Hekla (1971) and the extension of Heimaey in Vestmannaeyjar Islands (1973-1974). Postglacial lava fields cover about 1/10 of the country. The plants constantly colonize the new lava fields in a characteristic sequence, but the colonization is different in different climatic regions of the country. There are many species too, that do not distribute into the younger regions, but remain faithful in the geologically older parts of the country.

Nobody has yet been able to give an answer to the interesting question, whether Iceland originally was formed as an island through submarine, volcanic activity in the Atlantic, or whether it was originally connected to Europe and (or) to Greenland, before it was isolated as an island. It is a possibility that the tertiary

basalts, which now form the basis of Iceland, rest on older, now submerged basalts, which may have been a part of the early tertiary ridge extending from Scotland through Faroes Islands to Greenland.

More than 10% of Iceland is now covered by glaciers which have accumulated during the last 2000-3000 years because of deterioration of climate. These glaciers have retreated considerably since the turn of the century.

**History of Vegetation.** Sufficient plant remains have been preserved between the tertiary basalt layers to prove that a luxurious vegetation flourished in Iceland during Miocene (10-20 million years ago), just as has been demonstrated for other North Atlantic countries. The occurrence of *Sassafras* and *Magnolia* reminds one of the present vegetation of North Carolina (the southeastern United States).

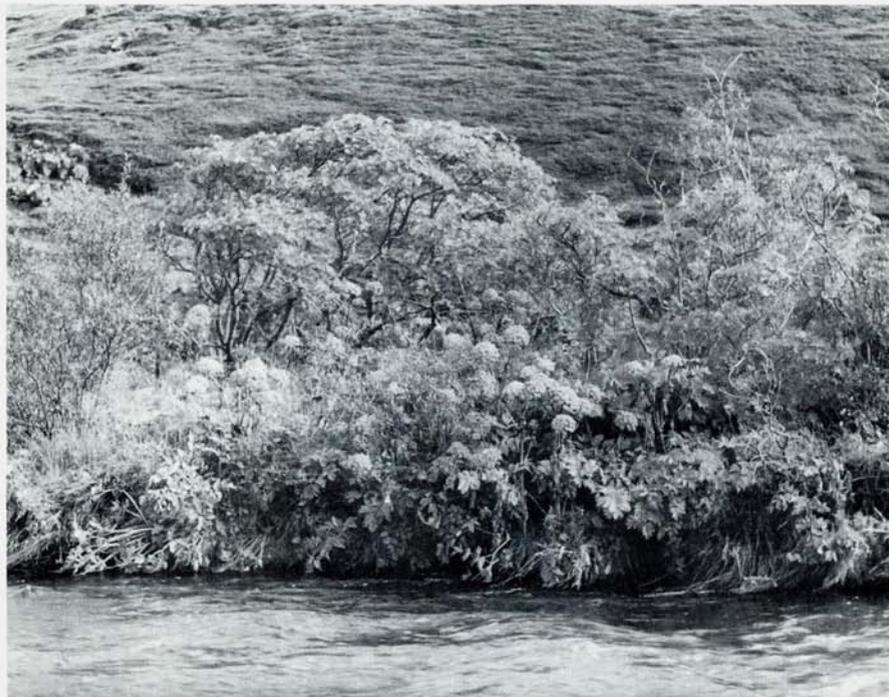
After subsequent deterioration of climate during the Pliocene and a corresponding change in vegetation from deciduous to coniferous forests, all but the hardiest plants became extinct under the Pleistocene ice cover. The plants on an island like Iceland had no opportunity to move temporarily southward to a warmer climate as they did in Europe. In the long interglacials, however, the flora was enriched again through long distance dispersal over the oceans, but this transport was restricted to a low number of species with sufficient dispersal ability. The present flora of Jan Mayen may perhaps give some idea about the species composition able to disperse over oceans in this region. It consists of about 50 species, most of which are also frequent in Iceland.

All the conifers became extinct in Iceland during the Pleistocene glaciations except *Juniperus communis*. The heavy seeds of the conifers never did reach the country and successively colonize it again, even though the climate of the interglacials and the postglacial probably was favourable to coniferous forests in Iceland. Even today, with approximately 2° C lower temperature than in the postglacial time, conifers can tolerate the Icelandic climate. The reforestation experiments made by the Icelandic State Forestry Department have shown that *Larix sibirica* develops well in the more continental northeastern part of the country, and *Picea sitchensis*, originating from the coasts of Alaska, is a suitable tree in the oceanic south and southwest Iceland.

Deciduous trees like *Fagus*, *Corylus* and *Acer*, which all are known from the tertiary basalts, became extinct in the Pleistocene, and the present climate is too harsh for their natural reestablishment, even though certain species can be kept in the garden. *Alnus* is known from layers up to the third last interglacial, then representing as much as 70% of the tree vegetation in southeastern Iceland, judging from pollen analyses. No trace of *Alnus* is known from later interglacials, nor does it exist in Iceland now. The climatic conditions should however be good for this tree in Iceland at the present time, and it is still a part of the natural vegetation in Greenland.

**The Present Woodlands.** *Betula pubescens*, *Sorbus aucuparia* and *Salix phylicifolia* are the only trees present in layers from the two last interglacials in Iceland, and they are also the only natural trees of Iceland today, with the exception of very isolated populations of *Populus tremula*.

The birch woods reach their best development in the relatively continental



A protected island in the Laxa River, North Iceland, against the unprotected riverside in the background.

Helgi Hallgrímsson

north and northeastern Iceland, where the trees reach the height of 6-10 m. In the more oceanic regions the birch forms only scrubs of 2-4 m, and in extreme oceanic sites it usually creeps along the ground and hardly exceeds 1-2 m. Exceptions are found in oceanic areas, where glaciers form a shelter against the oceanicity, as known for some of the southern glaciers (Mýrdalsjökull, Vatnajökull). This explains the relatively favourable conditions found in Þórs mörk, and in Skaptafell National Park. The mountain ash occurs in some areas intermixed with the birch, but *Salix phylicifolia* predominates in the wetter habitats. It forms beautiful, round cushions of several m diameter and 2-4 m height, where protected. The *Salix* must however withstand constant cutting by the sheep and horse grazing, so that its typical growth form is seen hardly anywhere in the country today. Without the preservation it expresses the growth form of short or creeping dwarf shrubs.

Even though the birch scrubs and woodlands represent the climax vegetation in the Icelandic lowlands, they are not prominent in the landscape. In reality the visitor drives mile after mile without seeing as much as a single tree. This is a secondary effect due to deforestation which followed the settlement of the country. Iceland was settled in the period from 874-1000, mainly from Norway and Britain.

The change in the vegetation of Iceland in the centuries after the settlement can partly be traced from the history, and has also been demonstrated by means of pollen analysis by Thorleifur Einarsson. New plant species were imported, the



*Chamaenerion latifolium*, the River Beauty, one of the most attractive Icelandic plants. It decorates the gravelly river beds, even up to the Central Highlands.

Helgi Hallgrímsson

proportion of grasses increased, and the quantity of birch pollen dropped down. The settlers depended on wood for different purposes, and during the climatically unfavourable middle ages, they consumed it faster than it could be restored. Sheep grazing helped to prevent the regrowth, and the sensitive, deforested soil was subsequently subject to heavy erosion, which is still in effect.

But why did Iceland suffer more than other northern countries through the harsh treatment by man? Simply because it was more sensitive. One of the main reasons is the recent, volcanic origin of its soil, which is unique for northern countries. The Icelandic soil has a very weak structure, and frequent accumulation of volcanic ash further helps to reduce its resistance against wind erosion, and also provides drifting material. This fact was a new experience for the settlers from Norway, which was only learned in several hundreds of years. No preventive measures were taken until too late, when the deforestation was already completed with quite few exceptions, where the climax vegetation can still be seen.

Reforestation experiments first started in this century, partly by using the native birch, and partly with imported tree species, like those already mentioned.

The Icelandic flora. After having learned something about the natural history of Iceland, one will not be surprised to hear that its flora is relatively poor in species number compared with its neighbour countries in similar latitudes. The Icelandic flora counts approximately 450 species of vascular plants, including some that have been brought in by man.

Most of the Icelandic native plants are found on both sides of the Atlantic

Ocean, and about 150 of these can be considered circumpolar. There is also a considerable number, about 100 species of European origin, which are lacking in North America or have been introduced there in recent time. On the other hand, species of western origin, lacking in Europe are quite few, probably less than 10. These figures are subject to some variation depending on the species concepts used.

Among the western species in Iceland are *Chamaenerion latifolium* (River Beauty), one of the most attractive decorations of the gravelly river beds, and *Carex lynghyei*, a very productive, robust sedge with drooping spikes.

None of the generally recognized species are endemic to Iceland alone, but one, *Alchemilla faeroënsis*, is endemic to Iceland and the Faroes Islands. Only quite few taxa recognized as varieties or subspecies are endemic in Iceland, with the exception of the genus *Hieracium*.

Many species have been unintentionally imported by the activity of man. Some were probably brought in by the first settlers like *Stellaria media*, *Capsella bursa-pastoris* and *Poa annua*. Among very late invaders are *Matricaria matricarioides* (1902), and still later *Stellaria graminea*. *Matricaria matricarioides* was rapidly distributed throughout the inhabited parts of the country, probably mainly by truck wheels from the harbours to the loading places in villages and farms. *Stellaria graminea* is frequently seen around farms. Practically all the invaders are limited to the vicinity of utilized land in their distribution, but some, like *Poa annua*, have been brought widely around by the feet of the sheep, but are unable to compete with the natural vegetation outside the manured sheep tracks. No plants, which with certainty are adventive in Iceland,



*Alchemilla faeroënsis*, a species endemic to Iceland and the Faroes Islands. In Iceland it is limited to the eastern part of the country.

Helgi Hallgrímsson

have managed to establish themselves in the really wild and uninfluenced tracts of the country. They are not competitive with the natural vegetation in the nitrogen deficient Icelandic soils. *Lupinus nootkatensis* may possibly turn out to be an exception.

*Alopecurus pratensis*, *Trifolium pratense* and *Lupinus nootkatensis* are examples of plants which have intentionally been brought in by man. The two first mentioned have in some places escaped from cultivation. *Lupinus nootkatensis* has recently been imported in order to increase the nitrogen supply of many eroded gravel flats. These efforts have been successful, and the plants distribute slowly on their own by seeds. The affected plots are prominent at a distance in the landscape by their deep blue color.

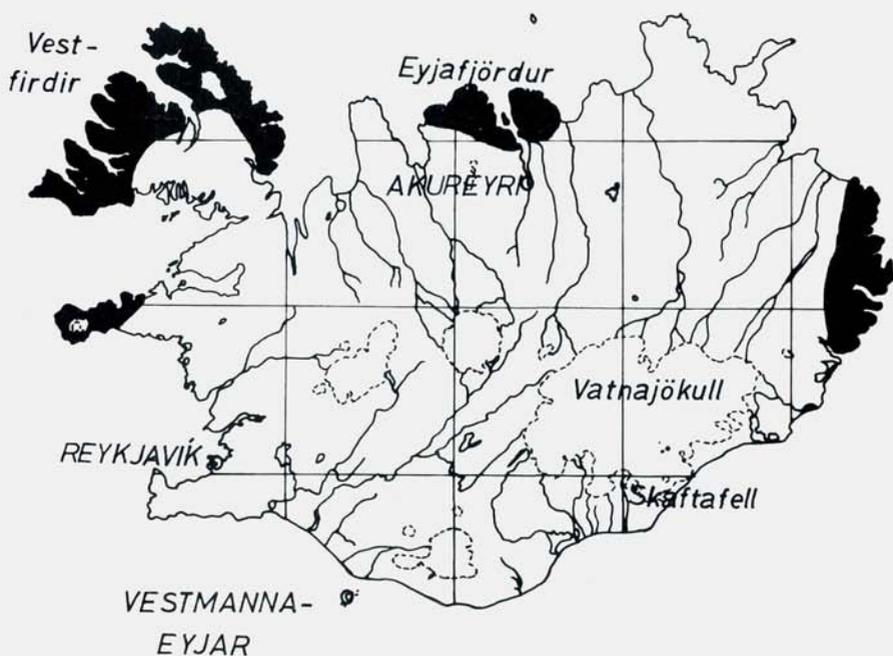
*Survival or Long Distance Dispersal.* With the exception of the adventive plants, all members of the Icelandic flora must either have survived the Pleistocene glaciations in Iceland, or otherwise have been carried by long distance dispersal through hundreds of miles across the Atlantic Ocean. This is a fact that to many botanists seems rather unacceptable.

