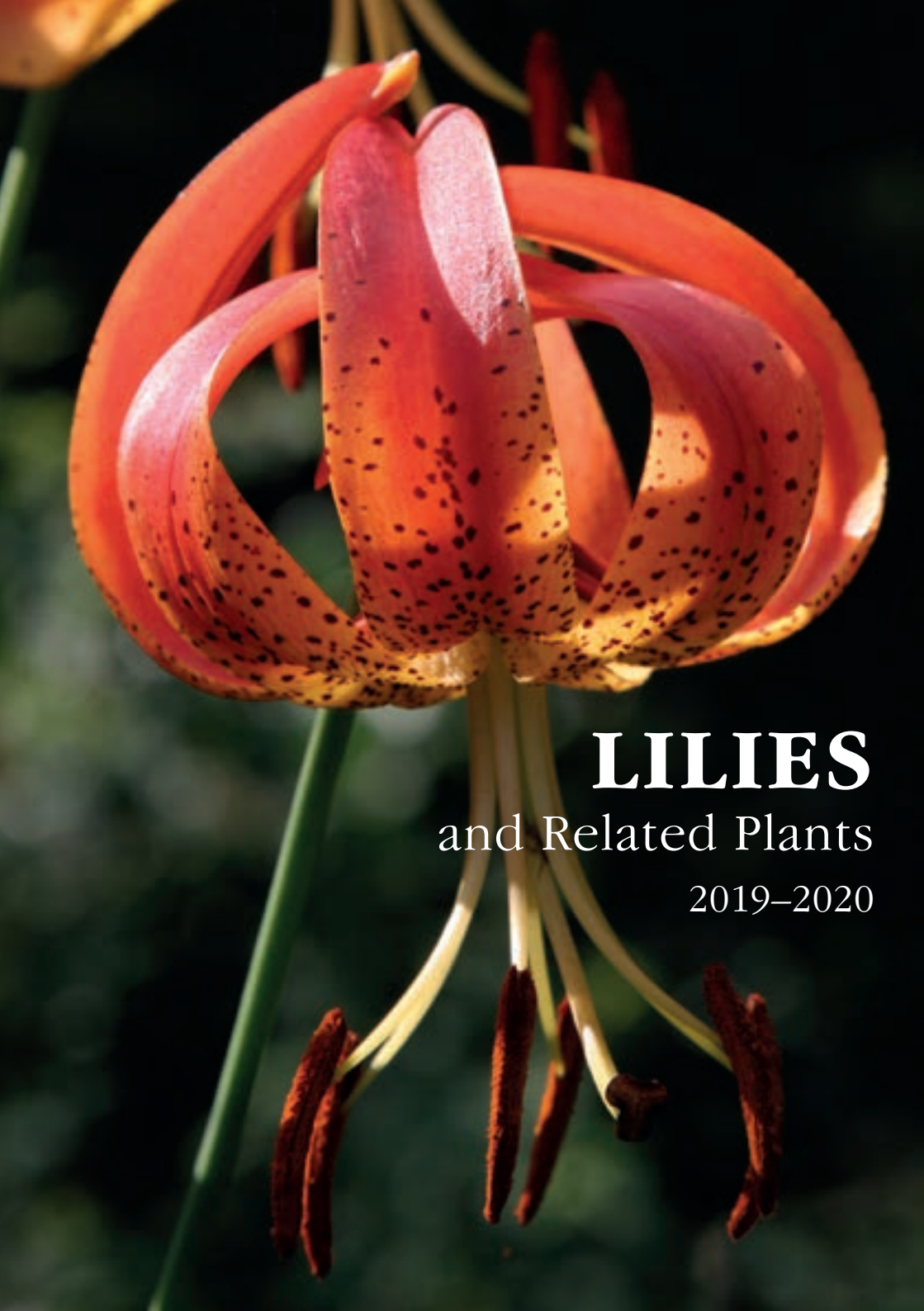

LILIES

and Related Plants

2019–2020

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Lilies and Related Plants
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Front cover: The darkly coloured flower of *Lilium pyrophilum* several days after opening. (see pp. 89–98)

Back cover: A pale flower of *Lilium pyrophilum* having recently opened. (see pp. 89–98)

Half title: *Lilium lijiangense* grown from Lily Group seed lot 11/077. (see p. 94)

Royal Horticultural Society Lily Group page:
Lilium rhodopeum, photographed here in Wales, is increasing both in cultivation and near Stoykite, Smolyan Municipality, Bulgaria. (see pp. 6–8)

Contents page: *Lilium callosum* flowering in the heat of Australia. (see pp. 27–32)

LILIES
and Related Plants
2019–2020

Editor
Melvyn Herbert

The Royal Horticultural Society
LILY GROUP

Royal Horticultural Society Lily Group

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NOTES ON AUTHORS

Vladimir Trifonov is a botanist, whose job is 'Chief Expert, Biodiversity and Protected Areas' for Bulgaria's Ministry of Environment and Waters, based at the Ministry's regional inspectorate in Haskovo, southern Bulgaria. Among his many responsibilities, is the conservation of rare plants, such as *Lilium rhodopeum*.

