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High summer here, and still the world, whether in the weather conditions or the political difficulties abounding, is often in chaos. Even those of us with a garden to retreat to are not immune from the problems that we can sometimes avoid by immersing ourselves in our world of plants. Perhaps, no matter where you are, or whatever horrors affect you, a few moments spent reading the International Rock Gardener will assuage your torment. We can but hope! We are delighted to present a new Crocus species described from Northern Macedonia by the team of Dr Jānis Rukšāns, from Latvia and Dr Dimitri Zubov, from Ukraine. Jānis says he is transplanting crocuses every day, but the first ones are already starting to bloom.

Second article this month is from the Scot, Connor Smith, about his workplace, the Utrecht Botanic Garden, which is rightly famous for its innovative rock gardens.

Connor is also excited for this event to enjoy: **Autumn Plant Market at Utrecht Botanic Garden.** On Saturday 3 September 2022 from 10:00 to 16:30 all are welcome at the best plant market in the centre of the Netherlands! In the Utrecht University Botanic Gardens you will find a fantastic assortment of plants during the Autumn Plant Market 2022.

Around 74 plant sellers from various European countries are expected, who will undoubtedly bring their own range of plants. In addition to vendors, various plant associations are present whose members will enthusiastically provide you with all possible information about their hobby.

Learn more about the event and those attending, here: https://www.uu.nl/en/events/autumn-plant-market-2022

Part of the Utrecht Botanic Garden, photo Connor Smith.

Cover photo: *Crocus jostii* by Jānis Rukšāns.

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New *Crocus* species (Crocoideae, Iridaceae) from North Macedonia

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Summary. During two expeditions to North Macedonia (spring 2013 and 2022) additional information about a new crocus species was obtained; its habitat within the Jablanica mountain range and the Šar Mountains, phenology and morphological features were characterised as well for further successful *ex situ* introduction. Photographs and distribution maps are provided. Morphological differences between the new species and the similar taxon of *Crocus veluchensis* are discussed.

Key words. Crocus, geophyte, the Jablanica mountain range, the Pindus mountain range, the Šar Mountains, Illyrian floral province, acid soils.

Introduction

Crocus veluchensis Herbert was named by W. Herbert in 1845 after Velouchi Mt. (now Tymfristos Mt. within the Pindus mountain range) in Central Greece. Regarded under this name nowadays are a lot of different crocuses distributed within wider area – from mainland Greece south in direction to Mt. Parnassós and north in direction to up to the Bulgarian ranges of Rila, Pirin, and the Rhodopes. Brian Mathew in his monograph "The Crocus" characterises *C. veluchensis* as extremely variable species: "…one might think that more than one taxon was involved…", although he concludes that he found "it impossible to recognise anything but one species" [1].

We grow in our collections more than 10 accessions all labelled as *C. veluchensis*, but from different localities and in most cases initially obtained from our correspondents only as few plants: we were surprised by their variability between different accession stocks, although inside each stock plants were quite uniform. But the small number of individuals did not allow us to judge the variability within each wild population and how their features overlapped in different populations. This sparkled off our interest in this species and during last five years we organised several expeditions to the areas, where *C. veluchensis* sensu lato was reported growing wild. As it usually happens, the greatest problem always is to be in correct place and time, so in most cases it was only possible to collect samples of plants by their leaves, after blooming. On the other hand, this allowed us to compare specimens from each population grown in cultivation under identical conditions, so morphological differences between them were easily observed. In addition, we asked our several correspondents about collecting of typical specimens of this species from localities not visited by us. Actually, it resulted in the collection of *C. veluchensis* sensu lato from 16 distant localities. Unfortunately, several samples from Montenegro are still represented by very few individuals and it is impossible to judge about their taxonomic status. At the same time, we asked our correspondents to send us not only corms but also some soil samples from their habitat. During our trips in the last years, we always had with us professional soil pH-tester and litmus solution, to check the pH values of soil solution, where the crocuses grew.

Crocus veluchensis from Serbia – from Surdulica to Streezimirovci, near Vlasinsko reservoir.

Left: White form of *Crocus veluchensis* from Serbia - hairs only at base of inner flower segments.

Right: *Crocus veluchensis* from Elatia forest in N Greece.

Left and below: *Crocus veluchensis* from Mt. Voros, N Greece - variability of throat colour.

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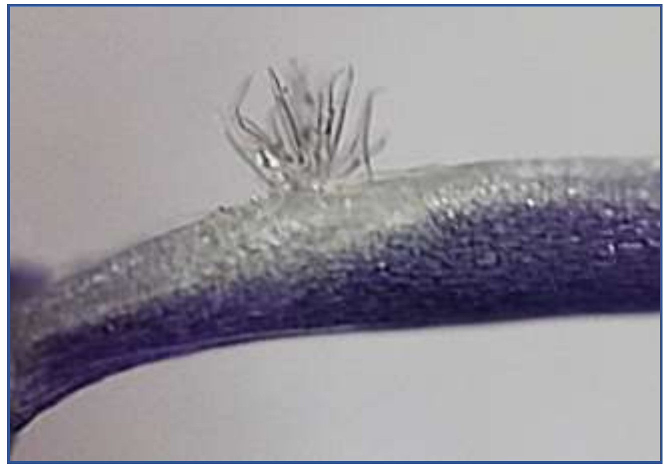
Crocus veluchensis grown from Kosovo, above Vratnica.



Crocus veluchensis from Kosovo - hairs at base of inner segments.

Crocus veluchensis from Mt. Parnassós in Greece, the Southernmost locality of *C. veluchensis* observed by the authors.

The first observations allowed the separation of several groups even by growing condition peculiarities: for example, the plants from Bulgaria and Serbia already started forming new roots before end of vegetation and before roots of previous season died. It was not observed in plants from the Jablanica mountain range, Kajmakcalan (Voras) Mt., Ossa Mt., etc. Plants from Elatia forest fell out from the general view by narrower flower segments and distinctly bordered white throat; plants from western side of North Macedonia were invariably distinctly smaller by size; in comparison with them Bulgarian and Serbian plants looked like real giants. Plants from Kosovo have a dark "v" shape mark at the tips of flower segments, but specimens from Menikion Mt. (to the east of Serres city, NE Greece) and Galata (Μπορλέρο) Mt. (the Pindus mountain range, Greece) have white style and stigma (diagnostic feature of *C. tomoricus* Markgr. regarded by B. Mathew as synonymous with *C. veluchensis* [1]). Common for all checked populations was acid growing soil solution – in some populations even very acid – at Elatia pH=5-5.5, but at Voras Mt. even around 4.5-5, less acid at Jablanica (North Macedonia) – pH=6-6.2. Only at Popova Šapka Mt. (the Šar Mountains, North Macedonia) where quite recently fires destroyed overgrown vegetation in some spots pH showed even 6.9 (this could be explained by fertilizing of soil by ashes after fires - wooden ashes are used in gardening to rise pH in acid soils), but in general varied between 6.2 and 6.4. In North Macedonia, at a similar elevation where typical *C. cvijicii* Kosanin grows, the pH of soil was around 6.5-6.6, similarly in North Greece where *C. gramensis* Jovanović, Raca, Shuka, Harpke & Randj. *nomen nudum* grows, the pH varied between 6 and 6.5 (there it was checked only using litmus solution, so the accuracy was not high).