Opinions differ as to what extent these two possibilities were realized. One Icelandic botanist, Steindór Steindórsson, has brought together a number of arguments which support the idea that a great part of the Icelandic flora, possibly half of it, did survive the last glaciation on nunataks and exposed coastal strips. His arguments were based mainly on a characteristic distribution pattern of many plant species (*Papaver radicum*, *Campanula uniflora*) which correlated to geological indications of exposed areas. The most conspicuous of these areas were the northwestern Vestfirðir-Peninsula, the mountain area around Eyjafjörður in the middle north, and the eastern fjords. All these areas have in common relatively high coastal mountains. It is clear that no other places had a better chance to escape being covered by the central glacier of Iceland, moving toward the shore, than such ranges of coastal mountains. But we should not disregard the possibility that this topographic quality may also affect the present local climate and result in the same distribution pattern. Large amounts of snow tend to accumulate in these coastal mountains, and their valleys, and this may explain the peculiar distribution pattern of some of the centric species (*Blechnum spicant*, *Athyrium distentifolium*, *Cornus suecica*, *Lycopodium dubium*).

The ideas of Steindór Steindórsson have been opposed by some authors but the basic theory, that a substantial part of the flora survived the glaciations, and that the rest of it arrived by long distance dispersal in postglacial time, is generally accepted. Opinions differ merely about the extent of survival and the extent of long distance dispersal.

In fact, if mountain slopes or some coastal areas have remained ice free, it is hard to believe that no plants were there, and besides vascular plants, there must of course have occurred a great number of mosses and lichens. Many of the hardiest plants that are now widely distributed throughout the country, like *Saxifraga caespitosa*, *Poa alpina*, *Festuca vivipara*, *Saxifraga oppositifolia*, *Salix herbacea*, *Luzula arcuata* and *Cerastium alpinum* certainly had very good possibilities to survive the glaciations, and some of them may of course partly be survivors and partly postglacial dispersed, too.

There are some indications that oceanic and lowland plants had a greater



A map of Iceland showing in black those areas with the highest number of "centric" species.

Helgi Hallgrímsson

chance for survival in the western and eastern area, and that arctic continental species had a better chance in the middle north. Possible explanation is that the oceanic southern winds probably had better access to the two first areas during the glaciations. Before reaching the middle north they had to move a long way through the extensive glaciers of the Central Highlands.

There are still relatively large gaps in our knowledge of the distribution patterns of the Icelandic plants, and we may develop better understanding of some of the mentioned problems after they have been bridged. In order to do this a project for mapping the flora of Iceland by aid of 10 x 10 km grid has been initiated, and it is hoped that this can be completed through cooperation of all interested in the matter.

Unfortunately, botanical interests are rare in Iceland. The Icelander is by nature more geologically oriented. Visitors often make the observation that natives know every fault and ridge in the landscape by name, but their questions about the plant world remain unanswered. In fact, the country offers much more variation in geological formations, with frequent creation of new land before the eyes of the inhabitants, than it offers in its living world.

## PUTTING GREENS OR ALPINE SCREE?

CHARLES THURMAN, *Mead, Wash.*

The Northwest Turfgrass Association and The American Golf Course Association have spent thousands of dollars in research and selection to improve golf putting green and playing field turf soils. After many years of trials and failures they have come to a fairly stable soil mix (if it can be called soil) that works equally well in all parts of the country and under Southern as well as Northern climates and using different grasses in each area.

There are some critical factors that are imperative under the conditions to which these turves are subjected that require the soil to do several things in order to be able to support continuously satisfactory playing conditions.

The first and probably the most important is fast drainage. Water must be able to drain away very rapidly and yet the soil not become dry too rapidly so that the grass wilts.

Second — The soil must not compact when wet. As traffic from thousands of feet pass over the turf, the fine soil particles tend to work upward and form layers that soon become impervious, stopping drainage and causing mud holes and dead grass.

Third — There must be adequate water and air storage space in the soil to support healthy roots, consequently grass.

Fourth — This soil must have a nutrient-holding capacity to support strong rapidly growing plants that in many cases are mowed twice daily and always six times a week.

As can be readily seen this is a big order, and small wonder it took years and money to develop such a soil, but with Experiment Stations and research specialists working with Golf Course Superintendents, a formula has been arrived at which works to accomplish all the requirements. The answer simply is SAND! BUT not so simply — just ANY sand. Sand must meet specific requirements to do the job.

The size (and shape) of the sand particle is the critical requirement and that size is from 50 to 100 mm in diameter by sieve analysis. Of the total mass by volume not more than eight percent should be larger and not over five percent under the above limits, and never more than two percent clay particles for these are the trouble makers for compaction with turf. To this medium for turf is added twenty percent *by volume* of organic matter, usually peat, for nutrient-holding ability. This material is thoroughly mixed off site and then applied over the putting green or playfield to the depth of *twelve to fourteen* inches. This depth is critical in order to have sufficient pore spaces for water-holding capacity and to force deep rooting. After this material is spread and compacted a hose can be laid on it at half throttle and a puddle no larger than a washtub will form as the water rapidly seeps out.

Let's look a little closer at sand. There are many kinds and shapes of sand. Wind blown and beach sands are round and very uneven in size and pack together too tightly, cutting down pore space, and should never be used because of this. Each grain of sand holds a film of water around its surface when wet, and no more, therefore the necessity of at least twelve inches of depth. As the surface

dries, roots are automatically forced to grow down for moisture. A sharp sand of even size will have larger pore spaces allowing more air spaces for oxygen, a prime requirement for all terrestrial plants. Sand has no ability to hold nutrients, and with water passing through the medium so rapidly, they are washed out beyond the root zone and lost; hence the need of organic matter or clay particles to tie up these nutrients in the upper soil levels where plants can get them.

Now you may well ask what all this has to do with growing alpiners. The answer is PLENTY. Did you ever dig a plant on an alpine scree and wonder what in the world kept it alive in rock chips and a few fine particles of soil on its feeder roots down in a narrow rock crevice?

Let me explain how I have for years, with a few modifications to the above soil formula, successfully grown most alpiners. The first thing I do in building a scree is to lay out a sheet of mil plastic on a five percent to eight percent slope. Anything more than this will drain too rapidly and should be terraced to reduce the slope. On flat ground a mound can be built and overlaid by a *minimum of twelve inches* of this medium. For alpiners I find that up to five percent of clay particles is better than the peat since there is not the compaction problem in a scree and the clay particles hold the nutrients by electromagnetism, then less peat is needed. I usually only add peat or organic matter around individual plants as they are set thus avoiding hand mixing of the sand. My source of sand has just about five percent clay particles in it so I save much labor by using it as it comes and adding only around each plant what is needed.

Flat rock surfaces placed nearly vertical in the medium hold extra moisture and alpiners planted next to them will develop fine feeder roots down the rock face to the plastic below which here acts as bedrock and is always wet thus simulating alpine conditions under the screes. It is surprising how many different alpiners from widely varying soils can be grown on this medium. Is it a lime lover like *Aquilegia jonesii*? If so, just add ground limestone and mix well in the sand. I have plants now blooming their third year after setting in this mix, and last year one plant had *eleven* blooms and set seed; something I doubt you will see in the wild. Acid lovers? Add peat or tundra soil on the shady side of a large rock, and so *ad infinitum*.

Now you ask, "Where can one get this magic sand?" I would suggest that you contact your nearest Golf Course Superintendent and ask him his source of sand *for building a new green*. This failing, write to the American Golf Association and ask them the source nearest you where it might be available. REMEMBER, JUST ANY SAND WON'T DO!

And then you always have this to fall back on; if you ever tire of growing alpiners, just level out the mound and plant grass and take up GOLF.

\* \* \* \* \*

ADVERTISING IN THE *BULLETIN* — It is interesting to note that in the October '62 *Bulletin*, my first, there were just ten advertisers using less than one and one-half pages in the *Bulletin* while in the July '75 issue, my last, there are thirty-seven ads ranging from one-eighth page ads to a full page ad, taking up seven pages of the *Bulletin*. What is more interesting is that seven of the ten advertisers of thirteen years ago are still advertising in the *Bulletin*.

## BABES IN ALPINE LAND

A. J. BROWNMILLER, *Gibsonia, Pa.*

Three-quarters up the road to the tree line, I told Gisela, my wife, who had the Instamatic camera, "Get the flower centered and shoot. We have to hurry to get to the top."

Not until a month later when we had reached home, did we know we had taken slides of *Pinguiculas* and *Soldanellas* which we had never ever hoped to see in the wild, nor had we seen them then, for in our haste up the mountain we had taken pictures of whatever blobs of color we had found along the roadside. It had all begun with a sister British *Bulletin*.

Therein the article had stated that it had not been a bad idea for a Botanic Garden to group alpines according to the mountain ranges to which they were endemic as had been done in the Munich Rock Garden. Thereupon my wife and I decided to see "instant" alpines, since we could cover the alpine world in a month by hurrying and with snapping without fuss or bother. Since Gisela was a native of Marburg we began our grand *burgerliche* tour there, "grand" meaning as many kilometers as we could cover in a month, and "burgerliche," cheaper than the motels are in the United States.

While Marburg is renowned as the site of the University where the idea of an antitoxin to fight toxin was first developed—in this case diphtheria—it maintained a rock garden of almost two acres with many delightful plants such as *Haberleas*, *Ramondas*, *Pleiones*, saxifrages, all within a ten minute walk from the downtown hotels. Here we made our first amateurish observations of the effects of climate on success with alpines. In late May of 1973, the grass had already turned brown for no rain had fallen for weeks. Yet saxifrages all around the city were lush as petunias are anywhere. Surely the "muggs" and lack of rain in summer which we in the eastern United States complain about are not solely responsible for our lack of success with certain genera. When we reached the Alps proper we noted what others before us had reported, that several other conditions made the whole region one Gargantuan alpine house with a wildly fluctuating and forgetful management just as in eastern North America.

After photographing about sixty plants then in bloom near the walks, we went on to Hamburg where we had been told the city fathers maintained a rock garden. Tourist bureaus, more's the pity, do not advertise the rock garden on a par with a town hall, museum, or even the King's Royal Carriage House and never will, until we loyal *aficionados* insist our votes to be counted, too. The local populace must have given the message to the budget bureau, for an elaborate rock garden and alpine house had been constructed in Hamburg years ago.

Although North Germany is a uniformly flat plain, the rock garden is over thirty feet high in spots and between five and six acres in extent within a Botanical Garden over ten times that size, easily reached by street car or underground from the main Bahnhof. Sections are constructed of limestone strata, some dolomite,

sandstone and acidic rock. Possibly we photographed over a hundred plants near the walks, such as *Lewisia rupicola*, *L. howellii*, *L. cotyledon*, *Eritrichium nanum*, *Asperula arcadiensis*, *Gentiana gedenensis*, *G. iolzman*, *G. alpina*, *Epilobium crassum*, *Leontopodium nivale*, *Primula reidii* var. *williamsii*, *Rhodiola rosea*, Papavers, Anemones, etc. I might mention the prize plant section is covered with a fine net to discourage the long-fingered public from the plants it covets, a practice I have been told, is also prevalent at Longwood Gardens. To give credit where credit is due one must mention the alpine house which is arranged to be viewed from its exterior. There on display are plants from Linnaeus' own garden, together with such species as *Teucrium polium*, *Degenia velebatica*, a stack of *Lewisia cotyledon* three feet high, *Andryala gordhii*, *Cypripedium calceolus*, *Anemone ischernwii*, and *Lewisia exosis*. Moreover, a word of warning should be apropos to unprepared shutter bugs like myself.

With extreme contrast of light in the alpine house due to the slatting, we did not know we had messed up the exposures of the slides we had most desired, until a month later. Had we had more experience and enough time we would have chosen a cloudy day or a time when the sun had lighted up the innermost recesses evenly. And since the visitor must not step from the walks, a telephoto lens is necessary to get closeups of the more distant plants. Rainy days and dark cathedrals are easy enough for a handheld camera using High Speed Push Processing ASA 400 film. But it was not available in Germany at the time and we had no German address to receive the mailers. So the flowers which got away were sometimes the most desirable, with no chance to retake the rarities.

When in Munich it seemed odd, delightful, and not without a sense of pride, to come upon some of our common and widespread natives, as *Trillium grandiflorum*, *Aquilegia canadensis*, *Dodecatheon meadia* and *D. integrifolia*, adorning the space in the North American Section which was adjacent to the Pyrenees and Carpathians, with alpines which we really consider exotics such as *Haberlea ferdinandi-coburgii*, *Asperula hirta*, *A. lactea*, *A. villosa*, *Crepis aurea*, *Geranium cinereum subcaulescens*, *Horminum pyrenaicum*. Andosaces, Minuartias, and the like. Another hundred photographs taken, but not without the travail common to the tourist.

To what new low has the dollar dropped, where are the three cameras, where did we park the brown suitcase, is the German Kodak film's rating equivalent to the U.S., did we lose the haze filter, where is the Hofbrau Haus? We cannot buy push processing 120 film, did I mix up the five kinds of film I was carrying, and worst of all, where are my notes scattered through the luggage in notebooks and bits of paper to synchronize the nomenclature with the finished slides? Photography turns out to be as important as finding the uncommon flowers.

Before we left home, we had seen the TV series, "Civilization," by Kenneth Clarke in which he had mentioned that a church out of Munich was the epitome of the "High Baroque Style." This we had wanted to see. Since I had forgotten the name of the Elector or King or Bishop who had built the church, our inquiries produced nothing more than the "Wies Church," which sounded unpromising.

