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Please note the editor's new email address

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President's Introduction

At the recent annual general meeting, someone commented to me how there was a lovely sense of being a family. That is a great strength of our club, and something that needs to be encouraged, as it is by no means universal in horticultural societies. But families can sometimes be inward-looking, and not necessarily welcoming to strangers. At a time when local groups are mainly decreasing in size, do we just say '*Hello*' to newcomers, or do we introduce them to the family, and make them feel part of it?

At the same meeting, I was given a big cardboard box, full of folders. '*Archive*'. I haven't yet dug deep into it, but the top folder included old correspondence from the time when the Queen Mother was being asked to become our patron. One letter said that in 1953 there were 2300 members, plus another 100 in England and 100 in the rest of the world. That total is remarkably close to our present membership – but now only just over a third of our members are in Scotland, with the rest split roughly equally between the rest of the UK and the rest of the world. We have become a truly international club – but the other side of that coin is that groups in Scotland are inevitably smaller.

I have also realised how wide our interests are – not just rock garden plants. Bulbs have been a prominent part of our shared interests for a long time, but the summer event in Dunblane has demonstrated our members' interests in climbers and herbaceous perennials and shrubs and all the rest.

So the Scottish Rock Garden Club is really the International Plant Lovers' Family. And it is in good shape – so a big thank you to Carole Bainbridge, who has guided us so well over the last three years. I'm looking forward to the next three – with some trepidation as well as excitement.

David Rankin

Editor's Note

Members may be surprised to find in this issue our longest article in ten years. Were a travelogue of this length it would usually split over two issues. However, the Bernese Oberland has been so influential for so many alpine enthusiasts, and the description of the Schynige Platte Alpine Garden that starts on page 42 is so unified, that I hope you will enjoy the unbroken account as much as I enjoyed preparing it for you.

Discussion Weekend 2016

After three years of superb Highland hospitality in Grantown-on-Spey, we now venture south to Peeblesshire to the delights of the Scottish Borders. This area of outstanding beauty and rich history offers ruined castles, sweeping valleys, magnificent forests and wonderful things to see and do. The organizing team invites you to the modern Cardrona Hotel, sitting by the River Tweed, midway between historic Peebles and Innerleithen. With views of the Border hills, this 4-star hotel offers spacious and comfortable accommodation, an award-winning restaurant, an 18 hole golf course and a spa. Even dogs are welcome.

Peebles and the Borders are easy to reach, with major routes touching the boundaries of the region. Peebles is about thirty minutes by car from Edinburgh and an hour from Glasgow, Newcastle and Carlisle. Airports at Edinburgh, Glasgow and Newcastle are within easy distance. There is a twice-hourly bus service between Peebles and Edinburgh.

Saturday morning offers you free time at the hotel or further afield. Peebles is a Royal Burgh and a picturesque market town of unspoilt character. Stroll through its medieval alleyways or follow its walkways along the beautiful River Tweed. The traditional High Street boasts fine independent shops and a good selection of top quality eateries. A guided visit to the Royal Botanic Garden's satellite at Dawyck promises magnificent trees and autumn colour in mid-October. Traquair House, one of the oldest and most romantic in Scotland, is only seven miles away and is well worth a visit; it houses a privately run brewery. Staying with the historic theme, Neidpath Castle, dating from 1370, lies on a bend on the river Tweed and is a pleasant walk one mile out of Peebles. Both Peebles and Innerleithen are within easy walking distance along the river from the hotel and the latter also provides a wide range of attractions. For those who wish to stay longer, there is a wealth of possibilities within driving distance of the hotel.

A full breakdown of prices and a booking form may be found in the 2016 Year Book and Secretary's Pages. For other queries, please contact E.MacKintosh@rbge.ac.uk

Programme

Our programme offers you a veritable 'Quality Street' selection of speakers, a box of classic favourites interspersed with new flavours. Our home-grown 'classics' feature Jack Drake's world-famous alpine nursery,

bulbs and plants at home and away, and two genus-specific lectures on the cultivation of fritillaries and hellebores. Scotland's native plants are not neglected and three 'new flavours' are also introduced: growing alpines in the Bavarian Schachen, gardening on rock (USA), and botanizing in Peru. The only question is '*Who is the big purple one?*'

Friday 14th October

- Bob Wallis, Wales: The Jim Archibald Bulb Lecture: *'Fritillaries in the Wild and in Cultivation'*
- Small Bulb Exchange

Saturday 15th October
Morning

- Optional activities
- Plant show
- Plant sales

Afternoon

- Jim Jermyn, Scotland: The John Duff Lecture: '*Inshriach Nursery*'
- Jenny Wainwright-Klein, Germany: '*The Alpine Garden on the Schachen*'
- Anne Spiegel, USA: '*Gardening on Rock*'

Evening - Drinks reception, dinner and plant auction

Sunday 16th October

- Rannveig Wallis, Wales: '*A Plantaholic, Home and Away*'
- John Massey, England: The William Buchanan Lecture: '*The World of Hellebores*'
- Heather McHaffie, Scotland: '*Growing Scottish Native Plants at the Royal Botanic Garden, Edinburgh*'
- Harry Jans, Netherlands: The Harold Esslemont Lecture: '*Peru*'

Two Favourite Plants

Harold McBride

Aster alpinus

The *Aster* genus with over 250 species provides us with many plants suitable for the rock garden. Without doubt the most widely grown is the ubiquitous alpine *Aster alpinus* from the European Alps, which is easy to cater for in the garden and is of course a very attractive plant.

Flowering in June when most spring Alpines are on the wane, it nevertheless seems to have lost some of its popularity amongst present day gardeners. Forms of *A. alpinus* may vary in height, size or colour of flower. The 2014 seed exchanges listed ten different colours or cultivars including *albus*, 'Blue', *roseus* and others. The most desirable forms are compact and low-growing with solid flowers of bright purple on 12 to 15 cm stems surrounding a golden disc. Any well-drained soil, ideally neutral to alkaline, will yield results and I find it enjoys a sunny aspect in a raised bed or large trough. Easily propagated from seed or divisions in spring, seedlings develop quickly, reaching flowering size in one year.

The plant shown below was grown from SRGC seed under the name of *Aster alpinus* var. *dolomiticus* and seems similar to the plants I observed growing on rocky slopes in the Dolomites. The main picture opposite is from the Tien Shan in central Asia.

Aster alpinus is a very desirable and dependable addition to the rock garden which I feel deserves much greater popularity among gardeners, and indeed among those alpine nurseries who often omit this attractive plant from their lists.

Silene caroliniana var. 'Red Wherry'

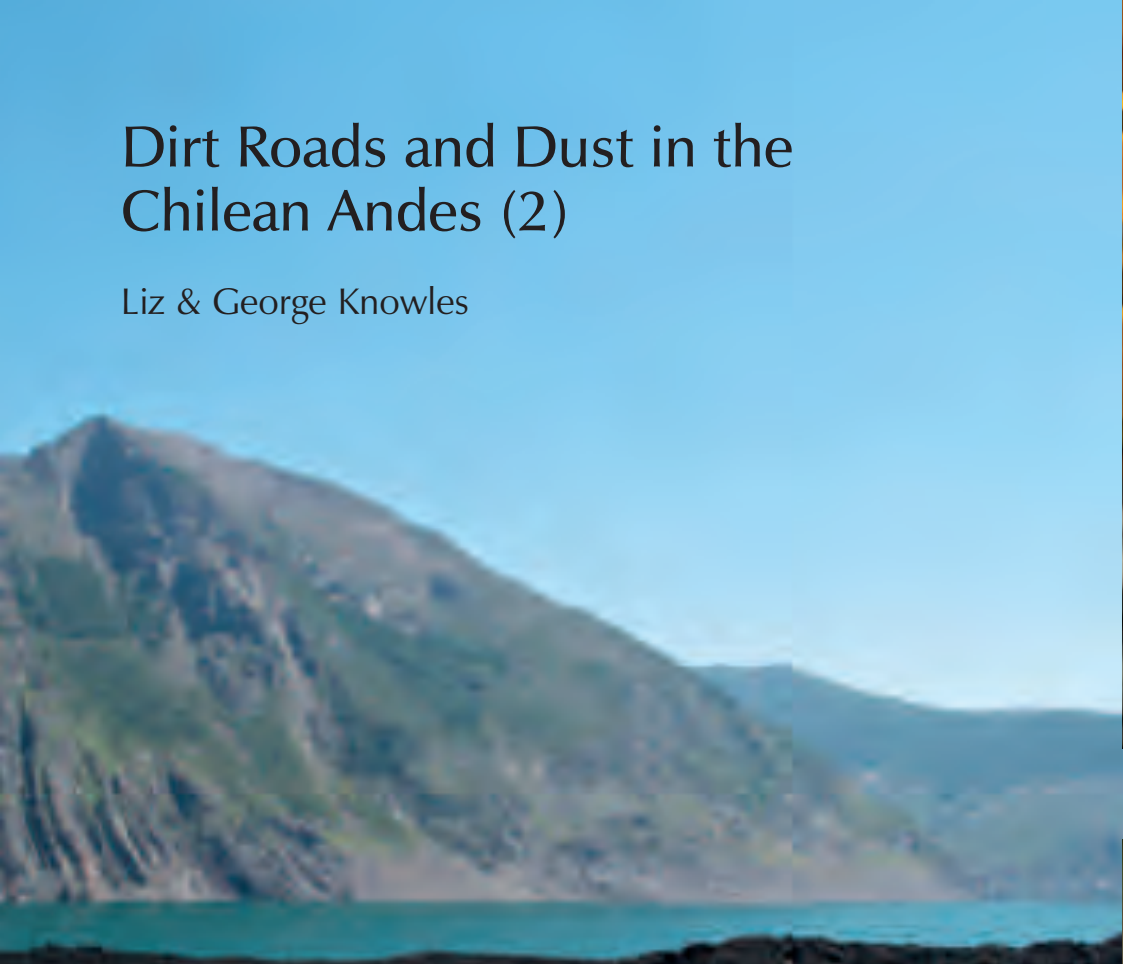
My very first book on alpine plants was a revised edition of a *Collins Guide* by Anna N Griffith, first published in 1964. Although this book gives a very comprehensive guide to alpine plants available to growers at that time and also mentions in passing a North American species of *Silene* with brilliant red or pink flowers, Griffith does not mention *Silene caroliniana*; indeed, the plant is omitted from many later publications, including the *Alpine Plants of North America* (Graham Nicholls, 2002). The *Encyclopaedia of Alpines* (AGS, 1994) includes the plant and comments that it is most attractive and has been strangely neglected by growers.

Silene caroliniana var. 'Red Wherry' has a long flowering period with me, usually from May until early July. The loose domes are covered with brick-red typical campion flowers. This native of the South Eastern USA favours rocky places with well-drained gravelly and sandy soils. This makes the rock garden or raised bed the ideal garden situation. Like many North American alpines it appreciates excellent light and plenty of sunshine. A profuse amount of seed is reliably produced, being ripe to sow in early August. I sow the seed immediately and the resulting seedlings are ready for pricking out in September, resulting in plants which will flower the following year. Self-sown seedlings also appear from time to time in my raised beds.

Because individual plants reach only 10 to 12 cm in diameter, I often plant several together, resulting in a clump of vibrant colour that stands out well in the garden. This *Silene* is perfectly hardy and over-winters well in my garden; however, I often treat it as an annual because younger plants tend to flower more profusely. The variety 'Red Wherry' is reputed to have larger flowers. In recent years seed has been available from both the SRGC and AGS seed lists.

Dirt Roads and Dust in the Chilean Andes (2)

Liz & George Knowles



Dear Reader, in the last issue of *The Rock Garden* we left you near the paved Chilean section of road through the Maule valley. On stony barren hillsides near the top, orange to yellow *Salpiglossis sinuata* grew through the asphalt beside the road and *Chloraea alpina* emerged among the tussock grass. Close to the road by a construction workers' camp we found pale yellow *Rhodophiala montana*; higher up on a wet bank *Calceolaria filicaulis* ssp. *filicaulis* and *Calceolaria corymbosa* ssp. *montana* kept company with *Arenaria serpens*.

Camping would have been a better option at Maule because our hotel on the south side of Lago Colbun, which looked convenient on the map, turned out to be hard to access. We ended up driving on a private gravel road through a quarry (for which we paid a nominal sum) reducing our travel time both to Maule and to Alto Vilches by at least an hour each way. We visited the twenty thousand hectare Altos de Lircay National Park just beyond Alto Vilches on two separate occasions. Bubblegum-pink *Alstroemeria presliana* ssp. *presliana* appeared at 1000 to 1500 m beside

Chloraea alpina

Rhodophiala montana

Rhodophiala splendens
Facing: *Rhodophiala advena*
Mutisia linearifolia

Facing: *Chloraea nudilabia*

the track to the Laguna del Alto. Here, *Mutisia linearifolia* was growing at the southern end of its range (Santiago to Linares), the small shrub has dense narrow leaves, pale yellow ray florets and projecting wiry scarlet stigmas. Cherry-red *Rhodophiala splendens* grew at lower elevations while creamy-yellow *R. advena* appeared just above the tree line on the track to the laguna. A low pink *Junellia* and 50 cm high purple and white *Calceolaria cana* var. *cana* flourished in a nearby xeric landscape of rock and sand. *Calceolaria dentata* and *Sisyrinchium arenarium* (syn. *cuspidatum*), both yellow, grew in semi-shade not far from a magnificent 60 cm high orange *Chloraea nudilabia*.