Dr Jamie Compton is a professional taxonomist (PhD on *Actaea* including *Cimicifuga* at University of Reading) and has conducted research on *Cyclamen*, *Salvia* and *Wisteria* and its relatives. He has collected plants with Martyn Rix and John d'Arcy (CD&R) in China, South Africa, Mexico, Argentina and South Korea. His written works include *Success with Unusual Plants*, Collins 1987, *Wisteria the Complete Guide* with Chris Lane 2019 and he was contributing Editor on *Plant*, Phaidon 2017. Jamie studied at RBG Kew, was head gardener at the Chelsea Physic Garden and is the current Chairman of the RHS Lily Group.

Chris Hind I have been growing lilies for 40 years, because they remind me of exotic oriental orchids and other delicate blooms. My main interest is in species lilies, of which I grow over 100 from the genus.

Hugh Synge was an ardent conservationist and outstanding field botanist with a longstanding interest in lilies.

Peter Shotter I am a hobby gardener and have grown lilies since the late sixties, then in my plot at our parents' family home. That said, it was not until we moved to our current home that the interest truly developed as part of my passion for woodland gardening. Over the past 25 or so years, I have planted a lot of magnolias and rhododendrons in my garden of a shade under an acre and, along with woodland herbaceous plants and trilliums, have introduced a lot of bulbs, lilies and erythroniums prominent among them.

Dr Nuala Sterling a niece of the market gardener and author Ethelind Fearon, almost chose Horticulture in place of Medicine. A short spell at Rothamsted was followed by a lifetime in medicine. Nuala enjoys growing plants from seed (bulbs to trees) and found joining the RHS Lily Group, in 2004, a revelation, inspiration and education.

Saskia Harris collects cultivated plants grown in RHS Plant Trials before pressing, drying and mounting the specimens to be stored in the RHS Herbarium. She also curates the existing collections and has a specific background and interest in the South African flora and garden plants generally.

Jennifer Kerry I became interested in lilies as a 20 year old after seeing a bouquet of trumpet hybrids in my grandmother's retirement village. I then began researching in the local public library and discovered the diversity and beauty of the various lily species' flower shapes, colours and perfumes. I obtained seeds in 1978 from the NSW branch of the now defunct Australian Lilium Society and started my first seed growing experiments soon after. I have had a continuing interest in all lilies but particularly the rarer species which I hope will all be preserved for the future.

Tony Dixon was introduced to lilies by his father in 1964, at the age of 14. He gave them no further thought until he got his own garden 25 years later and has grown them ever since. Tony joined the Lily Group in 2007 and is now Secretary, having joined the committee in 2015.

Alisdair Aird has been growing lily species from seed for several decades, and gardens mainly in Sussex, England. He is Vice Chairman of the RHS Lily Group, a past President of the Mediterranean Garden Society and Chairman of the Cyclamen Society (editing its journal).

Alan Shipp I am from a third generation of market gardeners and farmers. In 1985 I became involved in the commercial production of hyacinth bulbs but within five years had acquired the majority of the cultivars in the National Hyacinth Collection with 50 different sorts. After a few years I had increased the number to about 90 and in 1993 was designated as the National Hyacinth Collection, the former one having collapsed. Since those days, apart from newly introduced varieties from Holland, most of my recent accessions have come from the countries of the former USSR and I now have over 250 different varieties.

Ian Young A lifelong interest in plants and nature has given author Ian Young inspiration for his writing and his passion for geophytic plants. A former President of the Scottish Rock Garden Club, who is in demand as a speaker in the UK and overseas. He has been instrumental in the SRGC website providing many resources, such as his weekly Bulb Log, his e-book *Erythroniums in Cultivation* and the monthly e-magazine *International Rock Gardener* free to a worldwide audience of plant lovers. Ian gardens in Aberdeen in North East Scotland.

Dr Jürgen Koch has a scientific background as a breeder of agricultural crops. Lilies are a life-long interest, particularly the species of China and their hybrids.

Matthias Knoll For many years I have been interested in the conservation of plants, especially species *Lilium*, which are threatened with extinction in their natural habitats. As my job involves dealing with the dark side of the human psyche, the work undertaken in my laboratory, to cultivate and conserve lilies, provides respite and brings positive meaning to my life.