Morphologically, *C. veluchensis* is quite similar to *C. sublimis* Herb. and according to B. Mathew both are easily separable by colouration of the throat, which in *C. veluchensis* is white, but in *C. sublimis* it is yellow. Unfortunately, the situation isn't so simple. There are populations (Mts. Giona, Vrondous, Kajmakčalan (Voras), Parnassós, and the Serres region), where together with plants having white throat, individuals occur with lighter or darker yellow toned throat. Brian Mathew suspects that it is a result of hybridization with *C. sublimis*. If on Mt. Parnassós, where both species really occurred, it could be the reason, a situation on other mountains where between typical *C. veluchensis* were observed the individuals with yellow throat is different – there are no records about presence of *C. sublimis* in vicinity [7]. So, there remain only subtle distinctions between both species: in *C. sublimis* there is a definite waist to the flower whereas in *C. veluchensis* the flowers are strictly funnel-shaped; according to B. Mathew [1] the corms in *C. sublimis* are larger (although on Helmos Mt. we observed flowering *C. sublimis* with the corms even smaller than in *C. jostii* species nova described here, and in cultivation the difference in corm size is practically absent). *Crocus sublimis* has often five or more leaves per corm vs *C. veluchensis* having only 2-4 leaves.

In several attempts we tried to breed the plants of *C. gramensis* nom. nud. using pollens of various specimens labelled as *C. veluchensis*. We got hybrids when plants of *C. veluchensis* from Bulgaria and Serbia were used as pollen parent. The resulting hybrids were very variable by colour – from pure white through varying shades of yellow up to brownish-lilac-yellow individuals and bright violet, but no seedlings were received when small flowering plants from North Macedonia were used as pollen parent.

All previously mentioned observations confirm that several different species might be hidden under the name of *C. veluchensis*. The crocus plants from eastern slopes of the Jablanica mountain range lying along the western border of North Macedonia (pertaining to Illyrian floral province of the Circumboreal Region), we can definitively separate from all other accessions formerly regarded as *C. veluchensis*. They are easily separable by distinctly smaller size of flowers and some other features listed here below.

Crocus jostii *Rukšāns & Zubov* sp. nova

[*Crocus veluchensis* var. *micranthus* Randj. et A.D. Hill (1990: 23), *nom. inval.* without validating type citation].

Type: North Macedonia, the Šar Mountains, eastern slopes of Jablanica mountain range, 41°13’N, 20°31’E, 1830 m elevation, 24-05-2022, *Rukšāns* s.n. (holotype RIG!).

Corm – slightly elongated, in wild very small, only up to 10 mm in diameter and 12 mm high.

Tunics – Distinctly and intensively reticulated, only in basal part shows slight tendency to paralleling, but still shows some reticulated pattern.

Prophyll – absent.

Cataphylls – 4, white.

Leaves – 3(4), emerge with start of blooming and during flowering reaches or even overtop base of flower segments, of different width (during flowering leaves up to 2 mm wide, but later becomes wider, reaching 3-5(6) mm width), deep green, papillose on edges and with occasional long hairs on edges of lamina and ridge, white stripe 1/4 to 1/3 of lamina width; edges of lamina down and inward turned, lateral channels without ribs.

Perianth tube – lilac, below flower darker than flower segments forming small diffused darker basal blotch.

Bract and bracteole – subequal, white, light greenish at tips, ends below base of flowers.

Throat – distinctly hairy on both – outer and inner segments, smaller or larger, whitish with diffused edge, gradually turning lilac from around ¼ of segments length.
Filaments – 8-**10-**12(13) mm long (n=59), glabrous, white, always something longer than anthers.
Anthers – yellow, 7-**8,5-**11 mm long (n=59), with long basal lobes, pollens – yellow.
Connective – white.
Style – white, gradually turning into yellow to deep yellow, occasionally even orange 2-**3.2-**4(5) mm long stigmatic branches. Stigmatic surface rough to shallowly partite. Stigma positioned +/- around tips of anthers (from 62 observed and measured flowers in 45% it was slightly longer, in 35% level and in 20% ended something below tips of anthers).
Flower segments – oval, obovate to oblanceolate with rounded or subacute apex, mostly light lilac, but occasionally deeper lilac toned individuals occurred. Outside and inside of segments of same colour, only inner segments slightly lighter than outer; on base small, indistinct, diffused darker lilac basal blotch.
Outer segments – mostly light lilac, 24-**29-**33(39) mm long and 7-**11-**13(16) mm wide (n=62).
Inner segments – slightly lighter in colour, usually around 1 mm shorter but of almost same width as outer segments [24-**27.5-**32 mm long and (6)8-**11-**14(16) mm wide].
Capsule and **seeds –** not observed.
2n = 26 [4].

Habitat and distribution – subalpine and alpine pastures of the Jablanica mountain range and the Šar Mountains in North Macedonia; observed from two localities: eastern slopes of Jablanica mountain range at 1800-1850 m elevation, where it grows in mixed populations with *C. jablanicensis* N. Randj. & V. Randj., blooming slightly later than *C. jostii*, less often it occurred together with *C. pelistericus* Pulevic; and at Popova Šapka Mt. (The Šar Mountains), where it grows together with *C. scardicus* Kosanin at c. 2000 m elevation in grass and prostrate shrubs (*Juniperus* L. *sp.*, *Vaccinium myrtillus* L., etc.), mostly on acid soils (pH~6.2).

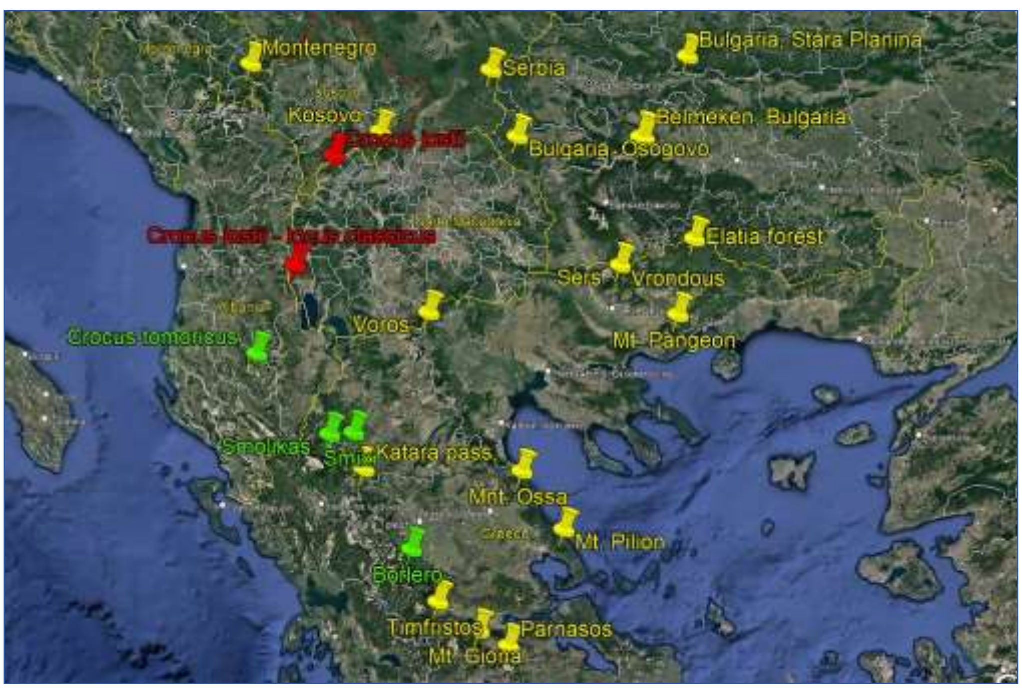
Flowering time – May-June.