Since "Wies" means meadow, we could not imagine a meadow church being high baroque. Nevertheless, we had no other choice but to see it. Accordingly we took the train south, then by post office bus through hamlets until we came to a crossroads where we were told to go, "that way," without a house in sight, only fields and forest. After four kilometers a farmer coming out of the woods told us to keep on going. Eventually we saw a church in the distance in front of which was a



A soldanella peeping from a February snowbank

A.J. Brownmiller

barn, two houses and an auto repair; a most unlikely place for a high baroque. Yet, entering, one glimpse of the interior shocked us into incredulity. In one moment we had an exalted feeling of perfection and fulfillment that transcended the senses. Not until we saw the alpines on the mountain tops were we transfixed with a similar feeling.

In the church the diversity of painting, sculpture, and architecture fused into a unity so complete the mind boggled. In the Vatican one sees the Pieta, the high altar and the Sistine Chapel separately. In the Wies all the component parts, though not Michelangelos, are a sublime indivisible whole. Later we were told it was a pilgrim church to which one was motivated by some ideal, as with the Wailing Wall, the Black Stone of Mecca, or Lincoln's Memorial; then after some delay in reaching it, even after hardships, with qualms about starting in the first place, one eventually found that the realization was a great deal greater than the anticipation had been. This we were also to find true with the high alpines, not the instant alpines around the corner, but the shy solitaires we found after an arduous climb in the mists surrounded by the wall of whitened peaks two miles up. This came several days later at Garmische-Partenkirchen.

The British Bulletin had also mentioned a natural rock garden at Schachen out of Garmische, where we had inquired where we could see a natural rock garden. We were told, "Just walk out of town anywhere." Had we taken this advice we might have discovered what we later did in the Austrian Alps. But we insisted on Schachen.

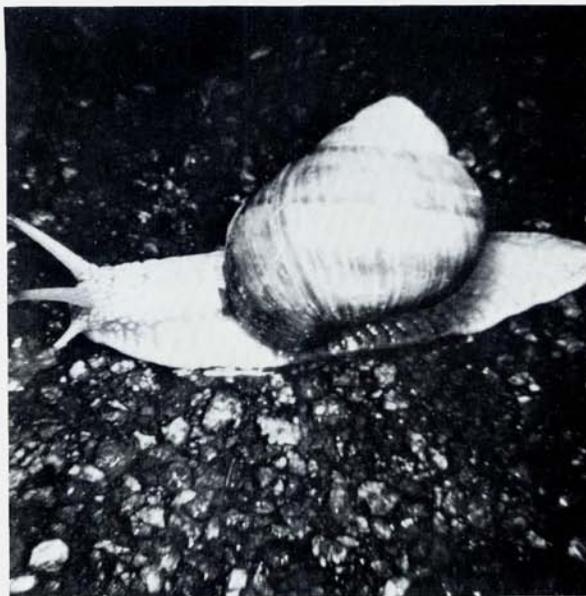
It lay three station stops toward Innsbruck at Klais. There we were told the road to it began between the post office and "that house." "But you can't go there." "Why not?" we had asked. "It is covered with snow," was the reply. "How far is it?" "Oh! about four hours." However, since we were vigorous Americans we decided

we could make it in two and a half hours. Barely out of Klais we found what we considered alpine.

*Gentiana verna* and Primulas were growing by the hundreds in the ditches, the grasses, almost up to the vehicle tracks. A woman going to work at an ex-castle gave us a lift for several kilometers on the private road. From there we walked to the forest road where no traffic was permitted. Since we were behind schedule we did not look for flowers ten paces from the road. Gradually we ascended into February snowbanks where only Crocus, Pinguiculas, and Soldanellas were in bloom.

There at the tree line the glistening peaks encircling us were the walls of a King's realm-sized alpine house, with the mists as the roof over the fragile blooms of the royalty of creation. We forgot the delay, the hardships and the travail of the climb in our exaltation as in the church, to the epitome of life itself. In the city parks were alpine, true enough, but more like illustrations in a catalogue. On the mountain top they were majestic in their isolation, their frailty protected only by beauty and innocence, their demureness inviolate from the rigors of the harsh elements. But reality brought us back to our 1830 train time.

Beyond the tree line there was nothing but snow. We had been three weeks too early. Instead of a vigorous two and a half hours to make the climb it had taken us six hours! Downhill we went with as much alacrity as we could muster. Never had the horizon seemed so far away or our feet so leaden. Curve succeeded curve, each small rise an agony. The watch said to run the last three kilometers as my wife was hoping I would not have a heart attack and I hoping I would. We really did catch the train but only because it was five minutes late. Since I could barely drag my bones down the hill for the next two days, we heard an explanation for my



An inhabitant of the misty slopes

decrepitude when we were told that the tree line was fifteen English miles from Klais and over a mile up. "Only for the strenuous," we read later in an A.G.S. booklet.

Hikers interested in Schachen later in June could drive their cars to the forest road, thus cutting the distance in half. But go to a natural rock garden, every alpine gardener should, to appreciate the triumph of delicacy over the extremes of mist, frost and intense light. Truly the Alps are an alpine house. The not too distant sea air rising to ten thousand feet contracts until the water vapor condenses into mist whatever the rainfall, to screen and protect the plants no less than the thumb-sized snails that inhabit the same slope. The spruce duff on the forest floor probably has never been subject to fires, unlike the tree slopes of the Rocky Mountains where one can crumble a spruce cone to start a fire with a single match.

In Linz and Vienna the rock gardens were smaller with the before mentioned genera but with others of an East European flavor, as *Alsine turkestanica*, *Anemone janczewski*, *Vella spinosa*, *Linaria antarctica*, *Centennaria orientalis*, *Matthiola vallesiaca*, in gardens easily reached from the centers of the cities.

Then back to Innsbruck where we took a side trip to Solden in the Austrian Alps where our boy had gone skiing while with the United States Army in Germany. We took the ski lift to a peak where skiing can be done on a glacier all summer long. Back in the hotel's coffee shop I told our boy I did not even want to see the field he had said had been colored with *Crocus* that April. To vindicate the honor of the place he told me I should go to the opposite slope to look for plants but I was so exhausted by looking at alpiners I refused to go out to photograph flowers even though they were of pure gold. However, he went out but returned in twenty minutes to tell me the whole field was crawling with alpiners. We went out but this was going to be for the last time.

Exaggerated he had not. *Astragalus*, *Coronilla*, *Gentiana*, *Trollius*, *Anemone*, *Clematis*, *Orchids* growing side by side amongst the grasses. Within thirty minutes in less than one acre we took over forty slides of flowers we made no attempt to identify because of our ignorance. Perhaps our inexperience will spur other tyros or experts to do better than we for our Slide Library, for it is a simple matter to find a wealth of alpiners in accessible spots without international experts as guides, but frustrating to our Slide Director, with mislabeled slides, non-labeled and distant shots of twenty gorgeous plants in each, and other gross mistakes.

Stuttgart was a gentle tapering-off garden with uncommon but doubtfully amenable genera, such as *Nolana*, *Physalis*, *Mentzelia*, *Catananche*, *Anagallis*, *Nemophila*. Such exotics, if they be such, we visualize growing in secluded retreats of misty valleys or sloping screes, indifferent to human foibles until they are overwhelmed by bulldozers or triumphantly holding their own in the callous world around them. No longer will these gifts of nature be recalcitrant or miffy to me. One might as well berate the Mona Lisa for being miffy because we cannot produce her equal. The alpiners are supreme in their beauty, and independence is their birthright. We are their subjects to do their will.

Coda—Since the Slide Director cannot accept slides unless they are recognizable closeups, only a small fraction of our efforts have been assembled for our "Collection" for a slide program under the title of this article. If we ever return to these fabulous and accessible German and Austrian rock gardens we shall donate originals, for the duplicates are not as satisfactory.

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The recent heavy floods in New Jersey and certain technical difficulties encountered as a result of a new printing technic have been responsible for this erratic printing spacing. It has been determined by all concerned that, in the interest of timeliness, no attempt would be made to correct these spacing lapses this time.

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## DR. WORTH'S GARDEN

MARY TIBBETTS FREEMAN, *Ithaca, New York*  
Part III: The Rock Garden — Summer and Fall

As the season moves through June into July, the dwarf Aquilegias begin to blossom - *A. saximontana* and *A. bertolonii* both very blue and *A. viridiflora* in growth habit thinner and less compact, whose curiously striking green-brown flowers stand well above the much-cut, near prostrate foliage. *Semiaquilegia ecalcarata* blossoms generously and gracefully, opening many charming chocolate-colored flowers. Many Dianthus come into bloom - DD. *neglectus*, *petraeus*, and *myrtinervius*. *Dianthus erinaceus* forms mats of beautiful blue-grey prickly foliage and although chary with its small pink flowers, keeps on producing them a few at a time well into September. *D. carthusianorum nanum* is gawky of growth and long of stalk but the wonderful color of its small velvety crimson blossoms leads one to forgive.

*Penstemon pinifolius* cascades over a rock and down the side of the north mound, brilliant in the beauty of many narrow scarlet trumpets over needle-like leaves. It grows and blossoms in other parts of the rock garden also, but this plant on the north mound is the original collected plant and is at least 25 years old. Another Penstemon, probably a microform of *P. davidsonii* (a dwarf shrubby plant) starts to blossom earlier and continues to open very pretty rosy-mauve blooms on short spikes above good green, shiny, rounded leaves, off and on all summer. This charming little Penstemon came to Dr. Worth's garden many years ago from seed sent by a childhood friend. Seed is hard to come by, and for Dr. Worth at least, propagation by cuttings is easy (he says he just breaks a piece off and sticks it in the ground) but in other gardens this little Penstemon is inclined to balk and be difficult.

*Veronica rupestris* (*V. prostrata*) faithfully opens loose clusters of small deep blue flowers and is both lovely and distinctive; lovelier is the pink form which climbs in and around the rocks on the side of the south mound. *Allium ostromskianum* raises large, round, handsome heads of carmine-pink; *Anemone rivularis* with blue-backed blossoms is delightful; even more charming are the ap-

ple-blossom blooms of *A. narcissiflora* which in Dr. Worth's garden blooms apparently on a schedule all its own. Here and there in the garden and especially on the eastern slope of the south mound where earlier in the season they are virtually hidden, first by *Corydalis solida* and then by *Anemone blanda*, many clumps of encrusted Saxifrages in assorted varieties raise large feathered sprays of white - sometimes pure, sometimes flecked or speckled - above happily spreading clusters or mats of crowding rosettes. *Oenothera flava* blossoms late in the day, its golden short-lived flowers loose among the dandelion-like leaves, and seeds generously - on mounds, in the path, anywhere. *O. fremontii* has large fragile blossoms which are of a paler, softer yellow and it does not seed around. *Catananche caerulea* (by seed from the Archibald Expedition to Iran) would be somewhat tall for the rock garden were it not browsed back so regularly by rabbits; as it is, the blossoms which escape being eaten off are of a good, bright and pretty blue.

On the west side of the north mound, spreading up and over the crest are several *Onosmas* whose pale yellow or white-flushing-pink flowers nod from stiff crossiered stems above basal tufts of silvery grey-green leaves. *Achillea clavennae* has flowers that are white above hoary foliage. *A. serbica* (which Farrer vehemently distinguishes as *Anthemis aizoon*) with many white flowers on short stems above close grey rosettes is choice and lovely. *Incarvillea delavayi*, on the south side of the north mound, bears several 8-10" stalks of large rose-colored trumpet-like flowers, brilliant and very showy, and then shortly thereafter takes itself off. *Aster yunnanensis* carries striking mauve, orange-centered blossoms on tall stems; *A. sibiricus* var. *meritus* is truly dwarf, a delightful little 3-4" plant whose pretty pale lilac-blue, yellow-centered blossoms appear throughout the summer - although spreading - a well-behaved little plant. *Linum flavum* bears yellow flowers on stiff foot-high stems in a neat clump. *Gypsophila cerastioides* bears white, pink-veined blossoms which closely cover the slowly spreading tufts of oval leaves. Although the silvery mats of *Antennaria dioica rosea* spread more rapidly, its pink "pussytoes" flowers are soft and charming. *Digitalis orientalis* which Dr. Worth grew from seed gathered in Iran by the Furse Expedition differs from the orange perennial collected by Archibald in Greece and opens curiously-lipped, reddish-tinged-cream flowers slowly; staying in blossom a long time. A small purple Iris from the Ludlow-Sherif Expedition is a late blossomer - and striking. *Leontopodiums* of assorted names but hardly distinguishable appearance blossom quietly but faithfully above the path.