En route to Termas de Chillan, we drove to the Shangri La valley nearby on an appalling dirt road. We hiked the final kilometre, despite a midday temperature well over 30°C, rather than jeopardizing our Toyota 4WD on the rock-strewn track. A place less like 'Shangri La' one cannot imagine, for the landscape at 1500 m was a jumbled mass of brown volcanic rock, with the Nevados de Chillan to the north east as backdrop. Beside the lava field and surrounded on two sides by *Nothofagus* was a flat area of brown volcanic dust that was home to *Maihuenia poeppigii*, *Viola rosulata* and *Viola cotyledon*.

As it was difficult to reach the high alpine zone at Termas de Chillan, we settled for a hike at lower altitudes from 1500 to 1800 m. *Chloraea grandiflora*, *Chloraea magellanica* and *Chloraea viridiflora*, together with

Calceolaria cana var. *cana*

Viola rosulata

some hybrids, all grew in an open field, with *Rhodophiala advena* in shades of orange to salmon pink and pale yellow *Rhodophiala montana*. Yellow and orange flowers of *Desmaria mutabilis* festooned nearby *Nothofagus*; a hemiparasite in the *Loranthaceae* family, *D. mutabilis* is endemic from Maule south to the lake district.

Chloraea longipetala grew beside the road; these striking 50 cm tall white orchids have a yellow throat and green stripes on their upper and lower lips. *En route* to Ñuble National Park, on a steep descent through woodland, we spotted the national flower of Chile, *Lapageria rosea*. An evergreen climber to 10 m, it is endemic to the Valdivian temperate rain forests,

Facing: *Chloraea grandiflora* with *Chloraea magellanica* (inset)
Calceolaria alba

Chilean national emblems:
the flag and *Lapageria rosea*

Facing: *Chloraea longipetala*

Chloraea barbata

although it has now become rare due to over-collection. Approaching Concepción we saw *Alstroemeria ligtu* by the roadside, accompanied by several deep yellow *Chloraea barbata*.

On a dusty drive to Antuco and Laguna del Laja we stopped frequently: shrubby *Calceolaria alba* and *Fabiana imbricata* forma *violacea* grew close to the road, with the aptly named *Chloraea incisa*, a 60 cm tall white orchid with green stipes on its lower incised lip; *Fuchsia magellanica*, *Cortaderia selloana* (Pampas Grass) and a large leaved *Gunnera* cascaded down a wet bank. Close to Laguna del Laja there was a mass of volcanic rock without any vegetation to soften its profile. It came as a surprise to see a rudimentary ski hill

nearby, the dark brown slope of volcanic ash an especially incongruous sight in summer. Equally surprising was the sight of pink *Ourisia microphylla* thriving in rock crevices on either side of the road. Closer to the lake in volcanic ash were numerous rosettes of *Viola congesta* and pink mounds of *Mutisia oligodon*. For miles we drove through this barren landscape until close to the Argentinian border we met a gaucho driving horses. He was none too happy when our vehicle spooked them and he raised his fist as he galloped off to round them up again. Near the lake a memorial to 44 Chilean soldiers who perished in May 2005 in a freak early snow storm reminded us of how capricious the weather can be in the high Andes.

Our final destinations as we drove south were the volcanoes Llaima & Longquimay and the pass at Pino Hachado. The roadside was ablaze with yellow and orange *Alstroemeria aurea* on the way to the refuge at Volcan Llaima and later we drove through a wooded track where two climbing members of the *Gesneriad* family made an appearance. *Mitraria coccinea* has velvet textured, orange tubular flowers whereas *Asteranthera ovata* has crimson flowers, a tubular base, four spreading petal lobes and white markings at the throat. Both vines can

Ourisia microphylla

Facing: *Chloraea incisa*

Alstroemeria aurea

Dirt Roads and Dust in the Chilean Andes (2) 21

Previous pages: Laguna del Laja with *Mutisia oligodon*

reach five metres in height and are native to the temperate rain forests in Chile and Argentina. *Calceolaria valdiviana* grew out in the open beside the road. At the refuge, *Embothrium coccineum* was in full bloom under *Araucaria araucana*, the famed monkey puzzle trees. In the mist, as we walked over volcanic ash towards Volcan Llaima we spotted periwinkle blue flowers of *Perezia pedicularidifolia*, *Chloraea magellanica* and white berries on *Gaultheria pumila*. *Rhodophiala andicola* appeared as the mist lifted and also *Viola fluehmannii*, although only a few mottled white and violet blooms remained. One more surprise awaited us as we drove back to Cherquenco. A cascade of the endemic scarlet *Tropaeolum speciosum* trailed through a stand of bamboo.

Our accommodation at this time was just below Nevados de Sollipulli (2282 m), an extinct volcano with a 600 m deep glacier inside its cone, which straddles the border between Chile and Argentina. The *Nothofagus* forest surrounding the cabins was home to a couple of noteworthy understory evergreen shrubs: *Drimys winteri* and *Desfontainia spinosa*. The latter has leathery, holly like leaves and tubular red flowers with yellow tips which, like many of the red flowered plants in Chile, are pollinated by hummingbirds.

Asteranthera ovata

Mitraria coccinea

Calceolaria valdiviana

Perezia pedicularidifolia

Drimys winteri

Desfontainia spinosa

Calceolaria pennellii

Loasa filicifolia

Facing: *Rhodophiala andicola*

Loasa nana

Mimulus cupreus habitat

Our last excursion was to Pino Hachado. The endemic *Calceolaria pennellii* grew on volcanic ash just above 1800 m and beside it pink *Leucheria millefolium* appeared near to white *Loasa filicifolia*, yellow *Caiophora prietea* and *Loasa nana*. *Caltha sagittata* and *Anagallis alternifolia* flourished in damp seeps and large clumps of orange *Mimulus cupreus* cascaded down the rocky banks. Close to the Chilean border post, orange *Mutisia decurrens* flowers, silhouetted against a blue sky, made a dramatic statement.

At the end of our trip we had planned to drive from Santiago to Portillo and to botanize as far as Punta de Vacas in Argentina. Sadly we had to make alternate plans because of road works on the heavily travelled stretch between the two countries.

How did the flowers measure up with those we had seen two years earlier in Patagonia?

Bearing in mind that some of the December blooming plants (rosulate violas) are over by January and that alstroemerias, for example, bloom predominantly in that month, here is the tally: *Chloraea* and *Calceolaria* topped the list in Chile with nine species each, compared with four and three seen respectively in Argentina;

Mutisia decurrens

Mimulus cupreus

Alstroemeria and *Mutisia* followed, with eight species of each in Chile; only one mutisia (*M. retrorsa*) was recorded in Argentina, and no alstroemerias were seen.

Rosulate violas, our main reason for visiting Patagonia in December, included ten species and at least two hybrids. In Chile we saw four rosulate violas in bloom, also the ubiquitous *Viola maculata* and *Viola fluehmannii*. The latter, with foliage reminiscent of a *Phyllodoce*, was recently also recorded in Argentina on Cerro Chenque.

In the *Amaryllidaceae* family, *Rhodophiala*, *Phycella* and *Famatina* are thought to have evolved from a common ancestor; their taxonomy is still being worked on. Seeing *Phycella herbertiana* (syn. *Rhodophiala herbertiana*) in Argentina brought to four the amaryllids recorded in 2010, while in Chile we noted six species. *Tropaeolum* and members of the *Loasaceae* family were less common in Argentina in December. In Chile we recorded five species of each in January.

Finally, twenty-four days of sunshine in January and the diversity of terrain and flowers seen throughout this part of Chile more than outweighed any discomfort that we experienced on our long drives on dusty gravel roads.

Viola fluehmannii

Hybrid Chilean *Tropaeolum*

Emiko Tsujii & Jean-Patrick Agier

Tropaeolum is a genus from South America. The Chilean species (Section *Chilensia*) is well known to *Tropaeolum* growers and can be divided into five subsections of which only the subsection *Gracilia* is discussed here. Ten species compose this complex: *T. austropurpureum*; *T. azureum*; *T. beuthii*; *T. brachyceras*; *T. hookerianum*; *T. kingii*; *T. nuptae-jucundae*; *T. rhomboideum*; *T.* x *tenuirostre*; and *T. tricolor*. Most of the hybrid plants described in cultivation are known and grown from species of this subsection. According to DNA analysis almost all these species can probably get involved in hybridization. Few do so in the wild as their habitats do not overlap, and also partly because they might not have the same pollinators. We've personally noticed this in a non-Chilean species (*T. argentinum*). This is all a bit different in cultivation where plants are grown close together in a limited and definite area. Cross pollination by bees and bumblebees can occur giving rise to hybrid plants with brand-new and unexpected colours.

In the wild, hybrids may spontaneously appear involving three particular species that may be found either in the same area or not very far from each other (*T. tricolor*, *T. brachyceras*, *T. azureum*). Such is *T.* x *tenuirostre*. As it is a well-known cross between *T. brachyceras* and *T. tricolor* it is disconnected from our study. It also, of course, may hybridize itself with its parents or another species, leading to yet more complexity.

T. kingii and *T. rhomboideum* are quite rare in cultivation in Europe (especially the former), so reports on hybrids involving these two species

aren't currently known. Because of its very specialized habitat in the wild, *T. kingii* certainly needs particular conditions to grow well and to flower. Few plants are known in cultivation in the United Kingdom (UK) and they seem all to have bloomed in 2012 after a gap of many years. *T. nuptae-jucundae* is not cultivated in Europe to our knowledge. For all these reasons we concentrate here on hybridization with the following: *T. austropurpureum*; *T. azureum*; *T. beuthii*; *T. brachyceras*; *T. hookerianum*; and *T. tricolor*.

The first hybrids seem to have been reported in cultivation in the UK from the year 2000 after the introduction of *T. austropurpureum* and *T. beuthii* but spontaneous hybridization might have occurred long before with the two most commonly grown species (*T. brachyceras* and *T. tricolor*). They have led to swarms of wrongly identified plants sold or distributed as *T. brachyceras*. An interesting report was published in 2003 on deliberate cross pollination: a cross between *T. beuthii* & *T. austropurpureum* produced a pink-flowered plant; and a cross between *T. austropurpureum* & *T. beuthii* produced an apricot coloured plant.

In the wild some species show a range of flower colours and - sometimes - different leaf shapes. *T. azureum* has been recorded with different shades of blue and even a white-flowered form. *T. austropurpureum* can also show

Right and Facing: Forms of *Tropaeolum lepidum*

various shades of mauve–purple, and a yellow *T. tricolor* has been (rarely) pictured in some areas. Might these forms be considered as normal variations of the species - hybrids - or the result of spontaneous genetic mutation? Another enigmatic species has recently been submitted for species status - *T. reicheanum*, previously known as the 'yellow' *T. azureum*.

Why hybrids?

Growing hybrids has been a trend in modern horticulture for years. Trying to raise new-coloured flowers and new flower shapes is a constant search in plant breeding. So why not *Tropaeolum*? This genus is neither well known nor widely grown (with the exception of *T. majus* and *T. peregrinum*) so it hasn't raised enough enthusiasm and interest among professionals. Only having grown a hybrid from seed may we assert a new plant to be fertile. Will it be able to produce seeds true to the parent (by hand pollination)? Could hybrids be easily produced and reproduced? Raising *Tropaeolum* is often some kind of a challenge as not all the sown seeds will produce seedlings. Nor will all of these flower in their first season and produce either seeds or a tuber. Another difficult and troublesome point is that some *Tropaeolum* tubers can stay dormant for several years and then suddenly rot for unknown reasons. A gorgeous plant might thus be lost to cultivation.

Forms of *Tropaeolum lepidum*

How to hybridize

We can easily grow two species together for cross pollination either by hand or by open methods such as letting bees and bumblebees do their work. But are these two plants really genetically compatible for giving hybrids? Are they clearly involved in the resulting hybrid, or might non-*Tropaeolum* plants bring genetic material to a *Tropaeolum*? The mix of genetic material can vary from one seed depending on how much pollen comes from the 'father' parent. This would partly explain the great variation in flower colour and shape. Some stunning hues (peach, apricot, bi-coloured, picotees, maroon …) would not have been expected from *Tropaeolum* flowers that were mainly yellow. And how can we explain the rise of white-coloured plants? An interesting feature is often noted on many hybrids: the flower colour fades to different hues as they age, leading to nice colour mixes on one single plant.

Emiko Tsujii's experience from past cultivation notes

I met *Tropaeolum azureum* for the first time in a seed catalogue in 1996. I'd loved common nasturtium (*T. majus*) long before this and every year I used to sow seeds. Their colours were so beautiful and the numerous flowers so wonderful that by the time I saw tuberous *Tropaeolum* flowers I changed to them instead of the usual nasturtium. I've been really attracted and charmed by them! Afterwards I

Forms of *Tropaeolum lepidum*

wanted to see more of these flowers but, with a big amount of seeds sown year after year, the cultivation site became smaller and smaller.