Etymology – named after our long-time research travel partner, famous Czech plant grower and breeder Vaclav Jošt.

There are several features separating *C. jostii* sp. n. from other morphologically related species formerly considered as *C. veluchensis*. At first, it is distinctly smaller size of entire plants – in *C. jostii* flowers are in average around 3 cm long, whilst in *C. veluchensis* they are around 5 cm long: although in all observed samples of *C. veluchensis* flower throat is hairy, only in *C. jostii* the hairs are present at the base of flower segments of both whorls, whilst in other observed *C. veluchensis* accessions they are only at the base of segments of inner whorl, but a base of segments of outer whorl are glabrous. The outer corm tunics in *C. jostii* are more coarsely reticulated and a reticulation pattern goes down almost to base of corm *vs* finely reticulated tunics mostly only in upper half of a corm and becoming parallel fibrous in the base direction. Samples of *C. veluchensis* from Bulgaria and Serbia as well as plants from Elatia forest in Greek Macedonia start forming new roots before old roots withered away, but in *C. jostii* a rooting starts much later and there are never active roots of two seasons at the same time.

By flower colouration *C. jostii* is quite uniform. At Jablanica we found only one individual with a distinctly bordered white basal blotch on both sides of flower segments, less prominent on outside. Maybe it was an occasional hybrid with neighbouring *C. jablanicensis.* By the way, among the individuals of *C. jablanicensis* we observed a few plants with a yellow stigma (in typical plants it is white) and blue flower tube (in type specimen it should be white [3]) allowing us to suppose occasional hybridization between both species.

Most likely, the morphologically same crocus plants are also mentioned growing in Kosovo under the name of *C. veluchensis var. micranthus* nom. inval. [2]. Therefore, we offer here the latter name in synonyms of *C. jostii* sp. n.



Map 1 Red marks - *Crocus jostii*, green marks *C. veluchensis* s.l. with white stigma and *C. tomoricus*, yellow marks - *Crocus veluchensis* sensu lato.

Habitat where *Crocus jostii* grows at Jablanica, N Macedonia.

Crocus jostii, at Jablanica, N. Macedonia.

Crocus jostii at Jablanica, N. Macedonia blooms near melting snow.

Crocus jostii at Jablanica, N. Macedonia blooms through running water.

These three images: *Crocus jostii* at Jablanica, N. Macedonia.

This page: *Crocus jostii* and typical *C. jablanicensis* blooming side by side.

Crocus jostii and typical *C. jablanicensis* blooming side by side.

Crocus jostii and possible hybrid of *C. jablanicensis* with yellow stigma and blue flower tube.

Holotype herbarium of *Crocus jostii* from Jablanica.

Herbarium of *Crocus jostii* from Popova Šapka Mt.

Crocus jostii - an atypically coloured individual in the centre.

Below: Flower details of *Crocus jostii* - top left, an atypically coloured individual.

An atypical form of *Crocus jostii.*

Crocus jostii - corm tunic, basal plate.

Crocus jostii corm tunic.

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Corm tunic of *Crocus jablanicensis* has a distinct neck, absent in *C. jostii.*

Crocus veluchensis corms/ tunics - left on Mt. Ossa, right from Timfristos, Greece.

Crocus veluchensis, locus classicus, corm/ tunics.

Crocus veluchensis, Mt. Ossa, corm/ tunic.

Below:
Fritillaria macedonica, Jablanica, N Macedonia: growing together with crocuses, but blooming later.

Crocus pelistericus, Jablanica.

Crocus pelistericus, Jablanica (plant at left bottom corner - *C. jostii*).

Albino of *Scilla bifolia* - found at Jablanica, blooming through water.

Crocus jablanicensis blooms just before *C. jostii*.

Habitat on Popova Šapka Mt.

Crocus jostii at Popova Šapka Mt.

Crocus jostii and *C. scardicus* at Popova Šapka Mt.

Crocus jostii and *C. scardicus* growing side by side.

Crocus jostii at Popova Šapka Mt.

Localities where *Crocus jostii* was found – marked in red:

Cultivation

Crocus jostii sp. n. (formerly grown as *C. veluchensis var. micranthus* nom. inval.) has had a bad reputation among the gardeners as a tricky grower ("the dwarf high altitude plants are not very satisfactory" – B. Mathew [1]), which soon dies in collections. Such was our experience with the plants collected in 2013 on the Jablanica mountain range and Popova Šapka Mt. Year after year they became weaker and weaker and finally almost disappeared. Fortunately, we have found a solution before the last individuals were lost. The problem was in a faulty growing substrate. After the soil pH testing on slopes of Kajmakčalan (Voras) Mt. and at Elatia forest, where *C. veluchensis* is growing, we completely changed the soil substrate. Now we use a mix of very acid substrate based on peat moss and purchased as "Rhododendron" or "Conifer" soil, mixing it with coarse sand in a ratio 1:1 to provide a good drainage. The same mix we utilise now for some other crocus species as well, e.g. *C. scardicus, C. pelistericus, C. jablanicensis, C. yalovensis* Rukšāns, *C. scharojanii* Rupr., and for most crocuses from Spain and Portugal. Of note, all accessions remained grown under the name of *C. veluchensis* are planted in acid substrate as well. They appear perfect and produce corms of a large size, much larger than in the wild. An alternative way is to use traditional soil mix but putting around 5 cm thick layer of acid substrate (e.g., "Rhododendron mix") on the top of corms and finally covering with soil/stone chips. When watering the acid solution washes down ensuring an acid medium for rooting of those crocus species.

The necessity for a moist substrate throughout the summer for those crocuses seems to be exaggerated. After the snow has melted in the wild, the corms of *C. scardicus* and *C. jostii* are naturally stored in a completely dry soil. The dryness is ensured by dense cover of overgrown blueberry (*Vaccinium myrtillus*). Jānis brings pots with those crocuses out of greenhouse when only the weather conditions permit and they stay outdoors all summer long exposed to different weather events, including occasional rains, but no additional watering was provided.