Holger Kühne is an optimistic gardener with a passion for breeding lilies, especially interested in interdivisional and american hybrids. He has now started the breeding and propagation of martagons too in order to preserve the breeding of Norgart Martschinke.

Mel Herbert is a keen amateur grower with a large collection of *Lilium* species, their varieties and forms. In addition to lilies his gardening interests include *Cardiocrinum*, *Arisaema*, *Arum* and *Polygonatum*. He also grows a wide selection of fruit and vegetables on his smallholding in Ceredigion.

Alan Mitchell is an optimistic amateur gardener with a passion for growing lilies. He finds their difficulty a challenge and their diversity and beauty engaging and therapeutic.

Bjørnar Olsen Why I like lilies... I've always liked plants, but my interest in species lilies probably started with the internet, and seeing pictures of the many, back then practically unknown, species offered for sale by Chen Yi in China. There are very few plants that can rival the beauty and fragrance of species lilies. I can still remember the first time *Lilium majoense* and *Lilium gloriosoides* flowered in my old garden back in Norway.

Prof Ki-Byung Lim has a PhD in Horticulture from Kyungpook National University, Korea, and another PhD from Wageningen University, The Netherlands, in the field of Plant Genetics and Breeding for *Lilium* species. His major expertise are molecular and coventional cytogenetics, introgression breeding through interspecific hybridization, polyploid genetics and breeding via mitotic and meiotic polyploidization.

Assist. Prof Dr Nursel İkinci is a plant systematists (PhD on *Lilium* at Bolu Abant İzzet Baysal University and Free University of Berlin) and has conducted molecular phylogenetic studies on *Campanula* at BGBM Berlin and *Iris* at RBG Kew. She has performed several local floristic studies and is currently working on the ecology and diversity of Turkish Potamogetonaceae. She was already interested in lilies as a child since three *Lilium* species were growing natively in the summer pastures of her hometown at the North Eastern corner of Turkey, Trabzon.

From the Chairman

It has been two years since Alan Mitchell stood down from his editorship of *Lilies and Related Plants* and Mel Herbert has stepped into the breach with determination and endeavour. I am sure you will agree that his tenure as editor will have begun with some superb articles on this our chosen group of bulbous plants.

Over the past year my own delving into Liliaceae has seen some remarkable 'first time' flowering of some of my older bulbs. The rare pure-white flowered form of *Muscari racemosum* for example with its delicious banana or musk-like scent. It is this scent from the Latin moschus = musk that gave the genus *Muscari* its name. Another first flowering was of a chance hybrid between the diminutive red-flowered pineapple lily *Eucomis vandermerwei* and *Eucomis zambesiaca* with its white, sweetly coconut scented flowers. The resulting seedling had a lovely rose coloured inflorescence that looked good above dark purple leaves. Another *Eucomis*, a prostrate and glaucous leaved form of *Eucomis schijffii,* collected high in the Drakensberg Mts in 1988 set viable seed and produced some offspring for the first time too. As for lilies growing here, they withstood the blazing heat of early summer in the coolish shade of a large plane tree. Aside from the lily beetle, they fared pretty well this year. A good layer of leaf-mould, especially during stem-rooting development, was helpful. As always the huge pink flowers of 'Anastasia' impressed and we tried the magnificent 'Conca d'Or' with its wide open yellow bowl shaped flowers exuding the fabulous scent of its *L. auratum* parentage.

I was lucky enough to participate in one of our two trips to see lilies and related plants growing in UK gardens. The first visit was to the garden of my old friend Martyn Rix. Martyn grows sheets of *Erythronium revolutum* in his woodland in a way that made me green with envy. He has also been putting together a monograph of the genus *Fritillaria* which is nearly at the point of submission for publication. That will be such a valuable book. Next we visited the remarkable collection of Paul Cumbleton and his partner near Somerton, Somerset. Many rare and unusual South African plants were successfully naturalised in their lawn and their collection of *Fritillaria*, *Daubenya* and *Massonia* were as good as any I have ever seen. Unfortunately I was in Kazakhstan when the Lily Group visited the legendary garden of the late Chairman, Tim Whiteley, at Evenley Wood in Northamptonshire.