How did I get seeds?

I have since always had *Tropaeolum* seeds from nurseries in the UK. Thanks to the internet, everyone can get anything from abroad with a credit card or other means of payment. I first had seeds sold as *T. lepidum* from a UK seed catalogue in 2001. After a few years it was announced that it might have been what is now *T. austropurpureum*. Nevertheless, in my cultivation records the name *T. lepidum* has been kept according to my first purchase. This report is mainly written about it.

My cultivation conditions

My plants were grown in a south-facing veranda. There were three racks. Two had three shelves sized 54 cm (width) x 90 cm (length) x 120 cm (height). One rack was larger than these, with five shelves sized 45 cm x 90 cm x 180 cm. The minimum temperature throughout winter in Osaka, where I live, is 4 degrees of frost. I assume the *Tropaeolum* plants can survive this temperature outside a greenhouse.

How did some hybrid plants appear?

Some uncommon flower colours began to appear in 2002. *T. azureum*, *T. brachyceras*, *T. lepidum* and

Forms of *Tropaeolum lepidum*

T. tricolor were put together in a small veranda. There were so many bees flying from flower to flower that it was obvious hybridization would occur easily.

2001-2002 The very first time I grew *T. lepidum* was from autumn 2001 to spring 2002. Seventeen seedlings bloomed and all had dark, light purple or pink flowers. No one could say whether all of them were pure *T. lepidum*. There might already have been some hybrid plants among them although their flower colour seemed to be at least within the typical range of *T. lepidum*. As some seedlings developed several tubers, I finally gathered twenty-one.

2002-2003 The second season started with the tubers and the seeds that had been produced in spring 2002. By February 2003 the plants grown from the young tubers bloomed. Those grown from seeds started to flower from the end of March. An unusual colour appeared - apricot. It seemed to be a blend of pink and yellow, which led me to think that *T. brachyceras* might have been a possible father. In April, flowers with white veined purple petals appeared.

2003-2004 This third season started with tubers and seeds produced in spring 2003. Several odd flower colours appeared: dark pink, dark apricot, peach and so forth. There was also an interesting plant, whose flower colour changed after blooming in a few days. As a result, one plant seemed to have three different colours.

Forms of *Tropaeolum lepidum*

2012 Nowadays I take up the challenge of growing and increasing a form of *T. azureum* bearing white flowers with blue picotee. I saw such flowers in my trials for the first time in 2012. Since then I've been trying to keep up this type of plant. Fortunately it produced tubers and seeds which seemed to give true progeny. As a result the stock plants could therefore be increased by seeds. However, although I've been momentarily successful, who knows what will happen in the future?

Discussion

True *Tropaeolum* species are stalwarts grown in every enthusiast's collection. But hybrids can offer strains of colourful flowers worth trying and keeping apart from the traditional ones. Not only the colour but the flower form and leaf shape can be attractive in raised hybrids. Recent *T. azureum* hybrids bear unusual leaves with divided leaflets.

Another interesting feature is the lack of spur. This curious phenomenon has also been reported on plants in the wild and is undoubtedly a

Tropaeolum azureum: these plants flowered for the first time in 2013 and their mother was the same plant, carrying blue picotee flowers. The blue picotee parent produced same-coloured children. These pictures were taken in spring 2014

characteristic of hybrids or variants. There is already a striking example in cultivation with two *T. majus* hybrids (*T.* 'Hermine Grashoff' & *T.* 'Margaret Long') that bear spurless multi-petalled flowers. But we are yet to see such flowers on tuberous *Tropaeolum* as well as plants with strangely shaped flowers. Unfortunately such multi-petalled flowers would be totally sterile and therefore needing propagation by cuttings. This would add to the concern with tuberous *Tropaeolum*, which are quite difficult to grow, and would stand in the way of a more important horticultural development of these beautiful species and hybrids.

A parallel could be drawn with many other genera. For example the cultivation of *Ipomoea tricolor* (Morning Glory) which has long been prosperous in Japan and reached its peak during the Edo era. 'Changing' Morning Glories (as these hybrids were called) were the result of breeding work that produced plants with completely new flower and leaf forms (most with split, divided or torn petals) totally different from the usual *Ipomoea* flower shape. Could such an evolution be seen for *Tropaeolum* in the near future?

Tropaeolum azureum: these germinated in 2010 and flowered in the spring of 2011 for the first time. They had white flowers with blue picotee. This was the first time I saw such flowers. The mother plant had normal *T. azureum* flowers. These pictures were taken in spring 2013

Natural pigments

The way plants and flowers get their specific colours is a complicated matter. There are many pigments that take part in the plant's colour appearance. Five main groups of organic chemicals are involved. They are: carotenoids coding for yellow, orange or red; chlorophylls coding for green; flavonoids coding for yellow or cream; anthocyanins, a sub-class of flavonoids, coding for red, pink, blue violet or purple; and melanin, involved in ultra-violet mediation, coding for brownish yellow to black. Of these, chlorophyll is the most important pigment. It is found in leaves, stems, calyx and, sometimes, in the flower petals. Chlorophyll is considered to be the photosynthetic backbone of all plants.

This was the first appearance of the white form of *Tropaeolum* azureum, but the mother plant had dark pink flowers. This picture was taken in spring 2012

Tropaeolum azureum: this plant had blue picotee flowers and was born from seed in 2012. The picture was taken in spring 2014

Tropaeolum azureum: this plant had blue picotee flowers and a unique shape, with petals curved outside. The picture was taken in spring 2014

The way natural pigments are arranged in flowers is genetically coded. But colour appearance may be influenced by several other factors including growing conditions (lack of light, acidic or alkaline soil…) and the pigments may merge with co-pigments or co-factors such as metals. As for natural hybridization done by pollinators, artificial horticultural methods can mix the genetic material of two different flowers, producing a progeny with new genetic arrangement coding for brand-new colours.

Trying to identify a hybrid's parentage

This is perhaps one of the most interesting parts of the study: having grown a plant from seed or, less commonly, from an acquired tuber and realizing it turned out to be a hybrid plant, can we try to find at least one of its parents? The first and easiest case is when you've grown seeds labelled as one particular species. Then the mother parent may probably be guessed. In other cases seeds are simply labelled as hybrids with no more indication, and matters are more complicated.

Are there dominant features in the Chilean species that we're studying? Which are the characteristic features that would be transmitted by the father and which ones would be kept by the mother parent for the hybrid progeny?

The flower colour and shape? We might assess that some unusual colours would involve *T. austropurpureum* and *T. azureum* (peach, maroon, mauve, pink). Huge petals might indicate *T. beuthii* as one of the parents. Flat opened petals are a feature of *T. azureum*.

The spur? This feature is premium for distinguishing species and it will also be of great help with hybrids. Long and thin spurs may come from *T. beuthii* or *T. tricolor*. Very short spurs would make you suspect *T. azureum* as a parent. And conical stout ones might indicate *T. austropurpureum* or *T. hookerianum* in the parentage. A reddish coloured spur is evocative of *T. tricolor*.

The leaf shape? This is of great help only with thin linear leaflets, a feature that is characteristic of some forms of *T. azureum*.

Clustered flowers? If flowers are clustered on the same internode, this is strongly evocative of *T. austropurpureum* and *T. hookerianum*.

The seed size? T. beuthii usually produces the biggest seeds within the *Gracilia* subsection. So we might expect its involvement in relatively fat hybrid seeds.

In fact, in short, we've found no particular feature which could refer to *T. brachyceras*.

Are we growing true species?

DNA analyses tend to suggest that hybridization in *Tropaeolum* species could occur more frequently than commonly thought. Plants that seem morphologically very similar could well have different genotypes (significant variations in DNA sequences). Consequently some of them might possibly be hybrids. Comparing our plants with pictures of other plants of the same species, we're often able to find various morphological differences between them. This is particularly the case with *T. azureum*, *T. austropurpureum*, and of course *T. tricolor* and *T. brachyceras*, which have given rise to swarms of hybrid forms often incorrectly named. Morphological differences as mentioned above may involve leaf form, spur shape or flower arrangement. This certainly leads to much confusion in naming, producing and distributing *Tropaeolum* plants.

Unfortunately DNA analyses are far from being commonly and widely available to professional or amateur growers. So we must bear in mind that checking our plants with taxonomic descriptions might not confirm they are absolutely true to type and that many tropaeolums we're currently growing might probably be hybrids.

Fragrance

It is not commonly known (and we know no report of it) that some *Tropaeolum* can be fragrant. Some hybrids inherit this from their parentage. The flowers' scent often appears a few days after opening. The perfume strength varies on each plant but can be very strong. Of course I've (Tsujii) noticed it in the closed area of my veranda in Osaka, in contrast with the perception of plants grown outdoors or in different cultivation conditions. I've personally found that *T. azureum* can smell like sweet violet and that *T. brachyceras* has a sweet *Alyssum* perfume.

Are there limits to hybridization?

As with most plant breeding, natural or artificial hybridization can sometimes lead to unexpected results: flower deformity, lack of petals, diminutive petals, dull flowers, double spurs, distorted or abnormal leaves, infertile flowers and other unattractive features. Crossing and re-crossing hybrids together can result in genetic alteration in the progeny with the consequent need to discard ugly or uninteresting plants and to save the showiest ones. In this article we've talked about *Tropaeolum* from the *Gracilia* subsection but might interesting results also also come from crossing them with *Tropaeolum* from the other *Chilensia* subsections?

Propagating a hybrid

Once you've grown an interesting *Tropaeolum* hybrid, how could this plant be kept or propagated?

First of all we have to know is whether the plant is able to produce seeds or not. Some plants are sterile, or seem to be sterile for a short period. Their flowers do not show any pollen. We've already seen this phenomenon in various species including *T. tricolor*, *T. brachyceras*, several hybrids and even in a non-Chilean species (*T. smithii*) which once produced flowers without pollen for a short period. It could correspond either to unfavourable growing conditions or to genetic incapacity. This leads to complete infertility for the Chilean tuberous *Tropaeolum*, as its flowering season takes place within a short period.

Provided the plant is fertile, hand pollinating is absolutely necessary in order to gather true seeds. This excludes open growing conditions. Once the seeds have been gathered and sown they may produce either identical plants or something quite different; this thus appears to be a dead-end way. Provided you know the two parents, an alternate way of multiplying a hybrid would be to hand pollinate the mother plant each year with the father's pollen. This is commonly done by professional horticulturalists for producing F1 hybrids.

From our experience and other growers' reports, plants with unusually coloured flowers haven't survived for long, not more than a few years. Almost all of them disappeared quickly. We assume a usual Chilean tuberous *Tropaeolum* would be able to live for several years, with an average 3 to 5 years and up to 10 years in the environment of cultivation. Could we possibly keep these hybrids for longer provided they're given special careful growing conditions? And which ones? We don't have any answers to these questions but would be strongly interested to hear any of your views on this particular point.

Schynige Platte Botanical Alpine Garden

The Alpine Garden Team

Many readers will have visited our Alpine Garden on Schynige Platte in the Bernese Oberland. We hope it inspired and stimulated you and we would like to tell you more about it. The garden was founded in 1929 by the society of the same name with around 600 members and was supported by the Dr Werner Schmid Foundation. The garden is located at 2000 metres above sea level and displays some 650 species of plants native to the Swiss Alps. Since its foundation, the garden has simultaneously served conservation, research and tourism. It is intended to aid appreciation of the beauty, riches and secrets of Alpine flora, to bring these closer to the general public, and to inspire visitors for the protection of nature, the landscape and the Alpine environment. The garden is a very special kind of botanical garden: it is one of very few in the world to display plants in their natural communities as far as possible. As a scientifically managed garden, it cooperates in particular with the Institute of Plant Sciences and the Botanical Garden of the University of Bern.

Right from the start, the garden emphasized findings on phytosociology (plant sociology), a field of research that was at that time brand new. It directed the attention of researchers and the general public towards ecology as a network of interactions between the animate and inanimate

Blue *Sesleria* Scree: *Leontopodium alpinum*

world. Plant sociologists thus investigated not only the soil conditions that allowed a plant to thrive but they also observed other plants in their locations as part of the wider environment.

Our garden sits on hilly ground in the Bernese Overland at altitudes between 1950 m and 2000 m, exposed to the south and the south-east. The geological subsoil here is limestone, sandy limestone and Dogger slate, with blocks of Malmian limestone from rock falls. The garden is separated from the neighbouring alpine pasture by fencing and the fenced area is a little over 8000 square meters (about two acres). The site is free of snow for about five months from the beginning of June to the end of October. During the growing period the average annual temperature is about 8° to 9°C whereas nearby Interlaken at some 600 m has an average of around 16.5°C. The annual average rainfall is about 1600 mm to 2000 mm, of which about half falls as snow.

The Alpine Garden is easily reached in fifty minutes from the village of Wilderswil by the historic Schynige Platte cogwheel railway that was opened in 1893. In addition to its botanical function, the garden is also an excursion destination in cooperation with tourism organizations in the Jungfrau Region and the Schynige Platte Railway. In both botanical and tourist matters, the garden enjoys a lively exchange with the

Facing: Primary Rock Outcrop, *Phyteuma scheuchzeri*
Schynige Platte Station: a garden at 2000 metres

Blue *Sesleria* Scree:
Left: *Campanula thyrsoides*
Below: *Veronica spicata*

Rokko Botanical Alpine Garden in Japan, with which it twinned in 2008. Finally, the garden also cultivates a close collaboration with the landowner, the Iselten Alpgenossenschaft, which leases the land to the society and in 2005 granted long-term right of use for a century.