Acknowledgments
We want to express greatest thanks to all bulb enthusiasts who shared with us samples of their collections and even organized trips to certain localities for collecting of crocus samples for our research – Jim Archibald (UK), George Papapolymerou (Greece). Atanas Tanev and Ivan Kostadinov (both Bulgaria), Vlastimil Pilous (Czech Republic), Oron Peri (Israel). Arne Strid (Denmark); to our long-time travel partners Václav Jošt and Jiři Bydžovský (both from the Czech Republic), Henrik Zetterlund (Gothenburg Botanical Garden, Sweden) and all others who joined us in our mountain trips. Of course, our thanks go to our regular language consultant Mārtiņš Erminass. And we are especially thankful to our families and friends for the hard work at the nursery during our absence while in the mountains.

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Crocus jostii at Popova Shapka.

--- Botanic Garden Report ---

A Scot, Connor Smith has been working at the botanical garden in Utrecht for around two years now – here he recounts some of his projects in the garden.

New Beginnings: Utrecht Botanic Garden by Connor Smith

(Photos by Connor unless otherwise stated)

The beginnings of the rock garden – Photo provided by Utrecht Botanic Garden (UBG).

I feel closer to horticulture than I have ever been; it has been a necessary solace from the challenges and difficulties presented in recent times. Nature can take you away from it all, albeit temporarily but a momentary absence to a greener, greater place is all but essential.

There is always a price for change, you will never be completely at ease in new surroundings until you have forgotten a bit about the old ones. Gardens are constantly in a state of flux, changing with the seasons, new dreams and the aspirations of the gardener(s). Trying to understand a new garden is a daunting task, a blend of nerves for the work before you and uncontrollable anticipation for the fresh canvas on which you are to paint.

Early construction of the centre of the Rock Garden which is 14 metres high – Photo provided by UBG.

Having changed the windy hills of Edinburgh, Scotland for the winding canals of Utrecht, in the Netherlands, I am quickly adjusting to the new conditions found within the Utrecht University Botanic Gardens. You may not be as familiar with the garden as others in Europe, despite it being one of the largest rock gardens in Europe at 2 hectares (almost 5 acres). I can assure you it is a treasure trove of rock gardening pleasures.

As we all know, the Netherlands – Holland is just a part of it – is a flat region with its highest point only being 323m asl (1060 feet). The climate is broadly described as maritime (Britain and Central Western Europe) but in could, in some years, better fit in to continental climate (we had 38°C / 100.4°F and -10°C / 14°F in 2020). The rainfall is about the same as Edinburgh, clocking in at 0.8m per year. In subsequent years after initial construction, alpine troughs were built, along with raised beds and later the peat walls. So, when the rock garden was constructed between 1967 to 1976, over 2,100 tonnes of rock was imported from Belgium and used to build the geographically constructed areas. In 1995, the alpine house was constructed and followed the plants of the time, notably Primulaceae, which was being vigorously studied at the time by many botanic gardens.

Old rock garden showing the European beds with conifers used as the focal points – Photo provided by Utrecht Botanic Garden.

The Rise of Urbanite

The ‘Living Walls’ by the Alpine Glasshouse, the water trough has now been planted with carnivorous plants, ferns and orchids.

The garden has always been a space where the gardeners have had the opportunity to experiment. Wiert Nieuman (former head of the Rock Garden and Head Gardener) had developed areas of the garden with reclaimed concrete. This was a low-cost method of creating retaining walls, crevice gardens and ‘living walls’ in areas of the garden. This method has since grown in popularity with the new ‘Urbanite’ trend, with high profile gardens creating these rock and crevice gardens. While I will always prefer natural rock, I admire the innovation and ingenuity used to further expand the ever-growing methods used in alpine growing. There is no better example than the spheres. The three spheres were built in 1995-1996 and are between 1.5 – 2 metres n height. For a complete breakdown on their construction, please refer to ‘Cultivating alpines at Utrecht University Botanic Garden’ written by Wiert Nieuman in Sibbaldia (RBGE’s Journal) No.5.
The spheres perfectly combine the diverse habitats required for alpine cultivation, while providing a unique aesthetic that is easy on the eye. While Ferns, *Ramonda* and *Haberlea rhodopensis* have been grown on the lower, shadier sides. *Daphne arbuscula, Saxifraga, Draba, Asperula, Primula allonii and Minuartia stellata* greet visitors as they enter the garden. In an old photo, I saw a clustered planting with specimens the size of your hand clinging to the spheres.

On closer inspection I noticed they were *Dionysia* which are seldom grown outside. *Dionysia* are mostly seen under cover in a glasshouse planted in tufa. Unfortunately growing in these conditions, they are susceptible to pests such as aphids and require a good air flow otherwise they begin to deteriorate. It is also imperative to mention places like Gothenburg and Tübingen have seemingly mastered the cultivation of these plants, not to mention the perfectly maintained private collections of *Dionysia*.

Utrecht BG spheres - Photo provided by UBG.

Dionysia aretioides and *Dionysia tapetodes* are the species best equipped to growing outside with others thought to more challenging, although I am curious to try. That is because these species are much more tolerant of water, while many of the other species while simply die off if watered from overhead. The plants on the spheres persisted for 3-5 years and most fatalities were caused due to the fact they got too heavy (often after heavy rain) and broke off. Cuttings were then taken and re-used to replace the lost plants.

We are now in the second coming of the stone age. A new and invigorated approach has taken hold of rock gardeners. While I am far from qualified on the matter, I shall offer a few, hopefully helpful, pieces of advice I have gained from my personal experiences, conversations, observations and my travels.

Establishing plants is often a challenge with problems spots which are too wet, or dry. After years or if the soil is not properly packed much of the soil spaces will be lost resulting in the plants running out of growing medium. While smaller plants are easier to fit into gaps, they will dry out faster so can be a greater challenge to establish if the weather is warm, however, once settled the roots which grow into the mix and anchor themselves in properly. Larger plants are more challenging in this respect. A method I saw while visiting Sue Simpson and George West in the west of Scotland, was by using small straws planted in with the plants to funnel water directly into the root system. They had developed this technique while trying to establish species on their tufa wall.

The spheres summer 2020: I am hoping to redo them and replant with fresh new things.

Global warming may be expressed more in cities than it is in the countryside: but why? Well, if you have ever walked bare foot on concrete on a warm day you will have undoubtedly made some funny noises. My point being that while concrete heats up in the summer it does not retain heat in the winter and will actually become cooler. This was notably discussed in The Rock Garden Quarterly Spring 2019, by Jeremy Schmidt, p149. As they recorded 5°F (2.6°C) colder than the upper levels of soil; therefore, it may be wise to select tough, cold hardy plants. Additionally, the spheres are prone to drying out so drought tolerant species should also be preferred. Individual water systems are installed in each of the spheres, a small sprinkler is at the top of the sphere. A second pipe is in the larger sphere with an open face which soaks the shady side (in photo above) keeping ferns from drying out and keeps them cool.