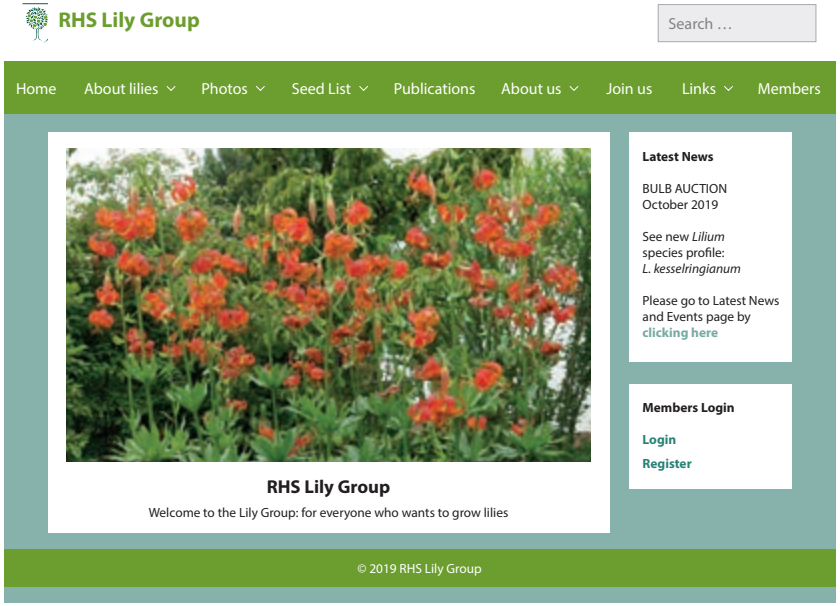
Next year we are planning a long trip to Japan in June. A country whose lilies include the golden rayed lily *L. auratum* as well as the beautiful *L. rubellum.* That is something very special to look forward to.

The Lily Group's new website and lily resource (*rhslilygroup.org*) is reviewed on pp. 4–5 and provides more information about what is going on within the group.

Dr Jamie Compton, Chairman

rhslilygroup.org

The new Lily Group website (rhslilygroup.org) represents a complete break with the past. On the site's 'welcome' page you will find a series of links and drop-down menus. These, with the exception of the 'Members' Area', are open access and it is hoped that both members and more casual visitors to the site will find much to interest them.



An extensive 'Species Lilies' gallery contains photographs of almost all the known *Lilium* species organised by their geographical distribution. Among the unusual species and forms is a very dark red *Lilium ponticum,* a rose *L. superbum,* even a pink form of *L. sherriffiae* along with images of a wide range of lily hybrids and other liliaceous plants. We are very keen to explore diversity within species and the range will continue to be expanded. The vast majority of these photographs have been provided by Lily Group members.

Useful links

If you are looking for an online version of 'The Lily Register', go to the 'Links' menu (located at the right hand end of the main navigation bar) and click 'Online Botanical Guides'. In this section you will find the '2007 Lily Register & Checklist' with all five Supplements. The 'Links' area also includes a list of those nurseries who are established suppliers of lilies, in the section 'Where to buy Lilies'. There is guidance for those who may be new to lilies in 'About Lilies' which covers basic information about these plants, their cultivation and propagation. Some of the tips may even be helpful to our more experienced members!

Registering for access to the 'Members' Area

Registering for the 'Members'Area' is easy and quick, and allows members to benefit from access to further and more detailed information. We will also be developing a blog facility to allow you to post in queries and comments about sourcing bulbs, cultivation, propagation and much more. Our hope is that this area of the website will help to connect all Lily Group members and encourage a sharing of knowledge, experience and advice.

To register, look for the 'Members login' panel on the home page and click on the 'Register' button. This will take you to the registration page. Enter a 'Username' of your choice and your email address, and then click the 'Register' button. You will receive a follow-up registration email asking you to create a password. Simply follow the instructions in the email and that's it, you're registered! Do make sure you keep a note of your Username as this cannot be changed.

What is in the 'Members'Area'?