In several places in the garden, shrubby *Potentillas* provide flowers and color from mid-June to frost. Most are upright and have yellow flowers - some smaller, some larger, some brighter, some softer; several show considerable variation in foliage. One erect little plant almost always has one or two blossoms clear apricot in hue, in addition to yellow blossoms. Two among Dr. Worth's *Potentillas* are distinctive: one, a low-growing, near-prostrate plant with beautiful large soft-yellow blossoms the size of a 50-cent piece, is choice. The soft pale color of the flowers is unusual among *Potentillas*. Plants from seed differ from the parent in color, foliage and growth pattern; propagation by layering is reluctant, by cuttings fairly easy but not entirely so. The second, a low-growing large white-flowered form, blossoms freely all summer long and well into the fall. In growth pattern the habit is arching. Even the seed heads are attractive. All told

it is a most desirable plant. Propagation from cuttings or by layering is easy but it does not come true from seed. Both the pale yellow and white blossoming plants came from the same package of seed sent to Dr. Worth years ago by Dr. Fred Stoker as *Potentilla fruticosa mandschurica*. Germination was good, but being then ignorant of the variability of seedlings of *P. fruticosa* and thinking that he would not need many plants, Dr. Worth saved only four seedlings. All four proved to be different and interesting in some respect, and Dr. Worth has many times regretted those other seedlings which he cast away.

The Campanulas, together with their relatives the Codonopsis, Platycodons and Symphyandras comprise the glory of the summer season in Dr. Worth's garden. As a family, the Campanulaceae is a favorite with Dr. Worth. The habit is good; the flowers shapely; and the color, of whatever blue, pleasing. As Liberty Hyde Bailey says, "They are eminently plants for the garden-lover, for those persons who graciously accept cool nights and soft rains and dews . . . for those who love to grow plants for the joy of growing them, who respond to the subdued and delicate tints in flowers, who like small but shapely seed-pods, who may treasure them on their own rear grounds and do not go to the shows for exhibitional effects and masses of color." (*Garden of Bellflowers*, p. 2). Dr. Worth grows many and each year plants seeds of new or different as well as familiar kinds. As a result, throughout the summer, from early June when *Campanula bellidifolia* and *C. tridentata* begin to flower, there is a beauty of bellflowers in his garden to see and enjoy: *C. carpatica* with open blue or white flowers; *C. raineri*, a hybrid form, dwarf and free-flowering; *C. caespitosa* whose nodding bells are somewhat constricted at the mouth; *C. cochlearifolia* 'Miranda' blossoming with a multitude of delicate nodding soft blue thimble-like bells; ivy-leaved *C. muralis* (*C. portenschlagiana*); *C. cephalenica*; *C. glomerata acaulis nana*; *C. ochroleuca* carrying yellowish or creamy flowers on foot-high angled stems. *C. makaschvilii* blossoms late and its long tubular bells hanging along one side of the two-foot stalk open white but turn softly pink. *C. stansfieldii* is charming and choice with open blossoms of a good lavender-blue; *C. tommasiniana*, which has been growing out from beside a rock above the path in Dr. Worth's garden for at least 15 years, is late to appear in the spring but makes up for its tardiness by continuing to bear long narrow drooping lavender-blue blossoms well into September.

Above the path to the west grow various Codonopsis, skunky-smelling straggling plants which also are late to rise and, Dr. Worth has found, although all grown from seed identified as being from different species, they are neither clearly distinguished one from another, nor reliably hardy. The large solitary downward-facing bell blossoms are lovely, however, open and bluish, often veined or patterned with darker blue or lavender and banded around the base inside usually with dark blue, purple or chocolate strikingly marked with yellow, yellowish-green or orange. Large blue, open-belled *Platycodon grandiflorum* growing on the west side of the north mound is broken back each year and so made to keep a size suitable to the rock garden. Several years ago Dr. Worth discovered by accident that if the first growth is broken back, the second growth comes on dwarfed and yet the quality of the blossoming is not affected.

Of the Symphyandras, Dr. Worth is at present growing *S. hoffmannii* and *S. wanneri*; both beautiful, easy, free-flowering over a long period and lovely in

the garden. *S. hoffmannii* has flowers which are large clear white bells held high (two feet) above rather coarse basal Canterbury-Bell-like foliage. *S. wanneri* (which Lincoln Foster calls the "dwarf beauty of the genus") thrives on the south-mound where the slope reaches eastward toward the apple and plum trees. Throughout the summer its many nodding violet-blue, bell-shaped flowers on 6-inch wiry stems make a wonderful display. Although generally monocarpic, both *Symphyandras* in 1971 blossomed in Dr. Worth's garden for a second season.

As late July turns toward August, the corner by the alpine house and potting shed is brilliant with lilies. Except for a stray self-sown seedling under the apple tree to the east, which has always been a later bloomer, the martagons have given way to *Lilium concolor*, *L. tsingtauense*, *L. cernuum*, hybrids of the Auratum or 'Green Dragon' strains, and others. The mass effect is striking. Over the years, Dr. Worth has raised many of the lilies from seed and individual plants show considerable variation in color as well as in size and shape. Growing lilies in Dr. Worth's cold garden tends to present more than the usual obstacles. Not infrequently, a late frost in June effectively cuts back tender new growth well before buds are even formed; an early frost in autumn is ever a threat to the late bloomers, and more often than not, Dr. Worth has to finish ripening off seeds by picking the pods and keeping them in water until ready to harvest. Nor are all challenges provided by the climate. In 1970 in a nursery bed just to the east of the bulb frames, 25 or 30 *L. auratum* hybrids were in good and promising bud for the first time; two days later all except one or two had been destroyed, eaten off by the woodchucks. Apparently the odd ones which were left were not to the varmints' taste, for they too showed traces of having been sampled. These few rejected ones were the only ones from the whole planting to reappear in 1971.

By late July or early August when the lilies are at the height of their splendor and *Clematis tangutica* is reaching up and over the side, end and even the roof of the potting shed and veiling it with countless small golden nodding tubular flowers, the time of abundant bloom in the rock garden has passed and a quieter, more leisured beauty prevails. In many ways, mid and late summer comprises one of the loveliest seasons in Dr. Worth's rock garden, when the beauty of patterned growth among lichened rocks can be seen and the soft colors and interesting textures of foliage enjoyed. Silvery Alyssums, prickly Acantholimon, blue-green Aethionemas, crinkly-leaved Primroses, frosted strawberry-leaved Potentillas all add color, tone and interest. The white feathered foliage of *Chrysanthemum haradjani* is always distinctive and in late summer, especially, looks cool and fresh. A variegated *Arabis* whose bright green leaves are edged with creamy white makes a handsome showing on the bank above the path to the west. An assortment of sages which Dr. Worth raised from seed brought back from the Near East by the Archibald and the Cheese, Mitchell, Watson expeditions show interesting variations in their velvety, silvery green leaves. *Origanum rotundifolium* whose fresh green foliage fades to greenish-white toward the ends of the thickly-leaved, foot-high stems tends to be more handsome and striking than the many small slender lavender-pink blossoms. By September, the whitish bracts at the tips of the stems have flushed pink and this late summer interest increases its value in the garden. Among the rocks to the right of the place where the path steps down, *Thalictrum chelidonii*, grown from seed brought back years ago by the Ludlow and Sherif Himalayan Expedition,

displays delicately-cut foliage suggestive of that of the Venus Maiden Hair Fern. Here and there in the garden and especially on the south mound, *Sempervivum* form close clumps of bright red and green or of softer grey and rose; several varieties in varying sizes are covered with closely tangled cobwebs. Still another group, distinguished by lopsided, tightly packed rosettes in a dusty rusty color which fades to tan in the heat of the season, is a hybrid form which grew years ago from seed planted as that of *Sedum sempervivoides*. Under the apple tree to the east the soft-shaded grey, wine-red foliage of the Japanese Painted Fern (*Athyrium goeringianum pictum*) is colorful and cool looking. Among the lichened rocks, fine-cut feathered silvery foliage gives distinction to *Saxifraga "microlepis"* so called, a plant offered by Carl Starker 25 years ago. The beauty of the soft, slightly woolly tiny rosettes of *Arabis androsacea*, whose small white flowers are always overshadowed in springtime's brilliant display, wins well-deserved admiration in late summer's quieter garden.

The colors in Dr. Worth's August garden are not entirely limited to soft greys and greens and silver of leafage, and even though the time of copious bloom is over, late summer brings its own blossoms. The eastern slopes of both mounds are blue with Gentians - *Gentiana septemfida*, *G. lagodechiana* and *G. asclepiadea*. Under the apple tree, clumps of the Japanese Toad Lily, *Tricyrtis hirta* show purple-spotted or (somewhat less familiar) creamy white long-lasting blossoms. *Trachelium rumelianum* (*Diosphaera dubia*) produces many pale blue clover-heads and makes a pleasing display. Two clumps of *Allium cyaneum* blossom, first one and then a little later, the other, in differing shades of blue; the first, steely, the second a darker, clearer hue. *Solidago mollis* often is just starting to show color on August 26. *Astilbe chinensis pumila* has deep pinkish-lavender fluffy blossoms which are almost luminescent and *Linaria supina* is pert and pretty with many yellow, burnt orange, mahogany flowers. In several places on the crest of the north mound where, over the years, seedlings have found a congenial root hold, the many small rose-pink flowers of a lovely grey-green-leaved *Origanum* grown from seed collected by a Peter Davis Expedition to western Turkey, are quickly followed by loosely drooping clusters of flattish, silvery, slightly pointed, herringboned seed heads. On the south mound, large balloon-like iridescent seed pods, flushed warmly pink, distinguish the *Physaria*s with a second season of beauty.

Toward the end of August, the rock garden loses the look of summer and the appearance of the first Colchicium blossom early in September signals the coming of fall. Fruit in the crab apple trees in the northwest corner and along the northern border of the garden is red and ripe. Frilled clusters of nuts can be found in the copse of hazelnuts beyond the tree peonies in the northeast corner; and the grapevines which festoon the potting shed, the lilacs, even the Japanese lilac at the corner of the lawn by the entrance to the path to the old garden, hang heavy with grapes ripening in greens and reds, blues, mahoganies and black. In the rock garden itself, many open spots appear as plants go underground. The season hurries along; and by mid-October, for the most part, all the plants are low and snug among the rocks, ready for winter. In spots there is color - a dividend of bloom on *Erinus alpinus*, *Geranium sanguineum*, *Hypoxis hirsuta*, *Dianthus nardiformis* (a good pink), and the shrubby *Potentilla*s. Under the apple tree a late-blooming *Lobelia*, *L. syphilitica alba*, lifts several stalks of fringed white

blossoms. On the west above the turn of the path, the *Pulsatillas* flaunt feathered seed heads. Just below them the bright blue flowers of autumn *Crocus* rise above the autumn-hued foliage of *Geranium pylzowianum* in a happily-contrived companion planting. Chipmunks have long since hunted out and devoured most of the plantings of *Crocus* in the rock garden; only those protected, as here, by the *Geranium* have escaped. Here and there self-sown Johnny-jump-ups fill in places now vacant with colorful little faces, some purple, others blue and yellow; all bright and gay. Dr. Worth did not plant these willing little charmers in this present garden; they came in on their own as stowaways with plants moved from the old garden and through the years they have taken care of themselves and continued.

The real show of color and interest at the end of the gardening year centers in the northwest corner where plantings of *Colchicum* provide a succession of bloom until the snow comes and shuts it away. The single form of *C. autumnale* in both the mauve and white usually begins the show in the first part of September; the double form of *C. autumnale* comes later, the mauve which rivals *C. 'Water Lily'* and the rarely seen double white which Mrs. Wilder describes as being "among the elect of autumn flowers . . . scarce and expensive (and worth its price)" (*Adventures with Hardy Bulbs*, p. 108); *C. agrippinum*, small and tessellated; *C. 'The Giant'*; the pinkish *C. 'Lilac Wonder'*; *C. 'Violet Queen'* a darker purplish-pink; *C. speciosum*, large of flower and slightly-tessellated; *C. 'Water Lily'*; *C. byzantinum* and several smaller-flowered species collected by the Cheese, Mitchell, Watson Expedition and named only by number. In 1971 the display of *Colchicums* lasted for fully three months. Early in December snow covered those in the garden, but on December 11, *C. #3806*, a small pale-pink form, was blossoming in the frames. Christmas morning dawned soft and pleasant; the snow had been gone for four or five days. On visiting his garden, Dr. Worth found a double *Colchicum* newly appeared and half open.

#### Epilogue: Summer 1972

Fall and winter 1971-1972 in and around Ithaca were exceptional. There was no killing frost until after Thanksgiving and the weather for the most part continued to be mild until the last week in January when the temperature fell from 50° one day to near zero the next, and stayed down there. The extended soft beneficent weather encouraged herbaceous perennials and shrubs to continue growing, and when winter finally came, there had been very little hardening off. As a consequence, garden losses over winter were many and Dr. Worth's garden was no exception. Chief among the casualties was *Daphne cashmiriana* in the old garden, for there is no known replacement. Also to be mourned were *Adiantum capillus-veneris* which failed to reappear in the rock garden and *Silene hookeri* in the frames. The Onco Irises were hard hit, yet survived, although there was little blooming, little summer growth and no increase. The double primroses which had given such a beauty of bloom in 1971 blossomed but sparsely and seemed throughout the summer to go back. In August, Dr. Worth lifted several, potted them up and moved them into the alpine house. Their response was almost immediate; almost overnight they seemed to take heart and grow. Who can say whether their decline was weather-related or whether the message is that double

primroses quickly exhaust the soil and require frequent dividing and setting over? In late summer of 1972, Dr. Worth opened up a new area under the lilacs in the southeast corner for the season's seedling crop of double primroses, Julianas, Hose-in-Hose and Jack-in-the-Green. But if the Onco Irises and double primroses were disappointing in their blossoming, *Aquilegia scopulorum* from seed collected by Charles Thurman in Utah was not. In the alpine house three plants blossomed, two with several blooms on a single stalk, one with several blooms on several stalks. Two were blue, one pink and some little seed was set.