Southern Hemisphere Area

Southern hemisphere plants are somewhat of a challenge in our climate. However, the current southern hemisphere bed has been a great success. So much so that we have decided to expand the area into the old cultivar beds. While cultivars are important in a garden. Utrecht botanic Garden is focused on conservation, education, and research. Therefore, we are wanting to expand the collection of hardy species from alpine areas like Chile, South Africa and New Zealand. This is a good opportunity for students to see the diversity within species not commonly grown outside in The Netherlands.

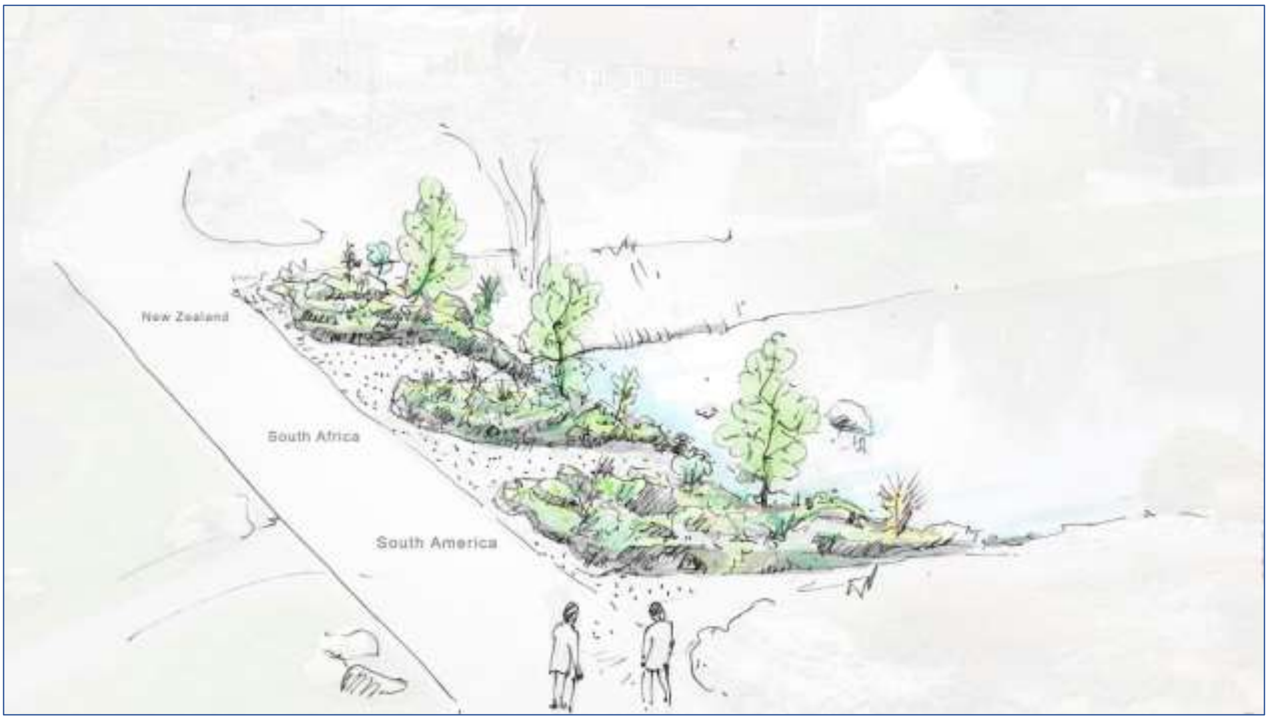
The Cultivar bed, summer 2020

Gondwanaland was the super continent comprised of the southern hemisphere and India that existed around 300 million years ago. Today, we can see plant species and even plant families that are found on all three continents. For example, a *Nothofagus* is currently planted in the southern hemisphere bed. While this species is from Chile, other species can be found in New Zealand. With the ability to show both species in the same location we are able to explain things like evolution, ecology and distribution. While unrelated genera have evolved independently of each other on opposite sides of the world some have adapted the same morphological characteristics to survive which allows us to expand the range of teaching both to students and visitors. Many of us are familiar with *Fuchsia* generally, some of us will grow forms in our gardens or have seen them in shops. These are mostly *Fuchsia magellanica* cultivars which is a species from South

America which is pollinated by hummingbirds. Fewer may know of the three species found New Zealand. These species have a vivid blue pollen which is eye catching to both us and the limited species of birds which pollinate them. Additionally there are other genera (or families) that can be found on all three continents – with obvious names like Asteraceae, Rosaceae and Fabaceae. Yet we are very familiar with some genera yet only see them from one continent – the giant Gunnera is easier to spot than the small new Zealanders and the African *Gunnera perpensa* is tough and should be grown more often.

While my wish list grows for potential plants, one species is high on my radar, far from the most attractive plant, it is one of the most interesting. If you have ever seen footage of a polar bear running around in the white desert that is the Arctic, you would be forgiven for thinking that nothing could grow there. While the land is home to mosses underneath the ice, it does have to flowering plants above surface – a grass (*Deschampsia antartica)* and an alpine plant (*Colobanthus quitensis*). *Colobanthus quitensis* is native to Antarctica and from southern Mexico down to Chile/ Argentina (this gives us hope to grow the thing). It is a low growing cushion similar to *Silene,* which is adapted to high levels of light and relationships with endophytic fungi. Tromsø Botanic Garden have an excellent [video on their YouTube channel detailing its cultivation and ecology].

There is a new plan to revamp this area of the garden and some details of this follow…..



The drawing made to illustrate the new design ©hemelsenatuur

Plants in the process of being removed.

All stones removed and the soil moved into position. Large rocks being placed.

The rocks selected for the area were sandstone This is much more fitting for southern hemisphere species, giving the feeling of a more desert environment. This is also closer in appearance to the metamorphic rocks (gneiss, quartzite and schist) seen in southern Africa - where I took much inspiration. Soil, roots are removed, and large rocks placed in pivotal positions.

The areas are split into three with south America being mostly in full sun, apart from the lower section, which is wetter. The African set is in the centre of the bed, which is a gradient, the area closest to the visitors will be split into horizontal rock work with overhangs for more succulent species. The upper part is the dry roof to the front of the bed and then is slopes down to the water increasing in richer soil and with a greater density of clay. This gradient imitates a mountain, this is particularly important for the southern African flora as many plants can grow well in wet conditions such as *Wachendorfia, Watsonia* and *Crocosmia*. The Oceania section is on the corner which is larger covered by an *Alianthus* and *Prunus* to provide more shade as many New Zealand plants prefer this. Each geographical location will get a crevice garden for the trickier species.

A view from on top of the fort to show the size of the area and the existing southern hemisphere bed.

Progression of rock work and paths.

An action shot of the African crevice section on my 1 year anniversary in The Netherlands and at Utrecht BG.

South American scree area.

The path splitting through Oceania.