The Garden Community Zones

All plants have their specific location. For example, the Edelweiss (*Leontopodium alpinum*) is not found everywhere but only in relatively dry soil or on rocks in limestone mountains. It makes very precise demands on all the ecological conditions of its habitat (climate, geology, soil formation, water and nutrients). Plants with similar demands are usually found together and form a plant community. Together with fauna and microorganisms they form a biological community (known as a biocenosis).

The ecological relationships in these biological communities vary in closeness and occur on various levels, often first becoming

Blue *Sesleria* Scree: *Acinos alpinus*. Throughout the Alpine Garden, our labels are always there to guide you!

visible when a change occurs. If for example a traditional alp pasture falls into disuse, juniper and other bushes may crowd out the smaller herbs in the contest for sunlight. If however the pasture is intensively fertilized, soil-based fungi are the first to disappear - and with them the orchids that in the course of evolution had adapted to nutrient-poor locations by entering into symbiotic relationships with the fungi. Moderately fertilized meadows and pastures are often more species-rich than totally barren locations. If a Mat Grass pasture, which is very low in nutrients because of the acidic environment, is treated with a calcareous fertilizer, a Milkwort pasture with many more flowers may emerge; however, the new flowers are common species while orchids and other rarer species adapted to barren locations disappear.

Many habitats and biological communities in the Alps therefore still remain largely intact as they have evolved over centuries in accordance with natural conditions and as influenced by traditional Alpine farming. Those in the lowlands have changed to a greater extent and been reduced to relatively few types because of increased pressure of usage since the 19th century. Our garden has been organized to reflect some of these communities.

Blue Sesleria Scree

Blue *Sesleria* turf, one of the most species-rich communities growing at lower-Alpine and sub-Alpine altitudes, is found on steep and very

sunny southern-facing slopes. Over fifty species of flowering plants may be found in one square metre. The terrace formation is typical: clumps of Blue *Sesleria* and Evergreen Sedge (*Sesleria caerulea* and *Carex sempervirens*) hold fine sand and debris and so create small steps. The ground is very stony, as seen from light-coloured limestone gleaming through the loose turf, and tends to dry out quickly. Typical plants of this wild turf are thus well-protected against excessive evaporation by - for example - a thick hair coat (Edelweiss, *Leontopodium alpinum*), thick succulent leaves which store water and have a very thick and waxy cuticle (Houseleek, *Sempervivum tectorum*), or rolled-up leaves which protect the stomata in an enclosed space in times of drought (Heather, *Erica carnea*).

Commonly found here are Alpine Aster (*Aster alpinus*), Mountain Thistle (*Carduus defloratus*), Tufted Bellflower (*Campanula thyrsoides*), Large-flowered Rock Rose (*Helianthemum nummularium* ssp. *grandiflorum*), Alpine Cinquefoil (*Potentilla crantzii*) and many others.

Rusty Sedge Scree

This is found on steep slopes with loamy soil and a sufficient water supply. The lush and grassy wild turf is often dominated by Rusty Sedge whose blades, mixed with other grasses and sedges, often hang down the slope as if combed. Many species of striking flowers occur between and below the sedge blades. The soil is calcareous and loamy, rarely dries out and so allows many different species to thrive. The slopes are too steep for grazing but are productive hay meadows, used regularly in

Rusty Sedge Scree and Milkwort Pasture: *Trifolium badium*, the Brown Clover

Rusty Sedge Scree: *Astrantia major*

earlier times. As mowing of these slopes is now an exception, the turf is in danger of going wild. The carpet of grass can then act as a slide for avalanches, which thus become more frequent. The snow and turf may also freeze together and, if the snow layer is thick enough, it can slip away taking the turf with it. This results in a type of erosion that is very difficult to prevent or reverse. Examples may be seen from the upper exit of the Alpine Garden, on the south slope between the Daube and the Oberberghorn. In such cases, if the land is no longer used in the customary way, destruction of the landscape may follow.

Important species are Rusty Sedge (*Carex ferruginea* ssp. *ferruginea*), Beautiful Fescue (*Festuca pulchella* ssp. *pulchella*), Hairy Phleum (*Phleum hirsutum*), Narcissus-flowered Anemone (*Anemone narcissiflora*), Frigid Mountain-lentil (*Astragalus frigidus*), Foliated Lousewort (*Pedicularis foliosa*) and Mountain Hawk's-beard (*Crepis bocconei*).

Rusty Sedge Scree: *Pulsatilla alpina*, *Trollius europaeus*, *Anemone narcissiflora*

Milkwort Pasture

Milkwort pasture is lush, green and productive and makes excellent cattle fodder. It is found mainly on deep soil in more level parts of the Alps. It develops on deep, nutrient-rich soil with a good water supply, mainly in the more level areas of the Alps. Alp huts are found in the vicinity, enabling regular fertilization with dung and liquid manure. The pasture is less species-diverse than the Blue *Sesleria* and Rusty Sedge screes; grasses are prevalent and form a very productive turf. However, a short time before grazing begins, Golden Cinquefoil, Hairy Milkwort and Golden Hawksbeard are in bloom and at this time the pasture is a wonderful carpet of flowers.

Milkwort Pasture: *Crepis aurea*

Mat Grass Pasture: *Gentiana acaulis*

Almost every Milkwort pasture contains some of the best Alpine fodder plants. They include Alpine Cat's tail (*Phleum alpinum* ssp. *rhaeticum*), Alpine Poa (Romeye, *Poa alpina*), Lady's Mantle (*Alchemilla xanthochlora* aggr.), Brown and Red Clovers (*Trifolium pratense* ssp. *pratense*), Alpine Lovage (*Ligusticum mutellina*), Alpine Plaintain (*Plantago alpina* ssp. *alpina*), Hairy Dandelion (*Leontodon hispidus* spp. *hispidus*) and Golden Hawksbeard (*Crepis aurea*).

An old herdsman's saying describes this plant community from the aspect of modern plant sociology, as it were. A loose translation is:

'Alpine plaintain, lovage and poa,
the best is what the cows go for.'

Half-dry Pasture: *Rhinanthus alectorolophus*

Mat Grass Pasture: *Hieracium aurantiacum*

Mat Grass Pasture

This very sparse pasture on acidic soil supplies little and poor cattle fodder. Many species occur here, some of which are endangered. This was the original vegetation for Werner Lüdi's 1930s fertilization experiments in trial pasture outside the Alpine Garden.

Mat Grass, or *Fax* as the herdsmen call it, grows in thick clumps with very tough blades. Even sheep avoid eating it unless the blades are very young. It forms low, sparse turf on nutrient-poor, acidic soil. Cattle select the various herbs between the wiry clumps and so they indirectly promote the growth of this pasture-weed. However, in favourable spots where the subsoil is not too poor, it may be transformed into pasture land by fertilization and the application of lime, as shown by Lüdi's experiments (summarized in Christian Korner's interesting *Alpine Plant Life: Functional Plant Ecology of High Mountain Ecosystems*).

Mat Grass Pasture: *Gentiana pannonica*

If the pasture is no longer used for grazing, it gets taken over by undemanding dwarf shrubs such as Blueberry, Bog-whortleberry, Heather, Alpine Azalea and Alpine Rose. The sparse pasture becomes a dwarf-shrub heath, where even trees can eventually penetrate if the pasture happens to be below the treeline. Mat Grass is widespread on poor geological subsoil and in some places constitutes a sign of earlier over-utilization. This pasture can be extremely eye-catching at certain times, exhibiting many striking species when in bloom.

Riviera

Riviera is not really an original plant community but we use the term to describe the warmest area in our Alpine Garden because there are some sunny rocks and the plants are protected from strong winds. Here we show plants that grow in warmer parts of Switzerland such as Wallis, Graubünden and Tessin.

Rich Mountain Pasture: *Pimpinella major*
Tall Forbs: *Stemmacantha rhapontica*

Riviera: *Saponaria ocymoides*
Riviera: *Silene flos-jovis*

Riviera: *Aconitum anthora* Riviera: *Verbascum nigrum*

Riviera: *Paeonia officinalis* flowered in summer 2015, for the first time!
It's a very rare plant, found only in a small area of Tessin

Windy Ridges

All ridges and crests are exposed to wind. Plants here have to be extremely robust in every respect. In winter the wind blows away the snow and greatly dries out plants and soil, often removing any snow protection. The wind, carrying tiny snow crystals, also grinds the plants like a sandblasting machine. Diurnal stress is severe: nocturnal frost leads to extreme fluctuations of temperature; on sunny days, even in mid-winter, leaves can thaw while the water supply is inaccessible in the deeper, still frozen, subsoil.

Despite the adverse conditions, the ridges are remarkably rich, with many species rarely found elsewhere. The vegetation is strongly influenced by a microclimatic environmental factor: the constant and powerful wind subjects the plants to mechanical stress and increases leaf transpiration. Consequently, many species such as Alpine Azalea (*Loiseleuria procumbens*) have hard, leathery leaves with stomata only on the rolled-up interior side and are thus well-protected against transpiration.

Typical plant communities in this extreme location are turfs of *Elyna* (*Elynetum*) and Alpine Azalea heaths (*Loiseleurietum*). Both are rich in lichen, revealing a fascinating co-existence of algae and fungi that can compete particularly well with higher plants under the difficult environmental conditions.

Facing: Windy Ridge: *Pulsatilla vernalis*

Calcareous Scree

On calcareous scree, the dominant ecological factor is the constant mechanical damage to the plants caused by detritus falling from the rocks above. Within the rock fragments that constitute scree, water is accessible only to plants with deep roots. Fine soil on the surface is as rare as it is on a rock face. To meet their water requirements, plants thus need an extensive root system stretching down to the finer, constantly moist, subsoil. In addition, the vegetation must be able to withstand not only the frequent rock fall damage to shoots but also the damage to roots caused by the slow downward movement of the upper scree layers. Various species are well-adapted to these conditions. In the seemingly bare and stony wastes they form a delicate loose cover and, when in blossom, some have astonishingly colourful flowers: Broad-leaved Chickweed (*Cerastium latifolium*), Glacier Crowfoot (*Ranunculus glacialis*), Alpine Poppy (*Papaver alpinum*), Round-leaved Shepherd's Pouch (*Pritzelago alpina*), Creeping Wood Avens (*Geum reptans*, the plant pictured on the old Swiss ten-franc note), Alpine Toadflax (*Linaria alpina*), Large-flowered Leopard's-bane (*Doronicum grandiflorum*) and Leopard's-bane Groundsel (*Senecio doronicum*).

On Schynige Platte our scree has been compiled artificially. Lacking both replenishment from above and natural down-slope rock movement, the characteristic mechanical dynamics are absent and so we take great care to ensure that vegetation does not get the upper hand.

Calcareous Scree: *Silene acaulis*

Calcareous Scree: *Valeriana montana* (plant with inset blooms)

Calcareous Rock

On calcareous rock, there is little soil, little water and few plant nutrients. The sparsely-spaced plants in this community must be well adapted to the extreme location. Rock vegetation is strongly influenced by the chemical properties and weathering of the rock itself. Even the position of the layers plays a role. Depending on circumstances, rock, scree and turf plants are prevalent. Typical rock-plants such as auricula (*Primula auricula*) are first to occupy the rock. Such species have long roots that penetrate deeply into narrow crevices to find a little moisture even in times of drought. The large smooth leaves store reserves for the winter, allowing the plants to flower in spring. In summer they store water in slime-filled cells, enabling them to be able to cope with any shorter intensive dry spells. However, the stomata are exposed on the upper surface of the leaf without any specific protection. The wax cuticle is also rather thin. Evidently, internal physiological adaptation prevents transpiration while externally visible adaptations are less effective. The main species are: Hairy Whitlow Grass (*Draba tomentosa*), Kernera (*Kernera saxatilis*), White Mountain Saxifrage (*Saxifraga paniculata*), Dwarf Buckthorn (*Rhamnus pumila*), Swiss Androsace (*Androsace helvetica*), Auricula (*Primula auricula*) and Alpine Balsam (*Erinus alpinus*).

Calcareous Rock Above: *Androsace helvetica* Below: *Erinus alpinus*

Dwarf Shrub Heath

Without the results of centuries of use as grazing land, most of Schynige Platte would now almost certainly be overgrown with a climax vegetation of dwarf shrubs. These occur chiefly on slightly sloping ground with a deep layer of subsoil, today covered with Milkwort and Mat Grass meadows. A compact layer of raw humus would have developed over time, overgrown with Blueberry (*Vaccinium myrtillus*), Cranberry (*V. vitis-ideae*) and Bog Whortleberry bushes (*V. uliginosum*) mixed with Rusty-leafed Alpine Roses (*Rhododendron ferrugineum*). In their midst would be spruces and perhaps a few mountain firs. Today the dwarf shrubs have been pushed back to the exposed ridges and steep slopes that have never been suitable as grazing land. The Mountain Avens and Hairy Alpine Roses in the Alpine Garden are found in places corresponding to their natural habitat and have only been slightly influenced by man. The Mountain Avens (*Dryas octopetala*, also the emblem of the SRGC) is found on shallow, coarse and stony soil above calcareous subsoil, while the Hairy Alpine Rose prefers humus cushions in limestone debris and karst areas. In the Alpine Garden it grows on flat terraces of calcareous rock. The most important other species are the above-mentioned dwarf shrubs, *R. hirsutum* and *Dryas octopetala*.