Several new plants also brought changes to the garden. High on the south side of the north mound *Campanula hawkinsiana* which had been planted out the previous August blossomed happily and freely and continued to produce its lovely wide-open purple bells for at least six weeks. On the north side of the north mound, adjoining the newer part which reaches out to the northeast, a species *Aubrietia*, again a seedling planted out the previous summer, blossomed for several weeks with clear soft lavender-lilac single flowers, quiet but very charming; smaller, more compact, silver-leaved and less sprawling than the hybrids and without question a most desirable little plant. Mid-summer brought into blossom a completely double little *Campanula*, in color a clear harebell blue. The leaves are basal, sharply toothed and slightly hairy; similar to those of *C. carpatica* but distinctly pointed. The flowers are held well above the leaves on stems and in a manner much like those of *C. rotundifolia*. What the *Campanula* is, is a mystery; its source equally so. Several years earlier, Dr. Worth had planted out a pot of unlikely looking, left-over *Campanula* seedlings - odds and ends - in this general area. All but the one had succumbed to the transplanting and until its blossoming, the single survivor had looked like just another second-rate *Campanula*. Such are the joys of a rock garden.

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WHERE DO OUR ARGS MEMBERS LIVE? — ARGS members are congregated for the most part as follows: in New York, Washington and Connecticut with memberships between 200 and 300 each. Then come Pennsylvania, California, Massachusetts and New Jersey, in that order, with memberships between 100 and 200 each. Only Mississippi is without a member. Surely there must live in the Magnolia State at least one rock gardener or one person interested in native flowers who would like to become an ARGS member!

It should be remembered that we are speaking of memberships and not people who are members of the ARGS for some memberships are family memberships in which two persons are involved. If the second persons in such family memberships are taken into consideration the quoted figures would be somewhat larger.

As far as foreign countries are concerned ARGS has members in 33 countries. Most of the memberships outside the United States are concentrated in England, Canada, New Zealand and Czechoslovakia.

It is interesting to note that our membership in the Scandinavian countries is increasing rapidly and now totals 45.

South of the equator our membership has been extended to 101 members, most of them concentrated in New Zealand and Australia.

## THE POLEMONIUMS WITH WHORLED LEAFLETS\*

DR. C. R. WORTH, *Ithaca, New York*

Very near the top of my list of favorite Rocky Mountain plants are the tiny *Polemoniums* with whorled leaflets. In Davidson's monograph they are all lumped together as a single species, yet in the field they resolve into at least four quite distinct entities.

All of the group is characterized by leaves that rise directly from the rootstock, with a rather thick petiole and tiny leaflets, sometimes no more than one-eighth inch long, arranged in what appear to be whorls around the leafstalk. To the casual observer, the effect is that of a stem set with small, more or less elliptical leaves. Stems of several inches bear heads of flowers with tubular corollas and flaring lobes. They are all perennial, and often develop into sizable clumps in the mountains, but in the garden rarely make more than a single tuft.

All the high-alpine zones of the Rockies, as far as I can recall, and even the peaks of eastern Nevada, display a representative of the blue-flowered species, with very rarely an albino. In the alpine meadows east of Leadville, Colorado, grows a rather small and compact form, no more than six inches high, while above it on slides of coarse boulders are plants of twice the size, with really magnificent heads of deep blue (slightly purplish) flowers fully an inch across. It took me considerable time to decide that these two distinct forms are actually the same species, which seem to be the only one in the Colorado Rockies. This I regard as typical *P. confertum*. To the west, in Utah and the Snake Range of Nevada, is a much smaller and more compact plant, with darker flowers, which seems to restrict itself to screes, either lime or volcanic. This seems to fit the description of *P. viscosum*, if there really is such a species. An extreme microform which has been given the name of *P. lemmoni* grows near the summit of the volcanic San Francisco Peaks above Flagstaff, but except in size seems indistinguishable from "*P. viscosum*."

*P. mellitum*, according to early records, was plentiful in the Laramie Range between Cheyenne and Laramie, but I have found it in only one location there, on the shady side of granite outcrops. Further north, in the Big Horns, it appears on lime cliffs just a few miles north of US Route 16. It has been reported from Colorado, but Mrs. G. R. Marriage told me that she never found it, and in at least one case the plant seems to have been merely an albino *P. confertum*. *P. mellitum* is a plant of moderate altitudes, perhaps around 9000 ft. rather than a high alpine. It makes the largest mats of any of the species, often well over a foot across, of rather flopping leaves six inches or much more in length. The flowers, on stems of six inches or so, are of a soft creamy yellow. At Edinburgh and Branklyn, plants grown from seed I had collected bore flowers with a blue spot on each lobe, which I had never observed on plants in the wild. Although strictly a crevice plant in nature, this species is probably the easiest of all in the garden, and will flower in common soil in full sun. In spite of Farrer's comments, I cannot find that the plant has any odor, although I have smelled *P. confertum* even a quarter mile away.

*P. brandegii* is often lumped with *P. mellitum*, yet in range, habitat, and general appearance the two are quite distinct. *P. brandegeii* comes from the lowest altitudes of any of the species, about 8000 ft., and is quite the smallest of

the group, with only a few short leaves of three or four inches, and minute leaflets. The flowers, on stems of three inches, or so, are of like size, and are reportedly sometimes greenish yellow. I was fortunate in blind collecting from plants in ripe seed (set very sparingly), for the offspring have had flowers of a good amber shade. So far as I know the plant, it grows on volcanic rock, usually just beyond the reach of my fingers, and is far from plentiful. It occurs near Creede, Colorado, and at the summit of the Sandia Rim near Albuquerque. It is also reported from a fairly definite station in southern Utah. I sought it there once, but the hour was late, the horse and I were both weary from two days at high altitudes, and there were still many miles, including the descent of a long cliff, to go before dark. There was no likely place to be seen and the search was half-hearted. Never again has there been an opportunity to go back and see whether the plant has escaped the heavy grazing of sheep.

All *Polemoniums* germinate quite readily and are fairly easy to keep happy for a time, in either alpine house or garden. But they are inclined to die after flowering, and never have they seeded in my garden. They are not beyond the abilities of the grower of limited experience, yet they challenge the ingenuity of the expert if they are to survive for any length of time.

\*Reprinted with permission from the *Bulletin of the Alpine Garden Club of British Columbia*.

\* \* \* \* \*

DR. C. R. WORTH — In this *Bulletin* word has just been received of Dr. Worth's passing but as yet there are no details. See Obituary in October '75 *Bulletin*.

\* \* \* \* \*

SEEDS OR PLANTS WANTED — Mr. L. Kreeger, 91 Newton Wood Road, Ashted, Surrey, England desires seeds or plants of the following species: micro-Phlox species, *Astragalus coccineus*, *Trichostema lanatum*, *Conradina pubescens*, *Satureja coccinea*, *Silene plankii*, *Hedeoma ciliolata*, *Monardella macrantha*, *Gilia* species, *Synthyris pinnatifida* forms and *Penstemon pennellianus*.

If you are able to supply Mr. Kreeger with seeds or plants of any of these species he will be glad to exchange seeds or plants from an extensive collection of rarities and would also be pleased to exchange with anyone collecting wild alpine seed from North or South America. Anyone interested please communicate directly with Mr. Kreeger.

## IN THE CAUCASUS MOUNTAINS

JOSEF HALDA, *Prague, Czechoslovakia*  
*Part III*

The exposed cliffs in the high alpine rocks of the Western Caucasus are inhabited by several plants which can survive extremely hard conditions. The first of them is *Potentilla divina*. It forms miniature adpressed cushion-like mounds of silvery leaflets with large, red-calyxed, rose flowers on red stalks. It resembles somewhat the alpine *Potentilla nitida*. In rock gardens it is not easy, but even there it is content in poor crevices as is *Eritrichium caucasicum*.

Of this *Eritrichium* I have a special memory from the wild with which I shiver all over. One day — it was before evening — we climbed with friend Tolja up onto small rocks immediately below the eastern ridge of Chugush. Here chamois and capricorns somewhat troubled us. These animals are curious and when they came to observe us from the upper cliffs they dislodged stones which inevitably started stony avalanches. We photographed *Eritrichiums* and other alpine, then started up a chamois path, with eyes only for the plants as is normal with alpine gardeners in such situations. When we reached the top of our ridge we heard some grumbling, the same as we had heard before, but less intensive. We looked ahead and stopped, astonished; at that moment unable to do anything for fright and surprise. Before us on a small shelf of the ridge crouched a nice splotched leopard. He seemed somewhat disappointed by our presence there. Before our trip, the home hunters warned us about visiting these ridges as there are most often leopards hunting chamois and capricorns, but we neglected this warning. The leopard crouched and we gaped at one another, then suddenly he moved up and quickly went away. Later when I became more familiar with these animals, we observed them several times at a distance but never again as close as at our first meeting.

In the Caucasus live many other larger animals; deer, wild boars (after their visit to a meadow, bulbs can be collected on the ground), bears which are to be seen from time to time, lynx, wild cats, marten and otter. When you approach the animals they are usually gone without your having seen them, only the white-headed vulture above rounds permanently in the air and reminds you that in case of your falling down the rocks nothing of you will go to waste.

But let us return to the *Eritrichium*: in the Western Caucasus it is not too often found, although in the Central Caucasus it is one of the more common plants. It grows often on cliffs streaming against the wind and not rarely even on firm screes. It seems to be easy from seed as well as from cuttings.

The rocky onions, *Allium szovitsii* and *A. ruprechtii*, with rose or white flowers are very tasty to chamois and they climb for these onions on such rocks as we could climb only with great difficulty. *Ranunculus lojkae* is miniature, a pale yellow buttercup 3-6 cm high with ternate, deeply cut leaves; an easy plant. *Gypsophila glauca*, cushion-like and hard, with white flowers, inhabits the driest spots on the rocks. Here also are present several Saxifrages, most often *Saxifraga juniperifolia*. It forms carpets up to 1 m in diameter, composed of acute, dark green leaves and with a profusion of golden yellow flowers. It is a lover of mois-

*Saxifraga cartilaginea**Campanula saxifraga**Omphalodes lojkae**Potentilla divina**Eritrichium caucasicum**Draba bryoides**Rhamnus microcarpa**Saxifraga juniperifolia**Ranunculus lojkae*

Jarmila Haldova



*Pulsatilla albana*  
*Androsace villosa*

*Viola caucasica*

*Draba brunifolia*

*Delphinium caucasicum*

*Arctostaphylos uva-ursi*

Jarmila Haldova

ture and here it grows together with *S. moschata* and *S. caucasica*, both greenish-yellow flowered. *S. cartilaginea* and *S. kolenatiana* (of section *Euaizoonia*) are light-lovers, preferring exposed places. Often it can be seen growing with *Rhamnus microcarpa* which is a minute alpine shrub with blunt, elliptic leaves and bizarrely twisted branches. On the same spots we found *Omphalodes lojkae*, a very showy plant with a leafy rosette, the leaves on the short stem narrowing as they ascend. The flowers are up to 20 mm across and bright blue. I've retained this plant in my rock garden for only three years, now I have it only on several nice slides.

*Paederota pontica*, very similar to its alpine related species, is 15 cm high with large and leathery, ovately lanceolate leaves and yellow corolla. *Betonica nivea* is also a dry-loving plant with snowy white tomentose leaves and spikes of creamy (more rarely yet, rose) flowers. *Jurinea woronowii* and *J. coronopifolia* are dwarf composites, closely related to the genus *Saussurea*, but with divided leaves and purple flowers. These plants in the wild are very often stemless and thus very decorative. *Symphyandra pendula* prefers shaded corners between stones and rocks where its pendulous pale blue flowers are neighbors of the fern, *Cryptogramma crista*, and lovely *Senecio renifolius* which is a dwarf plant with yellow flowers on 5 cm tall stalks and with kidney-shaped leathery leaves. It does

well in the rock garden. *Sagina saginoides* is a well-known plant, but it can become a weed in the garden. *Minuartia colchica* forms lovely spiny cushions covered by lots of white flowers with very narrow petals. Silene interested me here in two species: *S. pygmaea*, with a rosette of small leaves and whitish rose flowers and *S. lychnidea*, with large, incised, rose flowers on thick stems 5 cm high. *Gypsophila tenuifolia* is often grown in our gardens, but only scarcely shows its short-stemmed white flowers there.