Geographical areas of the rock garden

Entering the garden.

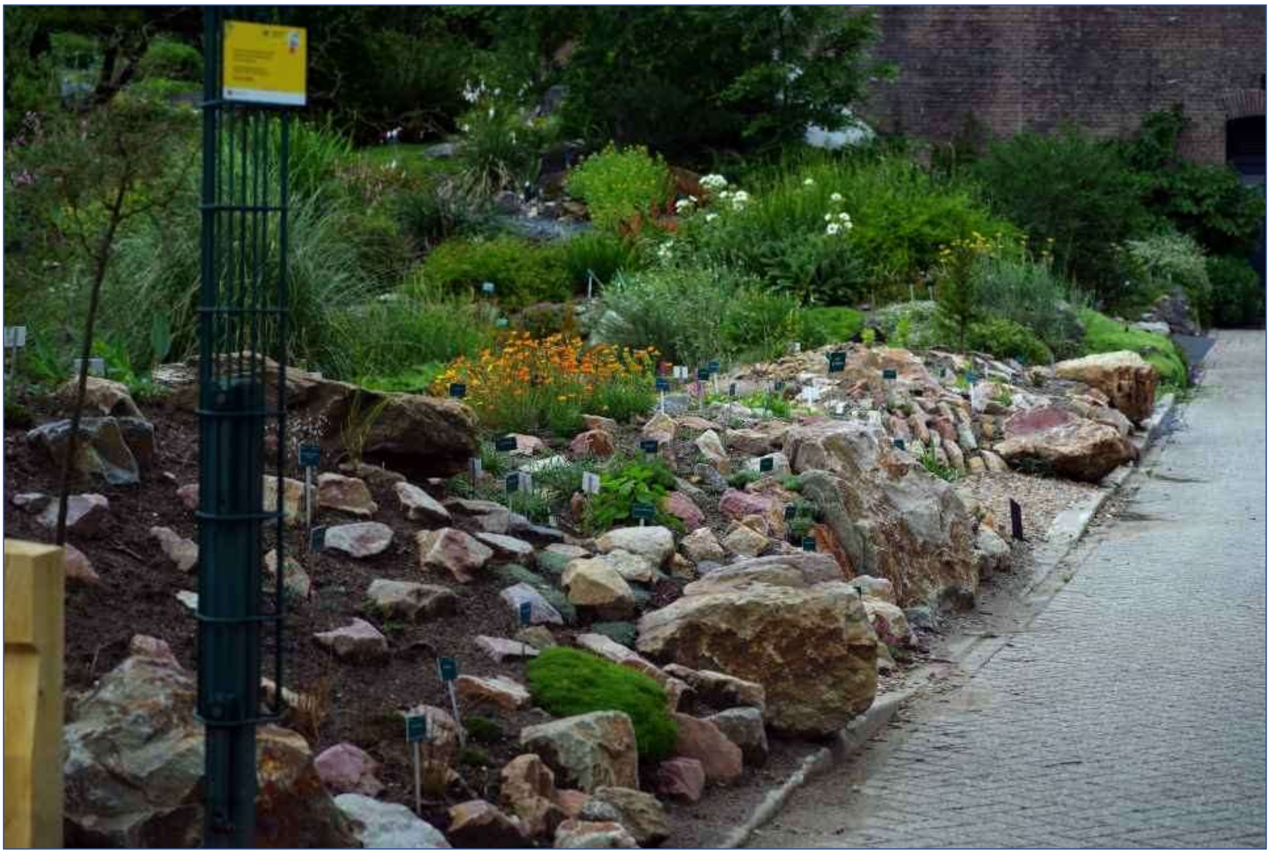
We have covered the entrance to the spheres and the new southern hemisphere area. We have another 300 or so plants in toughs, raised beds to greet you first, but to see them you will need to visit in person. The next area geographically is North America. This section is mostly in full sun with only a small section in shade. It is home to two national collections of *Penstemon* and *Eriogonum.* The former being a difficult genus. It is home to around 250 species all of which are found in America. *Penstemon frutescens* has now been moved into *Pennellianthus frutescens*, studies show that it is closer related to genera like *Keckiella, Collinsia, Nothochelone* and *Chelone.* The Western American species from areas such as Oregon, Washington and even California to Mexico do fairly well as they are adapted to the rain. Species from States like Utah tend to require drier conditions than we can provide in the open garden.

Specifically, the winter months are a challenging time, therefore cuttings are taken each winter of newly planted or short-lived species (at least in the garden). The clay soil can also contribute to the reduced life expectancy.

Eriogonum is a taxonomic mire for me as I find them painfully difficult to identify to species. The genus is characteristic and easy to spot in gardens flowing over rocks. A high level of endemism is found throughout its distribution, often various on a theme in appearance, but growing in diverse conditions like ultramafic soil or highly isolated mountains. A personal favourite being the tumbleweed like *Eriogonum rixfordii.*

The beginning of the North American bed with an *Erigeron* coming into flower below an *Amorpha,* from the legume family, Fabaceae. The *Opuntia,* below, is of great interest of the visitors who are impressed that this can survive the Dutch weather.

The hot red of *Penstemon pinifolius* creeps into the picture, complementing the carpet of *Eriogonum umbellatum* on the other side (both part of the National Collection).



Two views of the Southern hemisphere section.

One of my favourite things to do in woodlands is to listen to the noise of the swaying trees in high winds. The Asian section is largely covered in woodland. In early spring when the weather is changing the first green shots can be seen; the new seedlings (the good and the bad ones) and the warming of the soil. The thick layer of mulch begins to break down as plants orchestrate the ceremony. Some are always on time while others go with the season.

The pine hangs over the stream from the waterfall which is filled with wet loving Primula.

The mini forest of *Cryptomeria* gives shade and shelter to the plants below, pockets of light have been made for morning sun locations to grow species which like a bit more sun.

Europe and Balkans

Europe is the largest part of the rock garden covering areas of full sun to shade and deep soil. I am guilty of thinking that *our* native flora is not as interesting as that of the Himalaya, Andes or Rocky Mountains. But, when you learn of the mountains of Montenegro, chasmophytes of Greece and of course the vast flora of Turkey you learn to better appreciate what you have closer by.

Teucrium, Digitalis and *Veronica* make may for the great plumes of *Aruncus* to show off from a distance from the bottom of the steep bed.

The stream, combined with larger herbaceous perennials, leads you to the peat walls.