Dwarf Shrub Heath: *Rhododendron hirsutum*

Green Alder Scrub

Unused steep slopes are populated by Green Alders that secure the soil, preventing erosion, supply it with nitrogen, and also reduce evaporation. Both Green Alder and the Mountain Fir can grow on avalanche slopes. The snow flattens the flexible stems against the ground and the avalanches glide over them without causing any damage. Afterwards the plants return to their characteristic creeping shape. They are of little use as an avalanche check but the roots hold the soil well and thus the shrubs inhibit erosion on the steep slopes where they grow. Many tall and beautiful herbaceous perennials grow underneath. The flowering period is mostly in late summer.

The Green Alder has tiny nodules on its roots that contain a fungus (*Actinomyces*) capable of assimilating atmospheric nitrogen and making it available to the higher plants. This increases the importance of the alder because it plays a role as a nitrifying pioneer shrub. It can also thrive on barren soil and even increase the nitrogen content. Thus plants that indicate nutrient-rich soil may be found growing in Green Alder scrub. To a large extent, these are identical species to those found in the tall forbs, with a few shifts of emphasis and some additional plants such as Alpine Bells (*Cortusa matthioli*) and Alpine Columbine (*Aquilegia alpina*).

Green Alder Scrub: *Aconitum vulparia*

Tall Forbs

Tall forbs are large-leafed plants found on deep, mostly neutral or slightly acidic soil with good water and nutrient supply. They occur in moist and shady gullies, depressions where fine soil has been washed over time into thick layers, whereever the spring snow stays longer and the soil is constantly moist at the foot of rocks, on gentle slopes, in karst crevices and similar places. These sites are often naturally forest-free spots below the treeline, although poorer groups may also be found up to 2200 metres. Most of our tall forbs are thriving in suitable places, where they have been planted.

The nutrient supply to this community is plentiful and so the vegetation may be extremely luxuriant. In one short mountain summer, the fleshy stems grow to a height of over one metre, flower and produce seeds. Just after the snow melts in the following spring, no trace of this abundance remains. All plant material has decayed into humus or has been completely mineralized. At most, a few thick stalks lie pressed against the ground. In between them appear soldanellas (*Soldanella alpina*), primroses (*Primula elatior* ssp. *elatior*) and the young, often almost flower-like red shoots of the tall forbs: Tall Larkspur (*Delphinium elatum*), Blue, Paniculated and Yellow Wolfsbane (*Aconitum napellus* ssp. *vulgaris*, *A. variegatum* ssp. *paniculatum*, ssp. *altissimum*), Columbine-leafed Meadow-rue (*Thalictrum aquilegiifolium*), Round-leafed Saxifrage (*Saxifraga rotundifolia*), Large-leafed Yarrow (*Achillea macrophylla*), Alpine Blue Sow Thistle (*Cicerbita alpina*), Wood Groundsel (*Senecio nemorensis* ssp. *nemorensis*).

Tall Forbs: *Delphinium elatum*

Tall Forbs: *Cephalaria alpina*

Overleaf: Tall Forbs (*Adenostyles alliariae* & *Cicerbita alpina*), distant pasture

Tall Forbs: *Cirsium helenioides*

Nitrophilous Vegetation

Nitrophilous vegetation is very productive, with a few, fast-growing and large-leaved species. It is found on over-fertilized spots around alp huts. The plants are generally ignored by cattle so the same plants are found in other places where cattle and game lie and ruminate for long periods - such as flat crests where wind lessens the summer heat and hollows where the animals find a little protection in bad weather. Manure is deposited here in large amounts while it is lacking from the actual grazing land, particularly from the Mat Grass pastures that lie at large distances from the huts and so cannot be fertilized. In the Alpine Garden, the nitrophilous plants require regular fertilizing to ensure that the soil retains the necessary excessive amount of nitrogen. Typical nitrophilous plants, in particular the docks, would otherwise decline and starve, to be pushed out by species requiring less nutrition. In early spring, the Hairy Star of Bethlehem (*Gagea villosa* ssp. *fragifera*) appears, later followed by Alpine Dock (*Rumex acetosa* ssp. *alpestris*), Mountain Sorrel (*Rumex alpinus*), Good King Henry (*Chenopodium bonus-henricus*), white Bachelor's Buttons (*Ranunculus aconitifolius*), Wolfsbane (*Aconitum napellus*) and Ragwort (*Senecio alpinus*). The ground under these high bushes is covered with Lady's Mantle (*Alchemilla mollis*).

Medicinal Plants

The list of Alpine plants also includes species with a medicinal history. Many have been - and some still are - used in orthodox and folk medicine. Some are dangerous poisonous plants whose effects are only beneficial with medical advice in the correct dosage; for example Wolfsbane, which contains aconitine, a strong alkaloid. Others are merely aromatic herbs used for teas and alcoholic extracts. The effort of gathering some of these plants on rock faces and exposed cliffs may have added much to their beneficial effect. In other cases, early naturalists used the shape of the leaf or root to decide to which ailing organ it should be applied (the long-discredited *Doctrine of Signatures*). The active agents of many species are now well known. Species sought for folk medicine include Silver Lady's Mantle (*Alchemilla alpina* ssp. *conjuncta*), Yellow and Purple Gentian (*Gentiana lutea* and *G. purpurea*), Big Masterwort (*Astrantia major* ssp. *major*), Catsfoot (*Antennaria dioica*) and Icelandic Moss (*Cetraria islandica*) as well as Alpine wormwoods (*Artemisia genipi* ssp. *genipi*, *A. mutellina* amongst others), which are officially protected species throughout Switzerland.

The cultivated areas in the Alpine Garden demonstrate the difficulty of growing a plant in the Alpine zone when the environmental conditions do not meet its specific demands. While Arnica, Blueberry and Purple Gentian flourish in the places that suit them, they do not thrive well and rarely flower when cultivated.

Facing: Tall Forbs: *Eryngium alpinum*

Medicinal Plants: *Gentiana lutea*
Facing: *Digitalis grandiflora*

Primary Rock Outcrop

In the natural world, most plants grow only on a specific soil. Some species are found only on calcareous, neutral subsoil and these are common in the Schynige Platte area. However, another group thrives in acid conditions and so is almost never found in this region. These species are plants of the crystalline central Alps, found on acidic soils over rocks almost free of calcium. Some would be able to grow if carefully protected against competition from better-adapted species, whereas others would not tolerate any limestone content in the soil. To be able to display these silicate plants in the Alpine Garden, rocks and sand were imported from the Grimsel region so as to create a primary rock outcrop. Here we planted beautiful flowers from the granite massif of the Central Alps from the Valais to Graubunden. Consequently, many of these plants may now be seen in their natural communities.

Medicinal Plants: *Gentiana lutea*

Primary Rock Outcrop: *Rhodiola rosea* in bud

The following communities have been artificially planted in the Alpine Garden without, however, having yet completely developed the typical display: Alpine sedge turf, the sparse turf of the Alpine levels; shrubs with Swiss Willow; block scree and snow hollows (*Caricetum curvulae*, *Salicetum helveticae*, *Oxyria digyna*, *Salicetum herbaceae*).

Snow Bed

Many of these specialists grow in the only place where they are not threatened by larger competitors – the snow bed. With a lengthy period of snow cover and very short vegetation period, these plants are extremely small. Snow-bed vegetation is found in spots where winter snow remains well into summer, where snow has accumulated through avalanches, where the wind has produced massive cornices, or where lack of sunshine in shady depressions has delayed thawing. These specially adapted flowering plants can grow in the snow-free period - which may be as short as eight weeks - while the extremely undemanding snow bed mosses manage with an even shorter summer.

Snow bed vegetation is strongly influenced by the rock. The garden offers calcareous (limestone) and siliceous (acidic) snow beds. The latter

Primary Rock Outcrop: *Androsace vitaliana*

are found where a sufficiently thick layer of soil has formed over limestone or where the rock has a very low calcium content. They are thus more common than calcareous snow beds, which are only found where lime is present right up to the soil surface. The Alpine Garden has no spots that remain snow-covered for a sufficient length of time. Nevertheless, from the artificially constructed and carefully tended snow bed, visitors can see into an avalanche depression with a natural snow hollow, where typical plants from a calcareous formation grow next to those on acid soil: Dwarf Willow (*Salix herbacea*), Delicate Soldanella (*Soldanella pusilla*), Dwarf Cudweed (*Gnaphalium supinum*), Creeping Sibbaldia (*Sibbaldia procumbens*), Starry Saxifrage (*Saxifraga stellaris*) and others.

Snow Bed and Milkwort Pasture: *Soldanella alpina*

Alpine Fen

Many specially adapted plants are found in fens, particularly sedges and rushes whose roots grow in soil with a low concentration of oxygen. The Alpine region, with its high amount of precipitation, contains many waterlogged spots that are home to some rare and special species. Such places are more common on flysch (sedimentary rock layers of sand, silt and clay) along the edge of the Alps and on slate rock in the Central Alps. Fens are rare on the hard limestone of the mountains around Schynige Platte. This lack of fens is a natural feature of the Alpine Garden as there are no depressions in which water could accumulate.

To give the impression of rich wet Alpine vegetation, a hollow was dug out in a level spot, sealed with plastic material and refilled with loess and peat. The plastic material extends further up the slope to catch water. A number of beautiful species may be admired here. As elsewhere, the sedges, grasses and rushes predominate, while more conspicuous plants are less abundant. Managing the water level is difficult for this community, depending on rain and temperatures. There are Beaked Sedge (*Carex nigra*), Common Cotton-grass (*C. rostrata*), Star Gentian (*Eriophorum angustifolium*), Alpine Willow-herb (*Epilobium anagallidifolium*) and Marsh Marigolds (*Caltha palustris*).

Snow Bed: *Gentiana bavarica*

Nature and Art

At the garden's foundation in 1929, the piece of land next to the summit station of the Schynige Platte Railway was already extremely rich in species. Tenancy of the land was granted to the Schynige Platte Alpine Garden Society by the Iselten Alpgenossenschaft (mountain-farming cooperation). To the present day, the Alpine Garden still consists mainly of plant communities that have developed through natural processes over the thousands of years before the garden's foundation as well as through the history of Alpine farming that has been documented for 900 years. These communities include the nutrient-poor and species-rich blue *Sesleria* genus and Rusty Sedge scree, where various species of orchids and lilies bloom among other types, as well as the rather 'fatter' colourful Milkwort pastures and dwarf-shrub heathland with *Erica* and *Rhododendron*. These original locations have been enriched by small implantations of species found growing in these plant communities elsewhere in Switzerland. The Green Alder scrub where the *Primula matthioli* flowers in high summer, tall forbs such as the Yellow Gentian, Aconite and Blue Thistle as well as coarse vegetation ignored by cattle have been planted and tended with appropriate care. The flat moorland, calcareous scree, primary rock area and medicinal herb garden are larger man-made areas that provide the desired plants with locations that were totally lacking in the garden.

Green Alder Scrub: *Heracleum sphondylium*

New Species

Today, we have some 650 species. The goal, which may never be fully attained, is to display all 900 species found above the tree-line in Switzerland. Desired seeds are collected as they occur naturally by the gardening team and a botanist who set out on a one-to-three-day seed-collecting expedition every autumn - each time in a different region of the Swiss Alps.

We also collect seeds for our sister garden, the Rokko Garden in Japan, as well as for the Botanical Garden in Bern, which every year compiles a seed list from which other botanical gardens may order the seeds they want. Our gardening team grows seeds destined for the Schynige Platte Alpine Garden in our own seed beds in the climate of the treeline.

Challenges to the Alpine Garden

Plants in the Alpine region are exposed to the most extreme weather conditions. They have to endure huge contrasts in temperature as well as dry and wet periods. Winter damage in the Alpine Garden and seed beds

Rich Mountain Pasture: *Phyteuma spicatum*

is often caused by snow pressure and frost as well as mice. Damage is also caused by feeding animals; when food is scarce in winter, the snow hare gnaws on the bark of the rowan trees. Some plants from the southern Swiss Alps experience difficult growing conditions on Schynige Platte because it has a lot more rainfall than, for example, the Alps of the Valais.

Two thousand metres above sea level, the collected seeds are sown in autumn, pricked out after germination and planted out in the garden after a further one or two years. This results in a very long cultivation period from sowing to finished plant. Hence a great deal of patience is required until the new arrivals have established themselves in the garden.

To be able to display silicate plants in the Alpine Garden, boulders and sand are brought from the Grimsel region to create primary bedrock areas. It is often difficult to get hold of soil with the right acidity for such new projects and renovations. In addition, transport to the Alpine Garden is both costly and time consuming, often requiring helicopter flights.