Screes, stony fields with small islands of soil on them, are the home of many interesting alpine plants. The most typical alpine for such sites is *Androsace villosa* which varies here from very densely hairy and woolly individuals and forms to plants with nearly glabrous leaves, also in size of flowers from the most minute to relatively large ones. The form of the rosettes also varies distinctly. In association with them often grows the white pasqueflower, *Pulsatilla albana*, which has long been in cultivation. On dry places with scarcely any other vegetation live *Huperzia* / *Lycopodium*, *Urostachys* / *selago*.

The most typical conifer of stony fields is *Juniperus sabina*, forming large cover-like formations. Another juniper, *J. depressa* grows most often on rock turning to scree, together with red flowered *Sempervivum caucasicum* which has



*Sempervivum caucasicum*

*Arabis caucasica*

*Papaver lisae*

*Eunomia rotundifolia*

*Juniperus depressa*

green rosettes. Another, *S. pumilum*, also red flowered, lives on similar places often near *Thalictrum alpinum* which has white miniature flowers and near *Potentilla fruticosa*.

The firmed screes are also home to *Saxifraga scleropoda* and *Trifolium polyphyllum*. The latter has 5-7 leaflets in one oblong-linear compound leaf. The entire plant grows only to 5 cm tall and has rose flowers 3-10 in number in a head-like inflorescence, the individual flowers up to 25 mm long. It is a very graceful alpine. *Astragalus aureus* with yellow flowers and woody stems is relatively rare here, although farther to the east it becomes nearly common. *Galium fistulosum* forms green cushions saturated with starry white flowers. A very lovely plant here is *Papaver lisae*, a miniature poppy with shining red flowers. It grows often in association with *Eunomia rotundifolia*, a creeper related to the genus *Aethionema* and often called *A. oppositifolium* which forms large carpets of grayish, rounded leaflets and minute head-like rose or white inflorescences. *Gentiana kolakovskyi* (*G. septemfida* var. *diversifolia*) is a showy alpine of firm screes, its bright blue flowers often to 5 cm long. *Thlaspi pumilum* with white or rose flowers and minute coin-like leaves also inhabits these spots.

*Arabis caucasica* (*A. albida*) firms the new screes, as well as *Draba repens* and *Potentilla gelida*. *Draba globifera* forms only dwarf cushions with needle-like leaves to 3 mm long and with flowering stems to only 2 cm high. *D. siliquosa* inhabits naked ground. Other inhabitants of such places are representatives of the genera *Minuartia* and *Cerastium*. There are many species, most distinct of which is probably *Minuartia caucasica*, forming large vivid green carpets. *Delphinium causicum* is large flowered though a very small plant, only 7-15 cm high in the wild, with rich blue corollas. Frequent, too, is *Alyssum tortuosum* with abundant yellow flowers and small gray-green leaves at ground level. *Viola caucasica* is 5-10 cm high, small-flowered with darker-veined yellow corolla and minute coin-like leaves. *Helianthemum nummularium* is, even in Europe, a well-known, yellow-flowered shrublet with glossy leaves. *Anthemis rudolphiana*, a silver plant with large rich yellow flowers grows to 25 cm high. *Arctostaphylos uva ursi*, the familiar evergreen creeper, is frequently present and the chamois and capricorns dig its branches in winter snows. There are many other plants on the screes: I must name here *Arenaria lychnidea*, a very beautiful rose-flowered alpine, and *Dianthus kusnetzovii*, small in habit but with large rose flowers.

We must not overlook the high alpine sphagnum formations characterized by several species which do not grow anywhere in other associations, such as *Menyanthes trifoliata* with ternate leaves and spikes of fringed white flowers. *Sphagnum compactum* and *S. warnsdorfii* form boggy covers inhabited by *Swertia iberica* with dark blue or yellow flowers, the well-known *Parnassia palustris*, *Eriophorum vaginatum* with hairy white heads or *Pinquicula vulgaris*, an insectivorous plant with ligulate leaves and tiny violet flowers on long pedicels. Also many species are living at the bog margins: *Cirsium ovalatum* and *C. simplex*, *Caltha polypetala* with yellow flowers, *Trollius patulus* with rich golden yellow flowers, *Equisetum hiemale*, the yellow *Geum speciosum*, *Saxifraga sibirica* also with yellowish flowers, purple flowering *Pedicularis subrotata* and many others.

Now I must say a few words on subnivale and nivale zones which are developed in the neighborhood of glaciers at elevations between 3000 and 3800



*Rhododendron luteum*

*Adonis vernalis*

*Vinca herbacea*

*Paeonia tenuifolia*

*Ficaria valthifolia*

*Genista compacta*

Jarmila Haldova

m.a.s. On the snow surface can often be seen various algae (*Navicula mutica* and *Chlamydomonas nivalis*) and on the naked rocks there are living many various lichens (Lecanora, Rhizocarpon, Aspicilia) and also several mosses. As a collector of alpinists I had no success there but as an alpinist I was more than satisfied. From these heights were unforgettable sights toward the massif of Elbrus with all its peaks and glaciers.

If you would come into the Caucasus in early spring when the mountains are yet covered with snow, nothing is lost. The steepes below them give quite an unusual sight: everywhere on the slopes are abundant colonies of *Adonis vernalis* with large and shining yellow flowers. *Eremurus spectabilis* with its rose spikes is a surprise on the shrubby steepes as well as another genus, coraline-red *Paeonia tenuifolia* with finely cut leaves. Many species of Anemone are also present: our home species, yellow *Anemone ranunculoides* and white *A. nemorosa*, then the blue *A. blanda* and *A. caucasica*. With them appear the yellow *Ficaria calthifolia*, showy *Dictamnus gymnostylis* and *D. caucasicus*, both with fragrant leaves and rose or white flowers; tiny green *Adoxa moschatelina* or finely blue *Vinca herbacea*.

The meadows and light shrubs of lower elevations also are the home of many very beautiful bulbs: the reddish-violet *Fritillaria caucasica*, greenish-yellow *Tulipa biebersteiniana*, rose *Colchicum umbrosum*, *Merendera trigyna* and *M. eichleri*, yellow *Gagea taurica* or pale blue, porcelain-like *Puschkinia scilloides*. *Ornithogalum pyrenaicum* is not only a decorative plant but here even a useful one — its bulbs are very often eaten.

But I shall end my Caucasian story: I should be only very pleased, if you could choose from it a new plant for your rock garden.

## IN SEARCH OF ACIPHYLLA-1974-75

JAMES R. LECOMTE, *Ashburton, N. Z.*

In the previous two seasons, many planned trips could not be made because of lack of time, so it was decided to start earlier this summer.

A phone call was made to Greg in Wellington and as usual he caught the first flight to Christchurch where I met him and together we drove to Blenheim. Readers of the October, 1974 *Bulletin* of the ARGS will remember our ascent of Mt. Fishtail in the Richmond Range and the choice plants that grew there, and so will understand our desire to have another look at this area. The goal this time was Mt. Richmond (5,777 ft.) which is not very far away from Mt. Fishtail, and my main interest there was not an Aciphylla but a rare variety of the beautiful *Celmisia cordatifolia* we had seen and collected in February, 1974.

After leaving the car we located the track which followed a heavily forested ridge leading to a saddle below Mt. Richmond, and this track had been recently formed, for a swath six to eight feet wide had been cut with chain saws all the way up the ridge. The men responsible had made sure that the climber did not go to sleep because the trees, saplings and shrubs had been cut off about six inches above the ground level thus making one lift one's feet, or face the consequences — or the ground! The grade was reasonable and by 8 p.m. we were on the saddle



*Celmisia macmahonia* var. *hadfieldii* on Mt. Richmond (5777').

The Author

—thirteen hours after leaving home more than 300 miles away.

On the saddle was a Forestry tent stacked full of canned food, etc. This had obviously been brought in by helicopter, judged by the cleared landing pad nearby. Our small tent and puny amount of provisions which we had laboured so hard to carry up looked mighty small by comparison.

The next day was very foggy with visibility frequently varying from ten yards to a half mile, but we hadn't come all this way for nothing and so set off early, up the ridge to Mt. Richmond.

Although there are large tussock areas on the northern side, the whole southwest area, where we were, was a mass of broken rock fragments from which large solid outcrops reared at frequent intervals and it was on and around these outcrops that we found the plants; and one of the first found, and indeed the most prominent was an interesting form of *Celmisia spectabilis* which has lots of white hairs on the inner young leaves, giving the plant a grey-white centre. The leaves are broad, the whole plant having a solid appearance. With more altitude, *Celmisia macmahonii* var. *hadfieldii* put in an appearance and we were just as thrilled to see it this time as on Mt. Fishtail. Many of the beautiful cushions were studded with buds and some had flowers opening, or fully opened, but we were a week or so too early for the main flowering. Our first excitement at finding a pink flush on the reverse of the partly opened petals was dashed when we noted that this coloring disappeared on the fully opened flowers — white dominates New Zealand native flowers and a pink colouring would have been quite a find. Some very large mats of this *Celmisia* were seen (two feet to three feet across) but mostly about twelve inches or less. Further up, a moist-looking outcrop invited inspection and here were the plants we sought. *Celmisia cordatifolia* var. *similis*,

like the type (Oct. '74 *ARGS Bulletin*) grows in moist, shady places and at first look would appear identical but when the leaf is turned over one finds the foxy-red 'fur' has been replaced with a very thin layer of fine white hairs. This is indeed a very rare plant and was not found on any other outcrop despite the fact that scores of them were thoroughly searched, and information has it that ours was the first sighting since the original collection in 1952. On many outcrops there was an abundance of the tiny little *Aciphylla polita* (Oct. *Bulletin*) several of which were showing their frothy white flowers on six to eight inch stems.

Near the top of the mountain we came across multitudes of large hummocks of *Haastia pulvinaris* and although much has been written about this wonder, another little effort should not go amiss. Commonly known as the Marlborough Vegetable Sheep, this remarkable plant inhabits the higher rocky places, growing mostly on 'fields' of semi-stable rock fragments and on disintegrating outcrops. The plant is composed of a solid mass of rosettes each about 3/4 inch in diameter, pressed tightly together thus forming a tight, rounded, hummocky cushion of anything up to six feet or so across. Each rosette is formed by the broad leaves tightly wrapped about the wiry stems and the leaves at the tip of the shoots have long, fine, white hairs, thus giving the whole cushion a very woolly appearance. The colour is an attractive buff and they never fail to amaze the beholder, growing as they do in such inhospitable habitat. It is a great pity that *Haastia pulvinaris* is nearly impossible to tame — what a garden plant it would be! I can hear some readers muttering that Mrs. X and Mrs. Y grow this plant somewhere in Scotland or North England but such plants are merely pale ghosts of their true selves; lank, open and grey by comparison. Better by far that this alpine wonder be left to grow and flourish in its natural habitat.

By the time we were ready to leave the top, the fog had rolled in very thickly, but we had prepared for this eventuality by fixing marker strips of white cloth on the uphill sides of many of the dark grey outcrops, thus giving us a clearly blazed trail back to our camp on the saddle. Our descent the next morning was in fine warm weather and we drove over to the West Coast where we had a tentative appointment with friends who hunt deer in the mountains from a helicopter. There are several such venison recovery teams on the West Coast and in the Fiordland area; the resulting meat being exported. Much of the mountainous country being hunted over is very rugged and steep and almost inaccessible otherwise, so that the opportunity to fly with them was too good to miss. Some of the things these boys do in the course of their work would make your hair stand on end; such as stepping from the hovering helicopter onto a treetop; climbing down to put the deer on the hook; climbing up again and into the machine. These acrobatics are called for whenever deer are shot on steep bush-clad hillsides where landing is not possible—they earn their money!

Greg and I drove up a long narrow valley which thrust deep into the mountains, almost to the main divide, until we reached a sheep and cattle station (ranch) which was to be the hunters' base. There we camped in the shearer's accommodation which was fairly luxurious as some back country places go. It was almost dark when the helicopter came over the mountains with ten deer hanging on the hook, and the supply truck arrived by road soon after.

Now, I fully realised that an early night was desirable but the chance of good conversation and debate could not be passed over lightly and so the politics



*Celmisia petiolata* - its strong characteristic is the deep purple sheath and midrib.

The Author

of the land (and other lands) were thoroughly thrashed out; farming problems debated and tangled world affairs sorted out until 4 a.m. The alarm went off at 5:30 a.m. and the helicopter's engine shattered the dawn soon after. Soon after 6 a.m. we were on our way no more than 500 feet below the summit of Mt. Ajax (6010 ft.) and there were plants everywhere; a wonderful place to land and we were there in a few minutes where it would have taken us most of the day on foot. Having been asked to take stock of the *Celmisia* species present, I did a quick survey and noticed six around that site alone, and three others found later made a total of nine different species on that mountain. The most notable was one we had not met up with before, a recently described species, *C. vespertina*, which has stiff, very narrow (one fourth inch wide) arching leaves from four to six inches in length; the edges are recurved and the upper surface is conspicuously ribbed with alternate longitudinal bands of green and silvery white — the silvery white being very fine hairs. The under surface is completely covered with the same fine hairs, except for the midrib which is green. The plant forms an attractive open rosette and is found singly or in clumps. The white daisies are borne on six-inch stems which are covered in soft white hairs; a very nice plant!