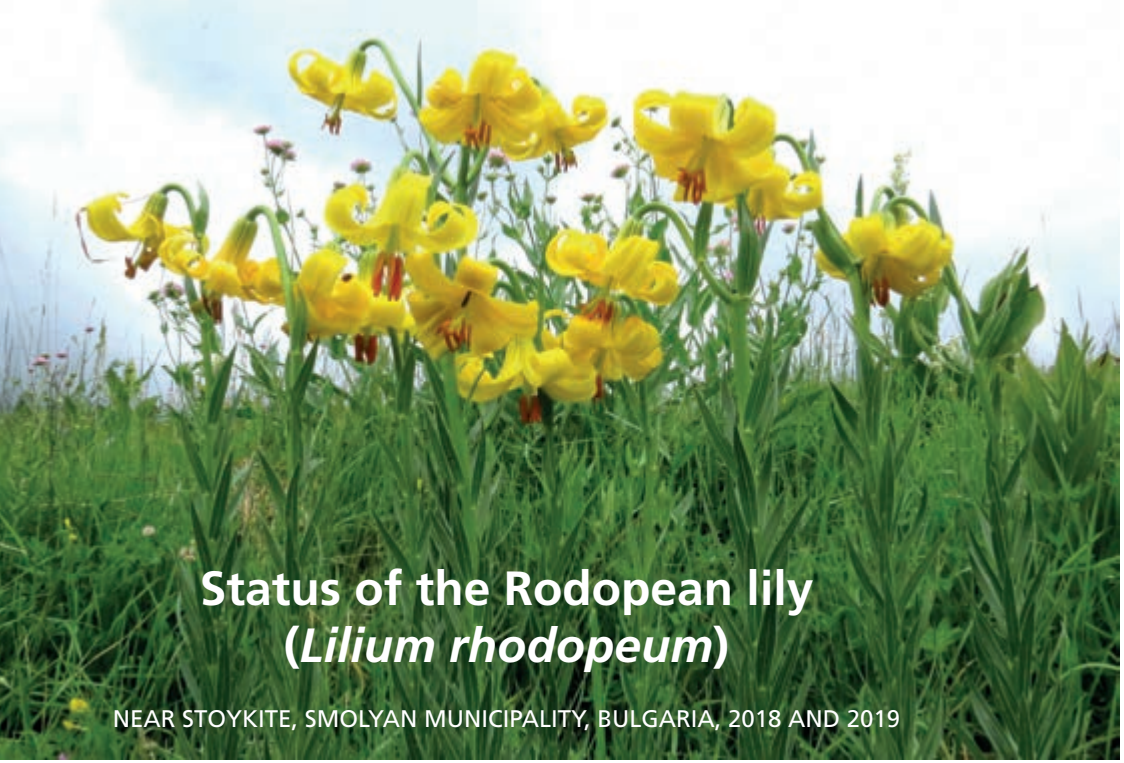
Here you will find an abridged version of the most recent *Lilium* Species Profile as an invitation to members to contribute their photographs and experiences with the taxon for inclusion in an unabridged version, which will be published in *Lilies and Related Plants* (see pages 104–118 of this 2019–20 issue). The Species Profiles will be archived in the 'Members' Area', gradually increasing this valuable resource for growers and enthusiasts.

Publications Archive, Seed List Archive

The Publications Archive contains the current and previous Newsletters and recent editions of *Lilies and Related Plants*, whilst the Seed List Archive is a quick and easy way to check on seed lot numbers and contributors (extremely useful when trying to decipher those faded plant labels!).

Interactive features will include a bulb exchange facility and the ability for members to make and respond to requests for information and so on.

Please take the time to register and help contribute to the development of the 'Members' Area'. Your feedback and ideas for development would be most welcome and should be emailed to Tony Dixon at: tonydxn@tonydxn.plus.com



Status of the Rodopean lily (*Lilium rhodopeum*)

NEAR STOYKITE, SMOLYAN MUNICIPALITY, BULGARIA, 2018 AND 2019

In this most recent report ***Vladimir Trifonov*** *provides encouraging updates upon the continuing efforts to conserve the very rare and beautiful* Lilium rhodopeum *in Southern Bulgaria. Since his previous report, in* Lilies and Related Plants 2015–2016*, the plants have been increasing in both numbers and floriferousness.*

The locality of the Rodopean lily was visited three times in 2018 (2 July, 13 July and 2 August) and on four ocassions in 2019 (8 June, 23 June, 30 June and 11 August) with the kind support of Honeyguide Wildlife Holidays. In 2018 a total of 148 individual plants were identified, 117 of them flowering and 31 vegetative (in 2019 the numbers increased to 194, 123 and 71 respectively). Ten of the plants were damaged by insects or cattle in 2018 and 30 in 2019. Amongst the flowering individuals in 2018 there were 106 with single blooms, eight with two blooms and one with three blooms in the inflorescence (109, 10 and 4 in 2019). The ratio of flowering to non-flowering plants was about 3.77 (117F/31V) in favour of flowering plants in 2018 compared to 1.73 (123F/71V) a year later. In the last four years the population has continued to increase. In 2018 there were 39 more plants than the population in 2017, an increase of about 36%, with 46 more individuals in 2019, representing a further rise of approximately 31%.

Opposite, an outstanding group of *Lilium rhodopeum* including an individual carrying three of the glorious yellow blooms for which the species is renowned.

2018 was the tenth year of monitoring this locality. The dynamics of the population over a ten-year period can clearly be seen. In relative terms, a consistently high total number of plants was recorded in the first four years (2008–2012), and then, in the next four years (2013–2016), there was a sharp decline, with the lowest number of plants occurring in 2015—only 45 individuals. Since 2014 there has been a marked increase in the total number of plants. It is believed that this increase in the number of plants is mainly due to natural periods of rest and activity of the species, as well as a variation in climatic conditions. Of course, it is hoped that the increase in the number of individual plants is due to several years of conservation activities. These have included mowing and removing the hay from the area and the clearing of aggressively competitive species from around the