Care of the Garden

The areas that have original vegetation continue to need maintenance and care. The gardening team thus attempts to replace earlier farming management by mowing the former alp pasture with scythes and so - above all - protecting the herbs. In addition, dead plants from the previous year are removed, as are the seed pods of species that threaten to become rampant,

Among the Tall Forbs: 120,000 visitors per year

in order to preserve biodiversity. The newly planted species also require extremely intensive care. It is a massive challenge to maintain the many species under the extreme conditions of the Alpine zone. The most important task is weeding, to ensure that the mainly non-competitive planted species are not threatened by the established vegetation.

The Gardening Year

To meet all these challenges, the garden is tended in summer by a team of four, some of them employees of many years standing. They live in the Alpine Garden building on Schynige Platte, or in Interlaken and the surrounding area. Their season begins around mid-May. At this time the ground is still covered by several metres of snow and so the gardening team must first clear the paths with shovels. Once the first spots are free of snow, the next job is to take the benches, panels and signage out of winter storage and erect a sturdy fence to keep the cows on the neighbouring alp out of the garden. Once the railway brings the first guests, the labels with plant descriptions must be in place and other informative material will be ready and waiting.

In June the seedlings from the previous October's sowing are pricked out. The young plants are usually planted out after two winters when they are already quite strong. The team weeds and waters the garden all summer long as needed. From the end of August to October, the gardeners are mainly occupied

Raising our plants

Slatted shading from the summer sun

Planting out

The label cave

with collecting and cleaning seeds, mowing the alp pasture, sowing new seeds for the next spring, putting away signs and bedding the garden down for winter.

After a wonderful five months of seasonal work, our employees are free to decide how to spend the winter. This time is often combined with travel, training or winter work at a ski school. The railway, hotel and garden operations on Schynige Platte all close down. The buildings are prepared for winter and made avalanche safe. The Alpine Garden is left to its own devices. The plants in the garden and seedlings in the seed beds are well protected under a thick blanket of snow. Nevertheless, a variety of preparatory work for the new season is already underway in the background during the winter months. During the winter we manage the website and deal with winter correspondence.

Research on Schynige Platte

Bern University and its Botanical Garden were instrumental in founding the Botanical Alpine Garden and from the outset integrated Schynige Platte into their research projects. The focus was on the then new approach of phytosociology, which one of the founders, Werner Lüdi, had become acquainted with in Montpellier. He studied the development of plant communities inside and outside the Alpine Garden. For example, on small plots in the garden he observed the influence and role of sowing and planting in the development of the composition of species of Alpine grasses and he related these results to soil conditions and climate.

Lüdi leased an additional piece of Alpine pastureland below the Alpine Garden from the Mountain Farming Cooperation to use for experiments with fertilizer. The focus at the time - after the shock of the food-supply crisis during World War One - was on the question of how to improve the yield of the Mat Grass pasture. This type of Alpine pasture, at that time widespread and often caused by overuse, involves a plant community of tough Mat Grass that cattle are reluctant to eat and dominant acid-loving plants such as Arnica or Purple Gentian. Werner Lüdi divided his experimental pasture into 340 areas each measuring one square metre and he treated each with different fertilizer, processing method and cultivation.

Transport of delight

After a few years, Lüdi realized that by using calcareous fertilizers he could transform a barren Mat Grass pasture into a Milkwort pasture with a much higher yield. However, publication of the data in the 1950s came at a time of economic recovery when the fear of food crises in Europe had faded. The experimental meadow was forgotten until it was rediscovered in the 1970s by Otto Hegg. He and several postgraduate students carried out botanical studies over the following decades. They found that the few applications of fertilizer from the 1930s still showed a partial and remanent effect even in the 21st century – an important result for conservation because it is precisely the highly specialized and relatively rare members of the old plant groups that are the last to return – if they return at all.

Studies by soil scientists included research into the long-term effect. They noted that soil life in the plots treated with lime or lime fertilizers by Werner Lüdi had shifted in the long term from fungal to bacterial dominated communities. Bacteria decompose organic substances more rapidly and thus make plant nutrients available again, setting in motion a cycle that prevents the return of Milkwort to Mat Grass pastures.

Current topics of research still focus on the world's oldest experimental plot of this type. They include the effect on biodiversity of the increased nitrogen and carbon dioxide input from the air, the impact of climate change and the importance of plant diversity to key ecosystem processes in the plant communities of the Alpine zone. Since 2010, the Institute of Plant Sciences at the University of Bern has also been studying the effect of different care measures on plant diversity in experimental plots in the Alpine Garden. High-altitude gardens in the different climatic zones between the valley floor and Schynige Platte allow the Universities of Bern and Basel to predict the results of climate change on rare and common plant species and on the stability of different plant communities.

Visiting the Alpine Garden: June - October

We hope members of the SRGC will visit our garden. But when? The most abundant blossoms are found in the mountain spring, around the last two weeks of June, and the largest number of flowering species occurs in summer from around mid-July. The loveliest growth of tall forbs blooms in late summer from around the end of July. We try to engage young visitors so for them there are afternoons with story time in the garden, quizzes and the chance to pot their own flower, with a guided tour with Louchi the (German-speaking) Mountain Hare every Wednesday afternoon during the summer. If you visit, you will be in good company. Over the season, some 120 thousand visitors from all over the world find their way here. Many are enthusiasts from Japan; even the Japanese crown prince visited here in 2014. Come and see for yourself!

Jasmin Senn, Elsbeth Honegger, Hans Zurbuchen, Brigitte Kimmig, Sibylle Hunziker, Markus Fischer, Hans & Jennifer Abplanalp

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A Little Late Colour

Brian & Shelagh Smethurst

As we write this on a very wet day in mid August we are aware of an opinion amongst some gardeners, perhaps northern ones, that there is little colour in the rock garden from now until spring. Therefore we would in all humility like to mention several plants that are flowering now in our garden and will continue to do so for some time.

We admit that these plants are not small cushions but, as everyone knows, the term 'alpine' covers a wide range of plants, many of them not strictly alpine, but nevertheless often loved by many members of the

Left: *Ursinia alpina*
Below: *Crepis incana*

Brian & Shelagh Smethurst

SRGC. If you already grow them you may now smile knowingly and move on to the next article. So here they are:

Ursinia alpina can make quite a spreading evergreen sub-shrub just over thirty cm when in flower, as orange-yellow daisies. This species is very hardy and is really very easy to propagate by cuttings.

***Inula ensifolia* 'Compacta'** has more yellow daisy flowers about four cm across. It is slower growing than the *Ursinia* but makes a decent clump under thirty cm when in flower. Propagate this plant by carefully removing pieces of stem with some root attached and all will go well.

Crepis incana offers lovely four cm pink flowers on drooping longish stems. The plant is only about

Right: *Inula ensifolia* 'Compacta'
Below: *Iberis* 'Masterpiece'

fifteen cm high, coming from a central crown. It makes a pleasant contrast to the yellows. We have another clump raised successfully from propagation using a similar method to that of the *Inula*.

***Iberis* 'Masterpiece'** we bought as a plant from a garden centre a couple of years ago and it flowered for months. Because it looked as if it had flowered itself to death, we collected seed and now have several plants both in the garden and in pots. They are still in flower (November 5th) on stems from fifteen to thirty cm. We are not sure how perennial they are but they grow quickly from seed. We intend to overwinter the ones in pots to see what happens; we wouldn't like to be without this.

Campanula* (*Symphyandra*) *hofmanii - this name-changing species is perhaps best treated as a biennial. It

Left: *Symphyandra hofmannii* (Wikimedia Commons)
Below: *Scutellaria suffrutescens* 'Texas Rose'

Brian & Shelagh Smethurst

puts on a good late show although it may be a little tall for some rock gardens at thirty-five cm or so. The seed is easy to collect and germinates to produce a plant with typical large drooping white *Campanula* bells.

***Scutellaria frutescens* 'Texas Rose'** is a little red-flowered gem. We admired it in John Dower's garden and subsequently bought one. It is doing very nicely thank you in the rock garden, is very compact and only fifteen cm high.

Stachys densiflora is another small alpine-like plant. Less than fifteen cm tall and perhaps not a stunner with its white flower spikes, it is nevertheless extremely hardy and reliable.

Satureja spicigera follows on from the above-mentioned plants. It is the shrubby but prostrate

Right: *Stachys densiflora*
Below: *Potentilla* 'Red Joker' in bud

specimen that we mentioned in *The Rock Garden*, January 2011, still going strong and full of small white *Erica*-like flowers. We have two large clumps about sixty cm across: one in the rock garden and a larger one that has grown for some years in a crack in the flags by the alpine house.

***Rhodanthemum* 'Casablanca'** was planted earlier this year and very jolly it is too. It sports lots of large white daisy-type flowers which hold up well with very dark centres and are long-lasting.

***Erigeron* 'Wayne Roderick'** is another composite planted earlier this year that is doing very well with its pink flowers and is not too tall. And finally - as the Monty Python team used to say, '*Now for something completely different*'. Well, sort of …

Left: *Rhodanthemum* 'Casablanca'
and *Potentilla* 'Red Joker'
Below: *Erigeron* 'Wayne Roderick'

Brian & Shelagh Smethurst

***Potentilla* 'Red Joker'** is a dwarf shrubby *Potentilla* with pleasant pale red flowers. Our particular plant replaced a large rock garden *Berberis* 'Kobold' that we had grown from seed many years ago. One great advantage to 'Red Joker' is that it has no thorns.

We rest our case. There we are with a set of useful plants that all show some colour in the season that Keats described as one of '*mists and mellow fruitfulness*'. If you do decide to try some of the plants we have mentioned we really hope they thrive and afford you the pleasure they have given to us. Even as we finish writing this in mid-November 2015 we see that *Aster ericoides*, a dwarf rock-hugger from Canada, is just coming into flower . . .

Right: *Aster ericoides prostrata* 'Snow Flurry'
Below: *Satureja spicigera*

Cyclamen x *hildebrandii*

David Shaw

Within the genus *Cyclamen* there are a few deliberate hybrids that come true when reproduced from seed. One of these is a cross between *Cyclamen hederifolium* and *Cyclamen africanum*, first described by Schwartz in 1955 and named after the respected German cyclamen authority Friedrich Hildebrand.

This plant is a man-made hybrid that does not occur in the wild because of the different geographical locations of the two species, *C. hederifolium* belonging to the northern Mediterranean region and *C. africanum* being found in Algeria and Tunisia.

The plants grown by Carol and myself are raised from SRGC seed sown about ten years ago (the original label is lost). At that time we sowed cyclamen seed in ignorance so they would have been sown in seed compost in January and, as the plants may not be hardy, the pot was kept in the unheated greenhouse over winter and until the seed germinated, probably a couple of years later. Today, thanks to the tutoring of friends within the SRGC I now place cyclamen seed pots in the bottom of the airing cupboard, 16° C and dark, and get germination within a matter of weeks! The original *C.* x *hildebrandii* produced three seedlings which were grown on to become flowering plants.

Maintenance of these cyclamens is fairly easy as they get re-potted every couple of years and in the inbetween year I replace some of the compost in the top half of the pot. Our compost consists of equal parts of loam, leaf mould and grit with a bit of extra grit thrown in for cyclamen. Bone meal is the only fertiliser that we use. The pots are normally kept in

an airy poly-tunnel but are brought into the front porch first to display their flowers and second - the porch has a frost-thermostat heater to give protection in the coldest weather.

Are they hardy? I don't know and I don't intend to find out! Allegedly, *C.* x *hildebrandii* is slightly hardier than its *C. africanum* parent but we quite like our plants so will continue to keep them protected during the worst weather.

Another question to be asked is '*How accurate is the naming of our plants*?' Authenticity might be determined by chromosome counts of the tubers but, as I am a mere gardener, this is all mumbo-jumbo to me and beyond my abilities. I raised the question with Kit Strange from Kew Gardens at the October 2015 Discussion Weekend and she, having given me some pointers, opined that the plant in question was, indeed, a hybrid between *C. hederifolium* and *C. africanum*. Just how true it is to the original material of *C.* x *hildebrandii* probably cannot be determined. Our seed came from the general selection of the seed list so we do not know who the original donor was.

Our *C.* x *hildebrandii* are pot-grown plants and our *C. africanum* are still recently sown seedlings, so not yet flowering. Most of the *C. hederifolium* that we grow are in the garden and the potted ones are all kept outdoors. We regularly return seed from *C.* x *hildebrandii* to the club seed exchange and can be reasonably happy that it is true to the original seed that we acquired so many years ago.

The silver-leafed form of *Cyclamen* x *hildebrandii* was awarded the Forrest medal at the 2015 Discussion Weekend show in Grantown-on-Spey. It should be noted that whereas most awards at our shows go to the grower for producing a very nice plant, the Forrest medal is awarded to the plant itself and the grower merely has the honour of receiving the award on behalf of the plant!