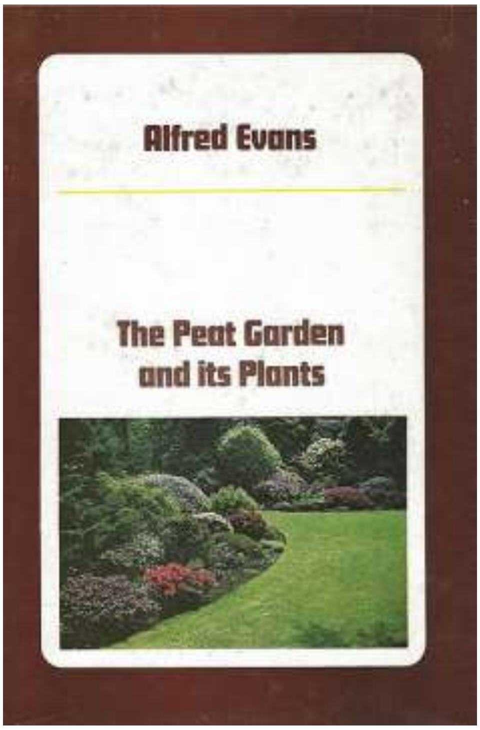
Peat walls

Peat Beds left upper side, rebuilt winter/spring 2020-2021.

Peat beds, left side.

Gardening with peat was originally developed in tandem with the influx of plants coming in from China with the aid of plant hunters in the 1900s. With a new range of species such as Rhododendron, Meconopsis and Primula requiring specific care requirements. Peat was selected for its acidic pH, water retention and nutrient content.

In the present day, we look through new eyes and are more aware than the horticulturists before us. Peat is not sustainable and is quickly disappearing from the world. The formation of peat takes years and alternatives need to be found. Unfortunately, no equal alternative has yet been found, although the garden is working to find an alternative to become peat free. Currently Utrecht only uses peat to build the walls, with the rest of the area and garden using other peat free growing media.



In October 2020 when I arrived at Utrecht BG. The team was working on redeveloping the peat beds, this is a job I had always wanted to do, as some will know this is done on an average of 10-20 years depending on speed of degradation, quality of peat, conditions like exposure, temperatures, and erosion. I was given 'The Peat Garden and its Plants' by Alfred Evans*, often referred to as the most complete book on the subject of peat gardening. It is important to go over some quick fundamentals of building a peat wall which I provide as a combination of information provided by my colleges, my own experiences and literature as found in Alfred Evans book, which despite being published in 1974, still has valuable insight into this type of gardening.

Calla Cobb and Alfred Evans in a Fife garden. Photo: Dr James Cobb.

* ED.: Many younger readers may not know much about Dr Evans – so it seems appropriate to say a little about him here: Dr Evans was for many years (1939-1985) Assistant Curator of the Royal Botanic Garden, Edinburgh, where his wide responsibilities included the Alpine and Herbaceous departments. He was a well-known and well-travelled lecturer, broadcaster and author and was holder of the Scottish Horticultural Medal from the Royal Caledonian Society and the Victoria Medal of Honour from the Royal Horticultural Society. As far as the Scottish Rock Garden Club is concerned, Alf Evans was a key figure and a particularly popular one. He served as Editor of The Rock Garden journal and was elected SRGC President from 1973-1976. He was one of our Honorary Vice Presidents until 1996 when he became our Honorary President. Alf was born in Broughty Ferry in 1920 and died in 2001.

The first step in initially making a peat garden is finding the correct situation in the garden, this may be easier in a larger garden, such as a botanic garden. The prime spot is somewhere that is sheltered from prevailing winds which will cause the rapid degradation of the peat blocks which will break down much faster under duress. A shady spot is also important as the sun will dry out the peat quickly in summer. Peat itself is a lot like fire, it is a good servant but a bad master. It can retain moisture to the point of rot during wet winters which brings me to the third location tip of a slow to encourage runoff. This will hopefully reduce some of the excess moisture which would build on a horizontal plane. Finally, the following recommendations would hope to create a slight micro-climate which would benefit your selected plant life.

Stinzenplanten

'History is written by the victors'. This is a phrase which has been immortalised into print, a product of historical revisionism and blurring the lines between truth and propaganda. Plants' native boundaries have been subject to continual questioning, as plants do not see borders, they spread freely as long as the conditions are hospitable enough to do so. This being said, we have aided in the transportation of such plants. The Romans brought medicinal plants which have naturalised, *Larix* being brought to Britain for timber production in the 1800's (classed as a Archeophyte as it is +150 years and could be classed as now native) and of course gardeners with keen eyes for new leaves, blooms, fruits and shoots. While we have made some notable mistakes, the vast majority have been successful with some becoming victorious in conquering new lands and making it their new home in the hearts of gardeners and nature lovers.

Dutch Stinzenplanten, as I understand it, are plants that have been introduced many years ago to the point in which they are considered naturalised in areas of the country. These are typically spring flowering plants, often bulbs and corms which can be found in Eastern/Southern Europe and Western Asia. These are broadly defined as woodland species although some of the species would be better described as alpines. While many stinzenplanten are found in churchyards, old manor house grounds and estates – the provinces of northern holland, Groningen and Friesland – are arguably the finest. The most iconic species being *Galanthus, Crocus, Narcissus* and *Corydalis.*

Utrecht Botanic Garden has developed a stinzenhelling (a slope of naturalised species with tree cover in the summer) in just under 30 years. Seed was collected from various localities throughout the country and sown onto the area. Despite being 'common' species, the range and spectrum of genetic diversity expressed in these communities is pronounced due to the wide-ranging geographic distribution. This, allow with the mixing of different estate populations exhibits a tapestry of colours, forms, habits and expression. The Dutch *Galanthus nivalis* comes in two distinct forms, the first shows the typical small leaves and short stature, while the other is named the ‘French clumping form’ which is considerably larger clumps quicker: for that reason, it was introduced into the Dutch trade. *Galanthus elwesii* is also present as well as a mix with *plicatus* blood in it. The *Crocus* come in a range of classic colours including a charming light pink/red form, as well as wine stain venation. Again, some of these are clumping up readily while others seem to persist in single forms. This beautifully illustrates the range of genetic and phenotypic (how one looks) expressions within a species both historically and geographically within less than an acre and achieved in less than 30 years. Something that needs to be replicated in more gardens and countries.

‘Stinzenplanten’ area in Utrecht Botanic Garden. Photo provided by UBG.

Alpine glasshouse renovation

The following is a photo gallery of a step-by-step progression of the alpine glasshouse renovation. This is to illustrate how we changed and remodelled the plants, rock work and overall design.

The alpine glasshouse in full flower in summer 2021 including the renovated external area from winter 2020/spring 2021.

Rock work has been rebuilt and new plants introduced, such as - *Saxifraga, Sempervivum* in the sunny part with *Androsace* and *Ramonda* in the shadier side. The glasshouse at this time contained large specimens of *Acantholimon, Sedum* and a few other genera (approx 20 in total). Soil was tired and compacted and plants had grown too large for the area. It was last reconstructed in 2003/4 season.

The *Artemsia tridentata* came to us in 1999 and was at time of removal pushing the glass. The hose is a drip line connected to an automatic water pump. This system is turned off for the winter and runs 20-30minutes (depending on the weather) a few times a week. Marco and Marloes in action.

The front foundation showing the extension made some years ago. The upper layer of the soil has been removed as well as all the plants. The metal beams of the glasshouse are painted to a mellow grey as the blue before was a bit garish. Many of the stones are removed apart from the largest to save one's back!