Table 1. Results of census studies 2008–2019

YEAR	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Number of flowering plants	122	96	145	78	17	42	41	56	75	117	123
Number of non-flowering plants	66	–	–	52	46	11	4	23	34	31	71
Ratio of flowering/non-flowering plants	1.85	–	–	1.5	0.37	3.82	10.25	2.43	2.21	3.77	1.73
Number of damaged plants	28	19	–	–	–	15	14	5	34	10	30
Total number of plants	188	96	145	130	63	53	45	79	109	148	194
Percentage increase/ decrease of total number of plants compared to previous year	–	-49	51	-10	-52	-16	-15	76	38	36	31

This photograph was taken in June 2017 and clearly shows the competing *Veratrum album* (False Hellebore) which is being controlled in order to encourage the growth of the lilies.

groups of Rodopean lilies. Perhaps the main reason for this sharp increase is that, in the last three years, the pasture where the Rhodope lily grows has been used for its intended purpose. The entire area was grazed, thus eliminating competing taxa which were suppressing the development of the target species. This year we can see the results of traditional methods of pasture management (intensive grazing) where all competing species such as bracken, false hellebore etc. have been removed, and the grass is kept low. It is now clear that this way of managing the area will benefit the population in the long run but only if it is carried out outside of the growing season.

The most significant negative factor upon the population is damage by cattle. In 2018 the percentage of damaged plants was very low, about 7% of the total, due to the fact that the Regional Inspectorate of Environment and Waters in Smolyan took measures to erect a fence around the area, thus protecting the species from trampling and grazing. Fortunately the Rhodopean lilies successfully formed fruit capsules in 2018. This year the population of *Lilium rhodopaeum* was not impacted by grazing until the end of the flowering season. Grazing started late, in August, which is very favourable for the species.

The lilies did not form fruit capsules in 2019.

Lilium amoenum Wilson

*In this article **Chris Hind** writes about his experiences with this beautiful but demanding Yunnan endemic.*

Lilium amoenum was first found in Mengtze in Yunnan province China in 1897, for Royal Botanic Gardens, Kew', by Augustine Henry a famous Dundee born explorer. It was initially collected by Ernest 'Chinese' Wilson who gave it the name 'amoenum', this means 'pleasing'. Bulbs, collected by local collectors working for Lord Aberconway after George Forrest's death, were sent to Bodnant gardens in 1936 where they grew and flowered for a few years in the glasshouse but then died without setting seed. *Lilium amoenum* was rediscovered in the 1990s.

This is a fussy lily in cultivation. It is endemic to a small region in China where it grows in frost free valleys from 1,800 to 3,000 m, at woodland edges, in sloping thickets and on grassy plains.

Above, the extremely beautiful flower of *Lilium amoenum*.

Below, bulbs of *Lilium amoenum*: small, but near to flowering size.

Shortly after a rain shower. *Lilium amoenum* in a Lily Group member's garden in Sweden.

Lilium amoenum is a rare dwarf lily which is about 20 cm tall. The small bulb measures around 2–3 cm and has white lanceolate scales.

This lily is a close relative of *Lilium sempervivoideum* but is separated by the leaf shape, wider perianth segments and flower colour. It is on the borderline with the related genus *Nomocharis*.

Lilium amoenum usually has single flowers but there can be up to three, which appear in late July (in Scotland). They usually have a pinkish, open campanulate bell shaped appearance with darker spotting in the throat and a fritillary like nodding way about them, and are very fragrant. The stamens have glabrous filaments with yellow pollen. This lily has never set seed for me and I am advised it may die at a moment's notice.

Culture (in NE Scotland)

I grow *Lilium amoenum* in clay pots, with a base of grit for higher levels of drainage, in an acidic soil. I achieve this medium with a mix of equal parts John Innes ericaceous compost, Levingtons/ John Innes mix and RHS grit). This gives me the acidity, humus and drainage required to grow this lily in conditions that are close to its natural habitat. The pot is overwintered in a frost-free insulated shed, along with most of my species lilies, where it is kept on the dry side as winter wet and cold would rapidly kill it. The recommendation is that this lily is grown in shade but in the NE of Scotland I grow it in full sun.

I have been collecting *Lilium* species for at least 20 years and have managed to source most of the available species, apart from the rarer Chinese ones. I had a single bulb of *Lilium amoenum*, which I bought from Rare Plants UK several years ago that did not grow well despite my best efforts.

With the help of fellow lily enthusiasts I have recently been fortunate enough to acquire a few more bulbs. My hope is that, having sourced new bulbs, I will have more success with *Lilium amoenum* than I have had previously.

Growers/suppliers of *Lilium amoenum*:
Rare plants UK (www.rareplants.co.uk) and Pottertons nursery (www.pottertons.co.uk).