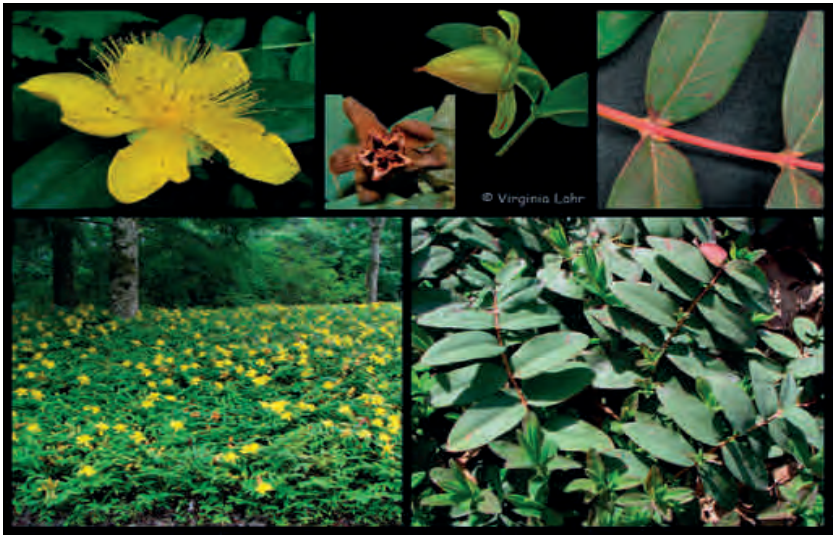
Notes on Hardiness

Carl Riehm

Is there a gardener who has not dreamed of growing plants from more temperate climes? I write from Ontario but perhaps I speak for many gardeners who live in the cooler parts of the world. I suppose that if there are exceptions, they must be members of the rock-gardening fraternity – after all, whatever the rigours of the Southern Ontario climate, it is benign in comparison to the high altitude places whence come our favourite plants. Certainly I am not an exception.

My garden is a veritable graveyard for Zone 7 plants. Not since the last ice age have so many plants disappeared from the face of the Earth. *Hypericum calycinum* (Aaron's Beard), *Sarcococca hookeriana* var. *humilis*, *Clematis montana* var. *rubens*, *Cytisus* x *kewensis*, rhododendrons too numerous to mention … the list goes on and on. May they rest in peace. Then there is the category of plants which do survive but are pale imitations of their brothers growing in more salubrious locales. My three attempts at *Albizia julibrissin* f. *rosea* have reached a stable state: the annual growth is equal to the annual dieback. *Rhododendron williamsianum* struggles on from year to year in a position sheltered enough to permit survival but too sheltered to permit flowers. I guess my chief disappointment in our climate arises from the unwillingness of *Cornus florida* to flourish here. Perhaps the summers are neither hot enough nor long enough to produce large and robust flowers. I have four specimens. Three are from Tom Cain's beautiful natural stand on the escarpment west of Dundas. None of mine does very well. At best one gets woefully undersized flowers. What a pity! In my days of ilexophilia, I planted every holly I could get my hands on. Of several *Ilex aquifolium*, only one survives – a widow, humbled by winter-burn every March. Too bad she doesn't find my surviving male *Ilex pedunculosa* attractive. After all, not too long ago he enjoyed the company of two sweet young things of his own kind. More recently the marvellous blue hollies (which are hybrids between *I. aquefolium* and *I. rugosa*) have of course provided us with serviceable and beautiful hollies. I have also had reasonable success with two cultivars of *Ilex opaca*; one is Hedgeholly and the other is a selection by Orville Pride. Unfortunately the latter holly recently had her leader lopped off by a gardening intimate of mine in a paroxysm of pruning passion. She

Albizia julibrissin var. *rosea*
(Photo by courtesy of Burncoose Nurseries, part of the Caerhays Estate.
Web www.burncoose.co.uk)



Hypericum calycinum, Aaron's Beard
(Photomontage by courtesy of Virginia I Lohr, Washington State University)

now peers about, wondering in which direction to grow next. There are a few marginally hardy plants which have done quite nicely in our garden. *Abelia* x *grandiflora* and *Sciadopitys verticillata* are two that come to mind. At the moment I can't think of any more!

Just what is it that enables some plants to survive winter nicely while others succumb? How can one help marginally hardy plants to survive? What are the environmental factors which determine these matters of life and death? Most gardeners have theories on these questions and again I am no exception. I had thought to substantiate and supplement my theories with hard scientific evidence. I therefore talked to a botanist and read two articles in a journal of botany. Unfortunately science does not have the answers either, only a depressing variety of guesses from many quarters, largely in contradiction with each other. It appears that in general very little is known about the process of plant survival (or non-survival) in the face of freezing temperatures. For what it is worth, the traditional scientific view is that the basic problem faced by a plant in winter is internal ice formation. There appear to be three methods used by plants to avoid this happening. The most common is simply to get the water out of the plant cells themselves into intercellular locations where it can freeze with little ill effect. If any water remains behind, it is in the form of a stronger solution and so has a lowered freezing point. This process is especially important with herbaceous plants. In extremely hardy woody plants, such as *Populus tremuloides*, the cell is able to withstand virtually complete dessication, and so can afford to have all its intracellular water migrate. The second avoidance technique is the intracellular binding of water molecules to protein molecules. This effectively immobilizes the water

Clematis montana var. *rubens* (Hortipedia)

molecules, preventing them from marshalling themselves into ice crystals. The third method is supercooling. The normal freezing point of water is of course 0°C. But, in order to form ice crystals, water needs nucleating substances to get the process started; in their absence, water can actually be cooled to -38°C before spontaneous nucleation begins (this no doubt explains why Lake Ontario is so cold!) Most plants, however, can only be supercooled by a few degrees. The leaves of olive trees are evidently very good at this. Supercooling, in principle at least, enables the plant to survive sudden freezes. But the more important method of allowing the water to migrate to intercellular locations takes time, and this perhaps partially accounts for the time needed for plants to harden off (called acclimation by botanists). Recent scientific articles express considerable doubt that ice formation is the only or even major lethal effect of freezing on plant cells. There are, besides the destruction of the cellular walls by ice, other injurious consequences such as: the damage caused by the concentration of solutes in the cell after extracellular migration of the water; loss of the semi-permeability of the cell wall; the expansion and subsequent separation of the cell walls from the cellular material inside; and altered osmotic behaviour of cell walls. Even if one accepts these as the injurious effects of freezing temperatures, it is not known how they occur. Thus scientific help in shepherding one's tender plants confidently through winter is not in sight.

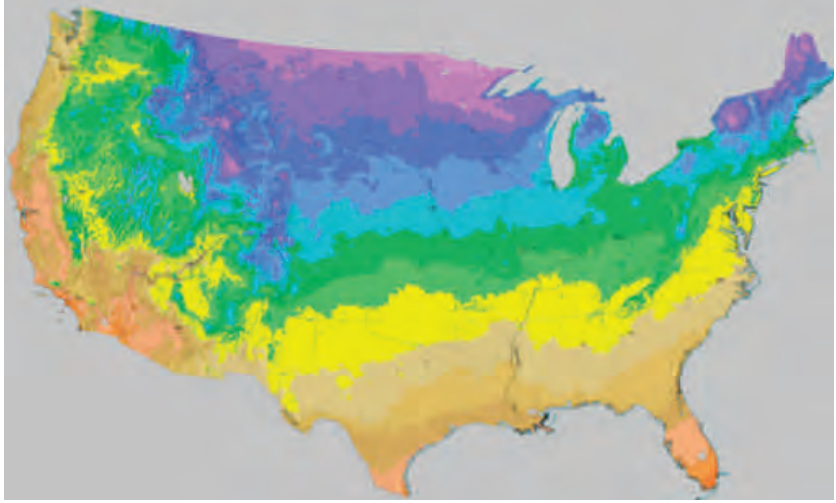
Horticultural experts, on the other hand, seem to have lots of rules of thumb for helping out. For rock gardeners, nothing is so helpful as a good deep layer of snow. A (poor) substitute is a layer or two of pine boughs or branches such as those from discarded Christmas trees. It is generally felt that mulches of any kind should not be applied before the ground is frozen. For

Cones of *Sciadopitys verticillata* (Wikimedia Commons)

one thing, bare earth radiates more heat to the plant than does mulched earth and so can help to avoid sharp drops in temperature around a plant during the fall. Furthermore, early mulching may delay the hardening-off process and so make the plant more vulnerable to winter cold. Of course, mulches that pack down too much, such as leaves from most deciduous trees, should be avoided, since they may produce rot over winter, especially around plants such as lewisias. For the same reason, one should clear the rock garden of such leaves before winter sets in. Another standard protective ploy used by gardeners is to locate delicate plants to the south or west of a building or hedge. This protects them from the worst winds and, if they are on the east side of a windbreak, protects them from the worst agent of winter destruction for many plants, the March sun. This is especially true of evergreens – the sun draws water from their leaves, which the frozen roots are unable to replace. How wonderful it would be for gardeners if some architect could design a house with only an eastern exposure! We all know that cloudy nights are warmer because of the greenhouse effect in which infrared radiation (heat) from the soil is reflected by the clouds back to the earth. A similar effect can be created by overhanging trees, even deciduous ones. I have always found this hard to believe, but it does seem to help.

I believe that next to a good snow cover, the most effective winter protection is good health. This is especially true for rock garden plants, which are notorious for their love of specialized habitats. Getting each one into a good approximation to its natural environment goes a long way towards ensuring winter survival. And if all else fails, you can always bury electrical cables in your garden, as was ironically suggested to me by Peter Rice of the Royal Botanical Gardens when he spied my *Camellia japonica* 'Berenice Boddy' struggling to survive in my most prized location near the vent of our clothes dryer! Just make sure you don't forget where the cables are buried – or make sure that your shovels have wooden rather than metal handles …

A discussion of cryobiology, as this subject is sometimes called, would not be complete without a mention of hardiness zones. These are, of course,



USDA hardiness zones: zone 7 is yellow

designed to help gardeners choose plants that will survive in their area or - as in my case - to choose plants that will not survive in my area. But we all know from experience that they are crude approximations at best. They are based mainly on the average annual minimum winter temperatures. This is calculated as follows: for each day over a long period of time, say 50 years, record the minimum temperature. Then for every period of 30 consecutive days during those 50 years, calculate the average of the 30 minimum temperatures for that period. The smallest of all of these averages is the average annual minimum winter temperature. It is used to establish hardiness zones. It is clearly a measure both of the minimum temperatures occurring as well as the length of time over which cold temperatures occur.

The hardiness zones don't seem to apply very well to alpine plants. Certainly the 'true' zones, if such exist, for most of them are unknown. Here in Ontario it seems to me that hardiness zones do not weigh heavily enough the effect of the length of our winter. One of the obvious effects of our winters is the depth of our ground frost, often one metre or more, and as a consequence of this, the ground remains frozen long after the air has become warm, causing the drying out problems mentioned above. Perhaps the best antidote for climatic melancholy is to forswear the reading of gardening books from more benign regions, such as those of the United States and Britain. Those in locations such as mine should perhaps restrict ourselves to books written in Winnipeg and Edmonton. If those areas do not produce enough reading material to keep us happy, we could always establish a fund to encourage the translation of gardening books of Finland.

The original version of this article appeared in the Ontario Rock Garden Society (ORGS) Journal in 1985; it appears here by courtesy of Carl Riehm and the ORGS; despite the perhaps ameliorating effects of climate change, your editor felt that it is of such relevant interest and eloquence that it still merits your attention in 2016.

The *Pulsatilla* Princess

Susann Nilsson

Once alpine growers saw the prospect of seeds of *Pulsatilla integrifolia*, formerly *Miyakea integrifolia*, their possessive instincts rose like wildfire. Most of us have probably, if not grown it ourselves, at least seen it in other gardens. But I dare to say there is another *Pulsatilla* species that only a few readers are aware of and that very few have ever seen. I believe this species, or - more precisely - a variant, is the true bearer of the title *Princess of the Pulsatillas*. Her charms are increased by her being an endemic species and one of Nature's teases, to be found only in a handful of very small places. Some of these sites may be as tiny as fifty square metres. How extensive her distribution once might have been is now only possible to guess.

So, who is this mystical *Pulsatilla* that I claim most folk do not know about? Ladies and gentlemen, may I introduce *Pulsatilla bungeana* var. *astragalifolia**? She is currently so unknown that the author of the recently published monograph on *Pulsatilla* completely missed her, but she absolutely deserves some attention. Unfortunately she lacks an English name. Of course there is a hook – there always is. In this case the hook is that the small princess only grows in Mongolia at high altitude and in very few places. Her choice of habitat may be an indicator of her being very picky, as neither man nor heavy grazing has affected these sites. But, optimistically, let us hope that her sparse distribution merely owes to the harsh environment and the tough climate she is fighting. If so, there is hope for growers. It would be so interesting and nice to get her into cultivation.

The princess prefers west-orientated screes at about 2500 m where she shares a habitat with small *Berberis sibirica* and some *Thalictrum* species, *T. minus* and *T. petaloideum*. You will probably also find species of *Valeriana* and *Pedicularis* next to her and she is actually often accompanied by a relative, *Pulsatilla ambigua*. A few hundred metres below you are likely to find a third congener, *P. turczaninovii*.

Pulsatilla bungeana var. *astragalifolia* is in Nature a very low and compact plant. Its appearance resembles *P. sugawarai* or a *Paraquilegia*. With age, each individual forms a small clump, as do many pulsatillas. Like

* Many of us who work with her use *astragalilifolia*, although some floras use the epithet *astragalifolia*.