*Celmisia petiolata* was a very prevalent species, which has lanceolate-oblong leaves up to six inches long by one inch to one and a half inches wide but the plants in this area were much smaller. The upper leaf surface was bright green with very fine, scattered golden brown hairs which are very conspicuous on the young leaves, giving a furry appearance, and the mature leaves are edged with brown 'fur,' while the underside is liberally coated with silky white hairs which lie flat and smooth. The strong characteristic of *C. petiolata* is the deep purple leaf sheath and midrib. The round silvery domes of *Celmisia sessiliflora* abound in

many places throughout the Southern Alps, and Mt. Ajax had its fair share. This species seems to hybridise occasionally with other species, giving rise to very interesting hybrids. One we found would appear to be *C. sessiliflora* x *C. petiolata*; a larger rosette than the seed parent but with the same very narrow leaves with some scattered white hairs plus the brown hairs of *C. petiolata* on the leaf edges and tips. *Celmisia du-rietzi* produced loose open patches as it crept about here and there, with rosettes (one and a half to two inches across) of narrow oar-shaped, slightly sticky leaves, smooth green on the upper surface and a thin white tomentum underneath.

Very close examination of the wetter places revealed *Celmisia alpina*, a real 'tiny' with narrow, upright, grass-like leaves of green (white underneath) about one-half to one and a half inches long and white daisies on stems of up to two inches. Next to *C. sessiliflora*, probably the most widespread species would be *C. spectabilis* in one of its many forms, and the plants on Mt. Ajax would be nearer to the type. It is a tufted plant, usually occurring in patches of about one foot to two feet or so across but often singly and has thick leathery leaves of four to six inches long by up to one inch wide, deep green on the upper surface and the lower surface densely clad in white tomentum. The leaf varies considerably in the variants of this species, from the short, very narrow form of *C. spectabilis* var. *angustifolia* to the long leaves of *C. spectabilis* var. *magnifica*. Very conspicuous in the area was *Celmisia discolor* which, with its prostrate creeping habit, forms broad patches of silvery-grey-green, and is indeed eye catching. The upper leaf surface colour varies a lot, even on the same mountain, sufficiently so to cause the unwary to believe he has two or three different species; silvery-green to grey-green to green, all with white tomentum underneath.

*Celmisia similis* was recently separated out from *C. laricifolia* and it differs from the latter in its stiffer and slightly wider leaves with silvery upper surfaces as opposed to the dark green of *C. laricifolia*. The rosettes of these silvery needles are small and neat, forming low patches and they certainly caught our attention.

On snowbanks and in sheltered damp hollows, we found *Geum uniflorum* in flower, its rounded, glistening, dark green leaves with reddish-brown hairy edges providing an attractive basal rosette for the lovely white chalice on hairy stems about four inches high. It really is a charmer!

The leaves of countless plants of *Senecio scorzonerooides* were everywhere and later this area would be quite a sight with the broad heads of white flowers on stems of up to two feet high. We were too early for many flowers but the myriad of plants were exciting enough — it was a veritable nursery. *Ranunculus insignis*, *Raoulia grandiflora*, dwarf *Dracophyllum* species, *Gaultheria depressa* var. *novae zelandiae* and hosts of others literally carpeted the steep mountainside. Higher up among the rocks were the evergreen mats of *Ranunculus sericophyllus*, only about one to two inches high, but the bright yellow buttercups were not yet showing. Three *Aciphylla* species were present; *A. similis* was everywhere but *A. indurata* was less common, and neither species were in flower or showing any signs. *A. similis* is a desirable dwarf plant of the wetter mountains and although it varies in size a little, according to where it grows in the wild, it seems to have a maximum of about five inches in cultivation. The individual leaf could be likened to a miniature palm leaf with long petioles and widely spreading dark green to bronzing narrow leaflets; the wide angle at which

the once-pinnate leaf segments (five to eight pairs) are set to the blade and the almost flattened leaf (as against the deep, boat-shaped leaf on many species) makes this plant easy to distinguish. *A. indurata* is larger and suitable for the big rock garden only, if one admits such a spiky plant at all.

The day was by now very warm and the lack of sleep was catching up so we sneaked forty winks and continued our ramblings later in the afternoon. We could see and hear the helicopter hunting the valleys around and below us but it was after 9 p.m. and very cold when we were picked up. With a load of deer on the hook underneath, the helicopter sped us back to the camp where it was quickly refueled, and returned to collect the shooters, even though it was almost dark — a task for an experienced and skillful pilot, and a task he had performed many times before. It had been a wonderfully rewarding and eventful day; one to remember always.

Readers will recall mention of *Aciphylla gracilis* on Mt. Hutt (Oct. '74) and the doubts about the name. My botanist friend had asked me to collect *A. gracilis* from its type locality in the Kirkliston Range of South Canterbury in an attempt to resolve the question. A Sunday drive with the family to the area around the foot of the range resulted in the location of a four-wheel drive track to 3000 feet and an obliging farmer who would take us up later in the season. Weather permitting, I arranged to make the trip on January 3 because that date coincided with the visit of Dick and Herb Redfield to our home. An early start was essential in order to be at the farmer's place by 8 a.m., from where we wound up a narrow and rough track which led on to the ridge. The wind was strong and cool but eased later making conditions much more pleasant. Growing in the tussock grasslands all the way up to the ridge, were countless thousands of *Aciphylla aurea*, a few of which were in flower; a very handsome species but rather large and formidably armed for the rock gardener's consideration, and it was interesting to note how the plants diminished in stature as we gained altitude until quite stunted specimens were observed at their limit of a bit of over 3000 feet.

Soon after leaving the vehicle, Dick found *Ranunculus crithmifolius* on bared patches of clay and gravel, and once one's eye was 'tuned in' to their camouflage, it was found that they were everywhere; literally thousands of them, but always on almost bare ground, even on the bulldozed track. The almost prostrate leaves of this species are greyish-brown to bluish-grey, fleshy, and with attractive mottling on the corrugated surface. The short stems each carry a single yellow bloom which would make them easier to see than they were here because flowering was over and the plants were difficult to see at first for their colouring blends in perfectly with their habitat.

We walked and climbed on to about 3500 feet where on the damp side (southwest) of the ridge we found *Aciphylla gracilis* growing and flowering among grass and small tussocks. While Herb sought photogenic specimens, Dick and I used up quite a bit of film because *Aciphyllas* are not frequent bloomers and the sight of so many male and female flowers made us rather shutter happy. *A. gracilis* forms a loose rosette, only a few inches high, of green leaves with long petioles and usually two pairs of leaflets plus a terminal leaflet; the inflorescence is of the elongate type and is orange-yellow, especially in the male. In contrast, the Mt. Hutt plant has a larger inflorescence and the bronzy-green leaves have almost invariably three pairs of leaflets and shorter petioles; the whole plant is



*Aciphylla* 'Mt. Hutt' female.

The Author

bolder and larger, having many more leaves and much brighter colouring. This plant is yet to be classified and must remain as *Aciphylla* 'Mt. Hutt' in the meantime. In a damp valley below us we could see the tall yellow-flowering spikes of *A. scott-thomsonii*, making three species found on this mountain.

The flora of this Range generally seemed typical of most of the drier Canterbury mountains with *Celmisias*, *Gaultherias*, *Pentachondra pumila*, *Leucogenes grandiceps*, *Hebes*, *Helichrysums* and a host of others. We did not climb high enough to locate any of the scree plants or to investigate the possibility of *A. dobsonii* growing on the summit rocks — perhaps another day.

An interesting plant found was *Corallospartium crassicaule*, known as the Coral Broom but it always reminds me of the antlers of a stag. Apparently it grows to five or six feet high but all the specimens I have seen were under two feet. The branches are very stout and rigid, deeply grooved and with notches alternating along their length, while the colour is brownish-green and the densely clustered flowers are cream. Leaves are rarely seen on the branches. It is an unusual shrub, hardly beautiful, but attractive in its unusual way.

With time on our side we browsed slowly down to our rendezvous with the vehicle, stopping to examine plants here and there and to collect a little seed. Who can describe that wonderful satisfied feeling when you come down off a mountain having found and photographed all the plants you sought (and sometimes some extras) and with still enough of the day left to enjoy the drive home?

To be continued.

## A NEW MEMBER'S SUGGESTION FOR A NEW ARG'S HANDBOOK

MARION KASPAR, *Wayzata, Minn.*

Editor's Note — The suggestions contained in the following letter from Mrs. Kaspar seem to warrant publication in the *Bulletin*.

"As another member who sees the value of a second Handbook, I felt my reasons could add stimulus for someone qualified to undertake the task.

"While perusing a 'bargain package' of ARG'S back issues, digesting a wealth of information not readily available from any other source, I wondered what percentage of new members would never order back issues, or find them unavailable.

"Articles such as 'Seed Collecting and Seed Cleaning' H. Lincoln Foster, July 1968; 'Desirable Strains' A. J. Brownmiller, Oct. 1973; 'The Glide Wildflower Show' Lois Wesley, Mildred Thiele and Joan Fosback, Jan. 1974; 'Responsible Rock Gardening' Ron Bowen, April 1974; 'Disturbing the Environment' Norman C. Deno, April 1974 should be available at all times through our ARG'S store.

"Another consideration! Might it be practical to compile a list of such articles as they were printed and automatically publish a Handbook every five years or so? Then make them available to non-members as well through groups such as sponsors of the 'Glide Wildflower Show'? I myself, purchased the first Handbook through a small garden publication before I joined the Society. In no small measure, it contributed to my becoming a grower of rock garden plants.

"I'm sure many other gardening enthusiasts would be interested (if the price were modest) accomplishing a twofold purpose: wider dispersal of this pertinent information and generating another field with potential for ARG'S memberships."

\* \* \* \* \*

IN APPRECIATION — The Interstate Printing Corporation of Plainfield, N.J. has printed the *Bulletin* of the American Rock Garden Society for many years.

In all of the thirteen years of the present editorship there has been nothing but cordial relations. It is hoped that this relationship may continue under the new editor.

It is the editor's desire to show his appreciation for the excellent service and understanding help in solving the problems which have arisen from time to time. Especially helpful has been Mr. George Hoffman and the Production Managers who preceded him. In the matter of typesetting there is nothing but praise for those whose names appear at the head of the galley sheets. Surely they must all have been knowledgeable botanists. Certainly typesetting errors where botanical names were concerned have been negligible. In emergencies Mr. E. J. Taborell, Vice President, has proved most helpful.

It is seldom in the business world for such pleasant relations to have existed for such a long time. Thank you Interstate!

## THE EDGAR T. WHERRY GARDEN— A LIVING MEMORIAL

ALDA STICH, *Freedom, Maine*

Today as in 1948 the Editor Emeritus of the *Bulletin* of the American Rock Garden Society is Dr. Edgar T. Wherry. Dr. Wherry for many years has been my teacher and friend. He has given a new spirit to the youth in America by trying to save a little of what is so precious and so easily destroyed—the American wild flower. Now with interest again growing in such forgotten historical roots, the American Rock Garden Society has an even greater purpose—the collecting and disseminating of seeds. Seeds that would take many years to find in the wild are offered to the generation that will inherit the earth.

Dr. Wherry has dedicated incredible energy to establishing a living memorial to all of the plants that he has discovered and to those plants that were particularly meaningful to him. They are beautifully set in a rock garden at the Barnes Arboretum in Philadelphia. After three years absence, I had the opportunity in October of 1974, to return to Philadelphia from Maine. Dr. Wherry gave me a tour of the garden and also took the time to patiently set out a few more plants and to see if certain seeds were ripe in order to send them to the ARGS Seed Exchange. Dr. Wherry is an inspiration and his garden is now ready for generations to enjoy.

In the early 1900's, Dr. Wherry graduated from the University of Pennsylvania with a B.S. in Chemistry. Fascinated by crystals he went on at Penn to Graduate School and was awarded a Ph.D. in Geology and Mineralogy. His first job teaching took him to Lehigh University in Pennsylvania. After doing extensive geologic mapping, he was offered the job as Curator of Mineralogy at the National Museum. There the work was mostly microscopic and to be at peace with nature, Dr. Wherry started a rock garden.

Prior to W.W. I, Dr. Wherry entered the Bureau of Chemistry, which was part of the U.S. Dept. of Agriculture, in order to study crystals—particularly those in food. Dr. Coville, who was then closely affiliated with the Bureau, gave Dr. Wherry one month off each summer to collect rare plants.

In 1931 the University of Pennsylvania was in need of a Professor of Ecology and so Dr. Wherry returned to the surroundings of his birthplace, Philadelphia. Few ecologists today are masters of as many earthly disciplines as Dr. Wherry.

It would take many articles to recall the exciting plant hunting trips that Dr. Wherry has taken and which he has shared with me. I therefore thought ARGS members might enjoy just a sampling of published titles that they might individually seek out.

Oct. 1923. A Soil Acidity Map of a Long Island Wild Garden. *Ecology*. Vol. IV, No. 4.

1925. "Wild Flower Culture." *Circular 12*. The Wild Flower Preservation Society, Inc.