References

Haw, S. G. (1986). *The Lilies of China*. Batsford, p.101.
Synge, P. M. (1980). *Lilies*. Batsford, p.148.
Woodcock, H. B. D. and Stearn, W. T. (1950). *Lilies of the World.* Country Life, London; C. Scribner's sons, New York, pp.140–141.

Hugh Synge 1951–2018

Dr Jamie Compton *offers a short appreciation of Hugh's life and briefly describes his huge contribution to conservation.*

Hugh Synge was that rare breed of human being—a man on a mission. He has been called by many a true maverick, an innovator and a man with a quest. The son of Patrick Synge, the man who edited the Royal Horticultural Society's *Dictionary of Gardening* and a keen lily enthusiast, Hugh was destined from the start to play a role in natural history. Hugh in fact made an enormous contribution to the world of Conservation within the International Union for the Conservation of Nature (IUCN) in particular to the Species Survival Commission and was responsible for setting up the first *IUCN Plant Red Data Book* for endangered plant species in 1978.

Throughout the 1970s much energy was expended upon the conservation of animal species and Hugh was determined to change some of the focus onto plants, an aim which he later achieved on a global scale. In the early 1980s Hugh became the first Chair of the Swiss based IUCN-WWF Plants Conservation Programme. His work on conservation at Royal Botanic Gardens Kew alongside the indefatigable Gren Lucas was legendary, Hugh helped in the management of the Threatened Plants Unit of the IUCN and with Botanic Gardens Conservation International (BGCI).

Hugh was one of the founders of the UK's wild plant charity Plantlife aimed at protecting our ever diminishing flora and which, over the years, has attracted some very high profile interest. In 1990 Hugh co-founded with John Akeroyd the magazine *Plant Talk* which over the next decade successfully publicised the role of

plants and the need for their conservation throughout the globe.

I first met Hugh when he was working at Kew although we had no reason to collaborate in our different areas of research. He was quietly spoken and could have been mistaken to be diffident but his manner belied a strong single-mindedness within. He was reserved and fastidious with a keen eye and an almost bookish manner. Indeed he gathered together a large and impressive library of botanical, horticultural and ecological books. We reconnected in the delicatessen in Tisbury our local town in Wiltshire (coincidentally where John Akeroyd also now lives) and became friends. My wife Tania and I were fortunate to have been invited to his charming Victorian cottage nearby. Hugh grew many lilies in pots around his house. He was particularly interested in the Asiatics and had some very rare species some of which were sold in the 2018 RHS Lily Group auction in Edinburgh after his sad and unexpected death of cancer on 4 August 2018.

★ ★ ★

A summer at the Oregon Bulb Farms

Hugh Synge *wrote this very evocative article shortly before his sad and untimely death in 2018. In it he has captured the atmosphere of the late 60s and his excitement as a young man going out independently into the wider world for the first time, an experience which had a profound and lasting influence upon his later life.*

The sun beat down from a clear blue sky. The rows of the bright-orange lily 'Enchantment' stretched as far as the eye could see, in full flower. My task was to walk along the rows, taking off the flowers and removing any diseased plants, especially looking out for any signs of virus. It was hard work, so the breaks were welcome, as was the inevitable stop at an ice cream parlour for cold drinks on the way home.

The year was 1969. I had just left school, and had the best part of a year to fill in before university. It was arranged that I should spend the summer working at the Oregon Bulb Farms, then at the height of its renown. I am not sure how it came about, but my father, Patrick Synge, then RHS Editor and a keen lily enthusiast, had visited the Farm a few years earlier, at the invitation of Jan de Graaff, and was astonished at the massive fields of colourful lilies he had seen.

So it was that, aged 17, I arrived at Portland, Oregon. The Farm did not need many staff in winter, so typically recruited a lot of summer workers. I met up with

Above, a field of 'Enchantment' at the Oregon Bulb Farms.

Below, what a fantastic 'office' to work in! Mid-Century hybrids growing in the immense Oregon landscape.

The Pink Perfection strain, photographed on the OBF in 1969, was very highly thought of but not to the taste of the young Hugh Synge.

Andrew and Owen, both English students, and we were lodged with the Sanders family in suburban Portland.

Richard Nixon was in the White House and the war in Vietnam raged, but little of that crossed our paths. Instead we marvelled at the vast forests and immense landscape, finding ourselves in a land that had been colonised within living memory.

We were provided with an elderly station wagon, massive in our eyes, which we drove out to the Farm each day. To begin with, I was assigned to the team checking the fields of Mid-Century hybrids, in particular their star plant, the bright orange lily 'Enchantment'.

A key feature of the de Graaff operation was that he only used fields once, keeping each field for just three years. As a result, by 1969, the fields were all some way from the home farm, which was near Sandy. So we got to see quite a lot of rural Oregon driving to and from the fields in the Willamette Valley. This was a farmed and pastoral landscape, much like lowland England but on a larger scale.