Pulsatilla bungeana var. *astragalifolia* Above: Mongolian habitat
Facing: Receptacle and seed head

Pulsatilla bungeana var. *astragalifolia* (Photo: Martin Schnittler)

all her relatives she bears only one flower on each stalk. And here comes her noteworthy speciality: the stamens are not yellow as in other pulsatillas but are dark blue! As if that were not enough, she has a receptacle with a beautiful red edge. That said, I have to admit that there is one more *Pulsatilla* that has blue stamens. It is *P. kostyczewii*, endemic to the Tian Shan. Both *P. kostyczewii* and our little princess are actually intermediate between *Anemone* and *Pulsatilla*. But that is the only resemblance that these two share. *P. kostyczewii* really behaves as a nasty anemone with its long runners below ground making each specimen the source of big colonies whereas *P. bungeana* var. *astragalifolia* keeps to herself.

Facing: *Pulsatilla ambigua*, an unusual and uniformly coloured white form. *Valeriana petrophila* - Two habitat companions - *Berberis sibirica*

Leaves of *Pulsatilla bungeana* var. *astragalifolia* (L) and *P. ambigua* (R)

Pulsatilla ambigua in the Khayrkhan National Park, Mongolia

The flowering time depends, as with all flowers, on the progress of spring. But in Nature the princess flowers before *Pulsatilla ambigua* and *P. turczaninovii* and therefore is already in fruit while her congeners are still in flower. This keeps her seeds clean because she has nobody to cross pollinate with. I collected seeds in 2014 and have distributed them to botanical gardens and skilled growers in Canada, Denmark, England, Germany, Japan, Russia, Scotland, Sweden and the USA. Hopefully this diaspora will get her into cultivation.

With this article I thank both the SRGC and the NARGS, who kindly contributed to make my collection expedition possible.

Herbarium specimen of *Pulsatilla bungeana* var. *astragalifolia*
Facing: *Pulsatilla ambigua*

Newcastle

10th October 2015

The organisers of the Newcastle Show engaged in a bold experiment this year, changing the venue to a local garden centre. Although the surroundings may have been a little unconventional, the plants were as good and as numerous as ever, whilst the light over the show benches was fantastic.

My first impression surveying the plant display while judging was in progress was of the extensive ranges of *Colchicum* and autumn flowering *Crocus* that were on display. *Colchicum baytopiorum* from Bob & Rannveig Wallis made an impressive large potful, but I rather preferred their

Colchicum macrophyllum (Bob & Rannveig Wallis)

pot of *Colchicum macrophyllum* with its delicately tessellated flowers on short stems just above the gravel top dressing. Of the numerous autumn crocus species, Ian Kidman's *Crocus mathewii* 'Dream Dancer' was a form of this desirable crocus coveted by many while *Crocus tournefortii* (Bob & Rannveig Wallis) with its extravagantly exerted anthers, and *Crocus hadriaticus* (Alan Furness) were particularly striking.

Facing: *Colchicum baytopiorum* (Bob & Rannveig Wallis)

Crocus mathewii 'Dream Dancer' (Ian Kidman)
Facing: *Crocus tournefortii* (Bob & Rannveig Wallis)
Crocus hadriaticus (Alan Furness)

Gaultheria crassa 'John Saxton' (Keith & Rachel Lever)
Cyclamen mirabile (Bob Worsley)

Fittingly for an autumn show, the Forrest medal was awarded to a plant in fruit. *Gaultheria crassa* 'John Saxton' (Keith & Rachel Lever) does not perhaps accurately fit the description of the species and may be a hybrid, but its numerous red fruits looked almost unreal in their perfection. Apart from fruiting plants, *Cyclamen* are one of the mainstays of the autumn shows and *C. mirabile* (Bob Worsley) was a perfect example, winning its owner trophies for the best cyclamen in a 19 cm pot, the best plant in sections B and C, and contributing to his points total to win the overall award for section B.

Another autumn show staple is the splash of blue provided by pots of gentians. There was a good range on the benches this year but, on close inspection, quite a number of plants exhibited spotting of the petals which I assumed to be marks from rain splashes. One of the older hybrids, *Gentiana* x *macauleyi* 'Kingfisher' (Keith & Rachel Lever) proved to be an exception to this and the clear blue flowers also posed less of a challenge to capture the

Gentiana x *macauleyi* 'Kingfisher' (Keith & Rachel Lever)

correct colour in camera than most, where purple flushing of the deep blue petals always presents difficulties for the photographer.

There were many other plants to catch the eye, but a couple that stood out for me were *Hyacinthoides ciliolata* (Bob & Rannveig Wallis) with a crowded mass of Delft-blue flowers that repaid careful inspection to reveal the deep blue anthers, and also *Oxalis perdicaria* 'Cetrino' (Ivor Betteridge). This was a slightly paler clone than is commonly seen but with a mass of perfect flowers hovering above its delicate and rich green foliage.

To complement that show of plants, our local group member Mike Dale staged a display to show how plants, especially alpine plants and ferns, have been depicted on postage stamps over time. He was awarded a gold medal for his efforts, which included a large and exuberant display of ferns and lichens as a centrepiece. Many thanks are due to Alan Newton and Alan Furness and their helpers for a splendid show, and also to Cowell's Garden Centre for allowing us to take over a large section of their display area for two days.

Peter Maguire

Hyacinthoides ciliolata (Bob & Rannveig Wallis)

Oxalis perdicaria 'Cetrino' (Ivor Betteridge)
A centrepiece (Mike Dale)

Aberdeen, 16th May 2015

The Aberdeen show, which for various reasons has been suspended for several years, was revived in 2015 in a new venue. The Victorian Corridor in the Winter Gardens, a well-known feature of Aberdeen's Duthie Park, proved an attractive setting for the show, and we are delighted to have been allowed the use of it. It is normally used for a striking display of pot plants, and features splendid hanging baskets of *Streptosolen jamesonii* or 'Marmalade Plant' from Colombia and Peru. Despite the disruption caused by the removal of the plants normally on display, management and staff were helpful and welcoming, and we are most grateful to them. The hanging baskets remained and the day was enlivened from time to time by both visitors and exhibitors finding orange flowers decorating their hair.

In the years when the show did not take place, non-competitive displays were held but in 2015 the show resumed its competitive aspect and was supported by exhibits from all over Scotland. Everyone succeeded in finding the show in its new home, club and plant sales were once again in evidence, and the show was well attended. Since entry was free, many people who had merely come to browse in the Winter Gardens were introduced to the glory of well-grown alpines, and we hope that we may have thus acquired some new members. Response from exhibitors was good, with a total of 179 entries from 22 entrants: 43 in Section I and 136 in Section II.

The Winter Gardens

Daphne calcicola 'Napa Hai'

Mike Hopkins presents the George Forrest medal to Cyril Lafong

It is perhaps no surprise that the George Forrest medal for best plant in show was won by Cyril Lafong for his *Daphne calcicola* 'Napa Hai'. Cyril also won the Esslemont quaich for class 6, three plants new, rare or rare or difficult in cultivation. The Simpson salver was awarded to Stan da Prato for his *Rhododendron* 'Wren' and Bill McGregor won the Aberdeen quaich for the best plant in section II with *Trillium grandiflorum* 'Flore Pleno'. Stan, also not surprisingly, won the Walker of Portlethen trophy for the most points in section I. It was disappointing that there were no junior members to claim the Elizabeth bowl.

Other outstanding plants won certificates of merit for Ian Christie, Bob Maxwell (*Trillium luteum*), Dave Aitken - who took the Brian Bull trophy, and Cyril Lafong (*Saxifraga pubescens* 'Snowcap') while Mike Hopkins won the AGS Ulster Group quaich with a magnificent *Lewisia*. The prize-giving was held in the Temperate House in a sunken area that is usually reserved for weddings; it attracted many visitors other than competitors.

All in all, the group was very pleased with the new location. The bright light showed exhibits to advantage, showing off plants like *Oxalis* and *Lewisia rediviva* to their full glory, something difficult to do in our past venue. Despite the very large number of visitors, the layout was less crowded than in our old haunt. The main disadvantage noted was the lack of a 'sitting out' space, and we are considering how to rectify this.

It was pleasing to see so many loyal supporters who, though not members, had always attended the show in past years. Having found us in the new location, they were without exception pleased that the show had been revived. We look forward, with the valued collaboration of the Winter Gardens staff, to holding the show there for many years to come.

Lesley Glasser

Saxifraga pubescens 'Snowcap'

Trillium luteum

Rhododendron 'Wren'

Please see http://www.srgc.net/site/index.php/shows/sample-menu for a longer account of the show.

Nairn 25th April 2015

Warm sunshine in the Highlands before the show tempted folk northward; Drumnadrochit recorded 21°C, and Highland Group members who show, especially in Section 2, came with many wonderful plants. The hall, reinforced by stalwarts such as Stan da Prato, looked a picture of spring. The quality of the best plants was breath-taking: a huge *Gentiana acaulis* from Peter Semple, *Andromeda polifolia* 'Nikko' and 'Blue Lagoon' from Stan, a wonderful *Salix reticulata*, but best of all a magnificent *Pleione* (perhaps *formosana*). The last two came south from Berriedale with Francis & Margaret Higgins, for whom the *Pleione* won their first Forrest medal. Many other excellent plants accompanied them, including *Jeffersonia dubia*, *Calceolaria* 'Walter Shrimpton' and *Celmisia sessiliflora compacta*. In Section 2, *Primula rusbyi* var. *ellisae* won Olive Bryers the Culloden trophy for the best primula, *Fritillaria acmopetala* won John Owen the Askival trophy for the best bulb, and *Fritillaria meleagris alba* the special prize for first-timer Hamish MacIntosh. Hamish also brought a lovely miniature garden, quite unusually given a certificate of merit.

Stan da Prato won the three pan class with 'Blue Lagoon', *Rhododendron* 'Ginny Gee' and *Saxifraga* x *stribrnyi* complementing each other in a study of pinks and purples. Stan's other *Ericaceae* contributed to his winning the Highland trophy for the most first prize points. Purple irises such as *Iris schachtii* and *I. babadagica* were notable. Dwarf narcissi were represented by *Narcissus* x *cazorlanus* and *N.* 'Solveig's Song', both hybrids between *N. bulbocodium* and *N. triandrus;* a hybrid *N. jonquilla* x *triandrus* emphasized how ready *N. triandrus* is to hybridize with other dwarf narcissi, and how lovely the resulting offspring can be.

The Higgins brought super anemones: the two pans *Ranunculaceae* award went to *Anemone* x *lipsiensis* and *A. obtusiloba* in its blue form; the yellow form shone elsewhere. Two plants caught my eye: a quietly lovely *Trillium luteum* shown by John Owen; and Colinne Souter's *Bellevalia paradoxa*, truly the most navy-blue flowered bulb, persuading me to buy two from the Rumbling Bridge nursery stand. Ardfearn and Askival nurseries also presented excellent and tempting sale plants on their trade stands.

All told, the show was an excellent day out. Congratulations go to the Shaws for their organization. Fine plants, good company, new medal winners and great highland scenery. But who suspected what was to come next? On Sunday afternoon we headed south, the temperature was below freezing and snow was so deep that we had a long detour via Inverness … the joys of a Highland spring!

Ian Bainbridge

For a fuller and illustrated account of the show, please see Sandy Leven's account at http://www.srgc.net/site/index.php/shows/sample-menu

Steppes: The Plants and Ecology of the World's Semi-Arid Regions
Michael Bone, Dan Johnson, Panayoti Kelaidis, Mike Kintgen & Larry Vickerman
ISBN-10: 1604694653;
ISBN-13: 978-1604694659;
£35; Timber Press

Although steppe may be regarded by a wider public as merely an enormous unproductive open area, I hope that SRGC readers are aware of the rich floral diversity to be found in these wide expanses of semi-arid grasslands, home to some fascinating nomadic peoples. The authors are all connected to Denver Botanic Gardens, a repository of expertise in the plants of the steppe as well as experimentation in their introduction to cultivation. They have tremendous understanding of the steppes and have written with both knowledge and passion. Immense as these areas may be, whether in the Americas, Africa or Central Asia, they are still threatened by all manners of incursion and destruction. We must hope that this book alerts many to the richness of steppe life and perhaps encourages care to be taken of the steppe habitats.

The various chapters, each by a different author, illustrate very well the often stunning scenery and breath-taking qualities of the plants to be found in these superficially barren landscapes and give great insight into the various factors which have created them.

Fluent descriptions of the steppes and their formation, along with notes on the flora and its interaction in the overall life of the steppes add to the pleasure of the book. For every person fortunate enough to be able to travel and study these regions, there are many more who are nevertheless deeply intrigued by the plants of these distant places; they will be the ones who most welcome this publication. The standard of photography is high – though I might have liked some larger pictures here and there. The authors seem to have been aware that there is no full integration of the use of measurements in either imperial or metric – so they include a conversion chart. For some readers, left puzzling about the common names of quite a few things, a glossary of American terms might have been a helpful addition to the index – but a little time searching out these meanings is a small price to pay - it has made me more thoughtful about such things!

I venture to suggest to my readers that seldom have so many fine contributors been brought together to author such a book to such great effect – this is a deeply satisfying publication; it will be something to be savoured and consulted over many years. And all this at a very sensible price – no small consideration.

Margaret Young

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