The first wall has been made of a porous mix with planting holes for smaller plants. This is the first terrace with the second wall being made just by the pipe.

This is where I have failed with no photos of other parts of the process. While the first two layers contain tighter rock work for smaller the species the back terrace are built with larger rocks and a bit more space for bigger species. The path will be explained in a later photo.

Planting, arranging pots to try and get the height, spacing and area of each plant. The drip irrigation is placed in a circle in the 2nd (this photo) and 3rd (last photo) terrace with no irrigation system at the front as it will get rain. Although the part by the wall will stay very dry. So succulents have been selected. First part done, yes I am trying a Begonia in a rock garden. Many hardy species out there, this collected in the Mexican mountains.

The upper part planted with larger specimens. *Plantago arborescens, Veronica perfoliata* from Australia can grow outside but hoping to get better flowering and colour inside.

UBG being home to one of the world’s largest Bromeliad collections, I was curious to test some species inside the glasshouse. This *Tillandsia* is the test subject selected by our Bromeliad taxonomist. As is the *Achmea* closest to the glass. Of the rest, I am hoping the succulent *Bursera fagaroides* from California and Arizona (Burseraceae aka Frankincence family) is hardy if bone dry in winter.

The path.

Before we didn't have a path to get in and just had to carefully watch the plants. I wanted a good access path but also a plant friendly one. I was inspired by a photo from Tübingen botanic garden: they had a path made with long strips of stone with curved into the planting scheme. I wanted to create the same with small stones in the same direction as the crevice work outside. The gaps between the stonework will allow seedlings to grow/ be planted or self-seed. I would like to get some species to grow in the path such as *Thymus, Origanum, Corydalis* and *Cymbalaria.*

Finished project front view.

Alpine house 2022.

The Nursery

Seed pots with labels containing accession number which has all of the information in the database. QR codes are on the top of the seed labels so we can scan the number and update the database information i.e. germination, planting.

Seed germination and cuttings have been successful this year and are often always the area people ask advice on. This is always an area which I find is poorly explained, with either to general information or skimmed over as not important. I will try and explain the method we use in detail, principally the same method and soil is used for all seed, with minor adjustments made based on specific genera based on their form, seed coat (hard coats can be soaked or scratched), growing conditions (acid loving or alkaline dwelling) age of seed (soaking in water) and method of dispersal (I am a strong believer that the seed tells you how it grows, if it is wind dispersed it is surface sown, the presence of an elaiosome means it should be sown deep in the pot as the ants take the seed below ground).

Small 7cm pots are used for space and to allow for the maximum range of species to be grown. A fingernail depth of grit is added to the bottom of the pot. The soil mix is dependent on your climate and watering regime. I prefer something light which is 2:1 compost to ‘bimps’ (perlite like substance). The depth of the seeds is different depending on what species it is. Broadly bulbs are planted at half to 1/2 of the pot (wind dispersed bulb seeds are sown higher), with others closer to the top covered with a thin layer of soil. Press a spare seed pot on the back of the soil and then top dress with grit. *It is worth noting that a thin layer of vermiculite as a bed for the seeds maybe advantageous. I personalyl have used this and it helps the seed stay moist, this may be an essential for those in warmer climates, lacking time or for moisture loving plants.* These pots are then put in a tray with water for approximately 24hours, so the seed can absorb moisture. I think this is an essential step for older or dry stored seed. Avoid freezing conditions when submerged in water as the seed may be damaged. They are then placed in a polytunnel and are watered approximately once per week, increasing to twice a week in early spring depending on the weather. *A polytunnel is not necessary, a cold frame, glasshouse or north facing spot will do, however, this should make you think about the soil medium more, as pots exposed to the elements react differently to those in a glasshouse. Additionally, mice and birds are rather fond of seeds and are deceptively good plantsman, always finding the rare, unusual and prized ones to be the tastiest!*

As per old traditions, if snow should appear, one most bear the cold and shovel a healthy layer of snow on top of the pots to make them believe they are in the mountains. Whether this encouragement actually does work is contested, but it does produce an odd placebo affect later when you recline onto the couch.

The Polytunnel with plants geographically arranged to help with planting and also arranged by life cycle i.e. bulbs and corms to be watered less in the winter period.

When germination occurs the seed pots are then moved into the nursery under lights and a heater which is set at around 10c. Densely sown seed or small seedlings like Campanula are split into large sections and potted on in clumps to keep the plants going and then properly prick out when larger. I try and prioritise larger growing species and pots which have been sown years before when re-potting, in order to refresh the compost quickly and provide new energy of the seedlings. I have always used a small part of the old compost in the new mix, believing that some mycorrhizal association may have been established and aided in the plants' growth. Whenever I pot on seedlings or young plants, I always keep them in the propagation room to baby them into the next stage. The equivalent being a north facing corner of the garden in which to rest.

Cuttings are predominantly taken in early winter when the garden calendar allows. The same process for seed generally applies to cuttings. Taking cuttings in the morning (not when freezing) is always best practice. With cushion plants, sacrificing one plant by sawing an inch below the cushion may ne needed. Brush off the extra soil and make "mini divisions" of the cushion. Splitting the plants into cuttings the size of your thumb. These are far easier to look after and to root than single rosette cuttings in my experience. You establish larger plants quicker and save shelf space. As a botanic garden we need to possess the highest range of diversity as possible, so only require a few plants of each accession to make it into the garden. An in-depth description of my trials and tribulations with *Acantholimon* propagation is available in IRG 146, **here** and on alpine summer seed sowing **here**.

Shade tunnel with a range of *Trillium*, ferns, *Begonia, Paris* and more.

The shade tunnel is used for the mostly herbaceous woodland species and ferns to let them bulk up before planting out into the garden. It is also used to store plants when we are redoing areas of the garden like the peat walls. The soil has a base of sand and then general compost which prevents the plants from rotting. It is shaded by a canopy of oaks and hazel as well as shade netting. Some tree seeds are sown in terracotta pots/trays and sunk into the ground to germinate. Additionally, just behind, we have a range of snowdrops as part of a research project to find out where the *Dutch* snowdrop comes from as there seem to be different forms, origins and collections. We have also curated a range of accessions of wild (if classed as being extant for more than 150 years) *Galanthus nivalis* from a range of locations.

The end - for now!

Thank you for taking the time to read this article and please do visit the garden in Utrecht. Information available online **here.**

UBG description of their rock garden:

"When entering the Botanic Gardens, the first thing you see is the Rock Garden. At its highest point, it is approximately 12 metres above the level of the fort moat. In terms of its wealth of different species and surface area, it is one of Europe's largest rock gardens. Construction started on it in 1963, on top of the fort bunkers. Of course, the height difference of these bunkers proved particularly advantageous. However, 2,100 tonnes of rock still needed to be brought in from the Ardennes to create and 'dress' the Rock Garden. Because the stones suffer from occasional subsidence or part of the Rock Garden may need to be replanted, additional blocks of rock are regularly needed."