May 1926. "Soil Reaction in Relation to Horticulture." The American Horticultural Society *Bulletin* 4.



Dr. Edgar T. Wherry at work in his garden in the Barnes Arboretum in Philadelphia.

Robert Atkinson



Dr. Wherry and the Author in the garden.

Robert Atkinson

July 1928. "Wild Flowers of Mount Desert Island, Maine." Garden Club of Mount Desert.

Dec. 1931. "Save Our Wildflowers." *Scientific Monthly*. Vol. XXXIII.

Dec. 1931. "One Hundred Wild Flowers of the Northern Blue Ridge."

From *A Guide to Paths in the Blue Ridge*.

July 1939. "Native Plants for Our Gardens." *Wildflower*. Vol. 16. No. 3.

1940 (?) "A Pennsylvania State Wildflower Preserve—Bowman's Hill."

1948. "Wildflower Guide to Northeastern and Midland United States."

Doubleday and Co. and The American Garden Guild, Inc.

Jan.-Feb. 1949. "Exploring for Phlox, 1948." *ARGS Bulletin*. Vol. 7. No. 1.

1955. "The Genus Phlox." *Morris Arboretum Monograph*, Phila., Pa.

1961. "The Fern Guide." Doubleday and Co., Inc.

May 1961. "The Eastern Foam Flowers." *ARGS Bulletin*. Vol. 10. No. 4.

April 1963. "Rock Garden Polemoniums." *ARGS Bulletin*. Vol. 21. No. 2.

1964. "Random Notes on Phloxes." *ARGS Bulletin*. Vol. 22. No. 4. Jan.

1975. "Key to 50 Rock Garden Flowering Plant Families." *ARGS Bulletin*. Vol. 33. No. 1.

Soon to be published—*The Flora of Pennsylvania*. A mapped account of every genus and species ever collected and recorded in a Herbarium known to date. (Dr. Wherry one of the three authors.)

I am hoping that in a subsequent ARGs article a listing of the plants in the “Edgar T. Wherry Garden—A Living Memorial” will be available.

Dr. Wherry is particularly encouraged and pleased with the ARGs Seed Exchange. He told me, “Everything must be divided and shared for the earth and mankind to prosper.”



“Dr. Wherry is an inspiration and his garden is now ready for generations to enjoy.”

Robert Atkinson

'76 — TENTATIVE INFORMATION ON COSTS — Some of the most sought after and, up to now, completely elusive information about the '76 Conference has been that regarding costs. In answer to heavy and entirely understandable pressure from many planning to attend, the *Bulletin Board* will contain a partial and highly tentative listing of costs. The prices quoted are current now in the conference areas, but who knows what will happen to them in a year's time? Check your *Bulletin Board* for costs and for sources of other information you might find helpful in making the most of your trip to the great Northwest.

## OMNIUM-GATHERUM

It has been said that thirteen is an unlucky number and this is proving true where your present editor is concerned for at the end of the thirteenth year of his tenure a stumbling heart and faltering eyesight have made it necessary for him to resign. With the distribution of this issue (July 1975) of the *Bulletin* the time has arrived for him to lay down his blue pencil and turn out to pasture his flock of extra commas, hyphens and other punctuation marks with which for so many years he has besprinkled his contributors' manuscripts.

It is well known that the *Bulletin* has grown in size during this period and that the membership of the Society has increased considerably. The number of members living in foreign lands has also increased. Instead of being strictly an American rock garden society it has taken on an international aspect.

In the beginning I was told that keeping an adequate supply of usable material on hand would be my hardest task. This has not proven true. A steady supply of satisfactory material has come to my desk from contributors throughout the membership from many parts of the world, some as a result of direct solicitation, many as the result of the efforts of interested members. As an example, there are the many articles that have been received through the constant interest of Don Havens of Wisconsin. Plant explorers have supplied the *Bulletin* with material covering many parts of the earth—increasing knowledge of new flora. Many of these plants have been made available to rock gardeners, mostly through the distribution of seeds. To the contributing members in all countries who have made the *Bulletin* possible, the editor gives his thanks.

It is true that there has been a great deal of work involved in the preparation of the *Bulletin* but as far as this editor is concerned it has been pleasant and rewarding and it is certain that after July 1975 this work and the association with so many members, either personally or through correspondence, will be greatly missed.

During these thirteen years encouragement has been received from the Society's presidents, Harold Epstein, H. Lincoln Foster, Bernard Harkness and Harry Butler. During this same period the Society's secretaries, with whom an editor's work is closely associated, have been Edgar L. Totten, Lawrence Hochheimer, Richard W. Redfield and the present incumbent, Milton S. Mulloy. All have been especially helpful. And before I end this message of appreciation I wish to mention the constant encouragement of my wife Eileen and, in later years, of our daughter Sharon. I also wish to express my appreciation to those who have helped with botanical problems.

The new editor will be Mr. Howard Porter of Guilford, Connecticut. He is scheduled to visit Seattle in mid-June and at that time the editors, old and new, will work hard to smooth the path of the man taking over the new assignment. May his tenure in office prove as rewarding as has mine.

\*   \*   \*   \*   \*

'76   '76   '76   '76   '76

## BOOK REVIEW

ALASKA-YUKON WILD FLOWERS GUIDE. Editors Helen A. White and Maxcine Williams. 224 p.p. 190 in color, 1974. \$7.95 plus \$.50 for postage and handling from the Alaska Northwest Publishing Company, Box 4 EEE, Anchorage, Alaska 99509. Available at book stores.

This is a delightful book composed of good color photographs, some excellent, and is well designed for a lightweight, compact field guide. It is interesting to note that many of the photographs have been taken by members of the American Rock Garden Society.

There is a comprehensive coverage of Alaskan plants, as the editors have included plants from the various geographic areas of Alaska. The line drawings which accompany each photograph have been well done by Virginia Howie and give a more precise idea of the plant than can usually be obtained from a photograph. Each page has the common family name and the botanical name of the plant as well as a common name. The height, habitat and range of each plant is given along with other bits of information. The book covers 164 species.

It is printed on good quality paper and the reproduction of the color plates is very good on the whole. There are three separate indexes listing the plants by both the botanical and common names but only the common names for the plant families. One wishes that the botanical names of these families could have been included.

The authors have given some good advice on growing wild flowers in our gardens, even listing some that would be possible from seed and suggestions for gathering and storing seed. Also some good hints on conservation are given. The authors have produced a most pleasing, beautiful and helpful book which should appeal to all.

Altha Miller, *Issaquah, Washington*

WILDFLOWERS OF ALABAMA AND ADJOINING STATES by Blanche E. Dean, Amy Mason and Joab L. Thomas. 246 pp, 400 natural color illustrations. University of Alabama Press \$10.00.

A delightful book about an area with which too few of us are familiar. It is said that few, if any, states can match this area's extraordinary wealth of wildflowers. Blanche Dean has devoted many years to the discovery and spreading of knowledge of these plants. Amy Mason has caught their beauty and freshness with her camera, and Dr. Thomas, the well-known botanist of the University of Alabama adds his knowledge of proper nomenclature and botanical plant descriptions.

In spite of its somewhat limiting title, it is a book for everyone who loves wildflowers whether an amateur, a student, or as a guide for the botanist or just for the beauty of its photographs and the pleasure of seeing and reading about some of our own favorites or their cousins.

There is a picture and a description of at least one representative of most of

the families. It is easy to read and delightful to look at. One senses the loving dedication that went into the making of this book. The 400 color photographs are arranged skillfully and artistically—four on a page and the opposite page contains a description of each plant shown, its common name, its botanical name and family, the time of flowering, habitat and range.

When botanical and technical terms are necessary one turns to an easily understandable glossary containing every term used; a great help to beginners or amateurs or those of us with short memories. Sketches of flower parts, leaf shapes and their arrangements, and inflorescences are on adjacent pages. There are over twenty pages of a fine, easily readable index. With all of this the book is not cumbersome but a joy to own.

E. B. S.

REFLECTIONS by Kay Boydston, available from the Fernwood Gift Shop, 1720 Range Line Rd., Niles, Mich. 49120 or The Maxine Shop in Niles. \$7.50 plus 50¢ postage.

Ninety pages of beauty in paintings, photography and philosophy. A salute by Gwen Frostic. A book to pick up often and refresh one's mind during the stress of these modern days—to alert us to the beauties and joys of nature and an awareness of the beauty around us. It is a lovely gift for friends, as the jacket suggests, "who prefer woodland trails to cement sidewalks and bird watching to television viewing."

\* \* \* \* \*

SEEDS — SEEDS — AND MORE SEEDS FOR THE NEXT SEED EXCHANGE — It is not possible to gather seeds properly at the gatherers' convenience. Mostly they must be harvested when they are ready. Each species, wherever it grows, is the final authority for the proper harvesting time. Members should be alert to the varying climatic conditions which advance or retard the proper time. Some species have an impish way of outguessing the harvester.

Watch the *Bulletin* and the *Bulletin Boards* for the Seed Director's various deadlines.

\* \* \* \* \*

UNANSWERED *BULLETIN* CORRESPONDENCE — As one grows older it seems that tasks or duties which used to be taken care of in a flash require about an hour or so and that those things which used to be accomplished in an hour, and on time, are put off from day to day and in many cases never get done.

A case in point is the editor's ever increasing correspondence. His unanswered file has grown to alarming and disgraceful proportions compared with earlier years. If you have written him and received no reply or have sent in manuscripts that have been unacknowledged please be lenient in your reaction and forgive his delinquency. He feels worse about it than you do.

## COLLECTOR'S NOTEBOOK

ROY DAVIDSON, *Seattle, Wash.**Holodiscus* 'Tenaya'

"Found at ca. 11,000 ft. near the southwest base of Mt. Conness, east of Yosemite, flowering profusely at ten-twelve inches." After a dozen years growing in the garden, it has not gone above three feet.

How often we here in the Northwest see growing on dry hillsides the most enviable, compact bushes of our ethereally lovely *Holodiscus discolor*, and wish it would behave in as mannerly an aspect in the garden. Brought home, inevitably and rapidly it achieves the curse of the Rose family (to which it belongs) producing those long, slim arrow-shafts halfway up on the old growth rather than basally, and then, undecided whether to stand or fall, it requires tying or pruning, and in spite of all one can do with secateur and knife, within a few years the subject is fit only for removal, having become a trussed and untidy, non-vigorous mass of spent growth and thwarted effort. Properly *Holodiscus discolor* is best suited only to wild, unwatered areas or to very large properties where it can spread its froth of fallen lace over as much area as it wishes to usurp.

*Holodiscus* 'tenaya' has all the beauty of the genus plus a truly neat and tidy growth habit, producing as it does its new canes from near the base or even offside in a stolon-like manner. It does not therefore require lopping or thinning, only removal of old wood every season or so, matter of course. It may possibly be kept to as little as two feet or lower by heading back new branches if one would wish a lower plant.

Short internodes and small, rather broad but obtusely wedge-based and silky-reversed leaves allow a neatly and densely clothed, freely branched low bush, producing its small but attractive beige-lace panicles so closely as to nearly mantle the greenery completely. Then they go off and its glory is over for the year, the subject blending in harmonious anonymity into the background till the surprise of its great beauty in another July.

The precise taxonomic affinity remained a mystery for all these twelve years, then I consulted Arline Ley's 1943 revision of the genus (Bull. Torrey Bot. Club #70) and discovered it to be *Holodiscus microphyllus* var. *boursieri*. In 1973 it was found to extend out into the desert ranges from the Sierra Nevada as in Troy Canyon; Quinn Canyon Range; Nye County, Nevada; possibly further. For horticultural purposes I shall continue to use the cultivar name I've attached to it, given for the lake basin near which it was found.

The *Holodiscus*es are some of our handsomest native deciduous shrubs and this form is a decided improvement over the usual.

ONE YEAR MORE TO WAIT! — Hopefully you will receive your July '75 *Bulletin* in July.

There is just one year more to wait for the Interim International Rock Garden Plant Conference to be held in Seattle, Washington and Vancouver, British Columbia in mid-July, 1976. This year will pass rapidly and it is hoped that your plans for attending are maturing satisfactorily.

Sunny skies, smiling faces, flowering alpinists and happy reunions all add up to a wonderful experience. We can scarcely wait to greet you here in the Pacific Northwest.

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Vol. 11 Nos. 1 & 3	Vol. 18 Nos. 1 & 3	Vol. 25 Nos. 1, 2 & 3
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Vol. 13 Nos. 1 & 2	Vol. 20 Nos. All 4	Vol. 27 Nos. 2 & 3
Vol. 14 No. 1	Vol. 21 Nos. 1, 2 & 4	Vol. 28 No. 3
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Vol. 16 Nos. 1, 2 & 4	Vol. 23 No. 2	Vol. 31 No. 4

If you have no further use for your copies, your contributions of any of the above will be most welcome additions to the Society's reserve stocks. Please send to the Secretary, who will also entertain offers on extensive "runs." (See back cover for address). Many thanks to past donors, many more are needed to meet demands.

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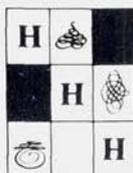
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