After a few weeks of this hard toil, I was very pleased to be transferred to work for Eddie McRae, the legendary plant breeder. This was a much gentler existence, working mainly at the home farm. He had greenhouses of a variety of clones and strains, and also seedlings in raised beds under glass. I became adept at unfurling the flowers about to open, making the pollination he had requested, and fixing a little cap out of silver foil to protect the stigma from any other pollen. Eddie was

the nicest and easiest of people to work for. He had trained at the Royal Botanic Garden, Edinburgh, and retained his Scottish accent and outlook. I was not then envisaging a career in horticulture, so regret not paying more attention to what I could have learnt about plant breeding.

When I arrived in June, the Mid-Century hybrids were at their height. Propagated vegetatively in vast numbers from scales, these were the mainstay of the business. They were followed by the Aurelians, of which 'African Queen' and 'Golden Splendor' are still around. Great pride was taken in the Pink Perfection strain, for its unusual colouring, but it was less attractive to my eye. Particularly fine were the white trumpets 'Black Dragon' (a clone) and the related Black Magic strain, both forms of *Lilium leucanthemum* var. *centrifolium*. In contrast I do not recall seeing the famous *Lilium regale* at the Farm though it must have been there; it was felt the new strains were much superior.

Then, towards the end of the season, came the most spectacular displays, of the orientals derived from crosses between *L. auratum* and *L. speciosum*. The mainstays were the strains called Imperial Crimson (good reds, with much *Lilium speciosum* influence), Imperial Gold (more like typical *L. auratum*) and Imperial Silver (white with dark spots). Planted in wide beds rather than individual rows, a field of these in full sun was a most spectacular sight. And then there were the bowl-shaped oriental clones, splendidly named as 'Empress of China', 'Empress of India' and 'Empress of Japan'.

Lilium leucanthum var. *centrifolium* 'Black Dragon'.

Above, from left, 'Destiny' and 'Golden Sceptre' (Golden Splendor type) together with 'Cinnabar' (opposite), were all much appreciated by Hugh.

Right, Ed McRae checking the harvested seed capsules at Oregon Bulb Farms 1969.

Looking at the 1969 catalogue that I still have, I am struck by how good the colours were in the hybrids that were the mainstays of the business. The bright pastel colours of the Mid-Century hybrids—the orange of 'Enchantment', the maroon red of 'Cinnabar', and the clean yellow of 'Destiny'. Then, in the trumpets, the clean white with black ribs of 'Black Dragon' and the soft yellows of strains like Golden Splendor and clones like 'Honeydew'. They seemed chosen to look well in a garden setting. Looking at the spectacular lily displays at recent RHS shows, with their complex colour patterns, I cannot help yearning for the softer and more delicate hews of the de Graaff hybrids in the 1960s.

Sadly the Oregon Bulb Farms are no more and had in fact already been sold when I was there—although we did not know it at the time. And all too many of their splendid hybrids seem to have died out or be no longer available.

It was a wonderful summer that opened my eyes to the New World and changed my life. Returning to the UK, I changed course to read horticulture at Wye College. Then I was fortunate enough to work at Kew on plant conservation for most of my career. And now, in semi-retirement, growing lilies has become a hobby. But as I struggle to keep my lilies alive from one year to the next, and defeat the ever-present basal rots that attack them, I sometimes remember the spectacle of brightly coloured lilies as far as the eye could see and marvel at what Jan de Graaff and his dedicated team achieved.

Editor's note: Judith L. Freeman (McRae) has very generously provided most of the photographs to support this article. The black and white images really show the scale of operations at OBF and were taken in 1969, the year of Hugh Synge's work experience.

A bulb planting team, Oregon Bulb Farms 1969.

Grading the bulbs and ***right***, Ed McRae making careful notes on the 1969 crosses.

A story about time and some lilies of the Caucasus

In this article ***Peter Shotter*** *takes up the challenge to extend his scientific and botanical experience, describing some elements of recent DNA work on section* Liriotypus *(Liliaceae) and relating this to observations of living plants in his Kentish garden.*

Just before Easter, I received an e-mail from Mel Herbert, inviting me to step outside of my comfort zone! He had received a copy of a scientific paper by Asst. Prof Dr Nursel İkinci of the Abant Izzet Baysal University in Bolu, Turkey, entitled *Molecular phylogeny and divergence time estimates of* Lilium *section* Liriotypus *(Liliaceae) based on plastid and nuclear ribosomal ITS* DNA sequence data*.

Mel, at Dr Jamie Compton's suggestion, thought there might be an interesting article to be winkled out of the academic fog about four closely (backed by this DNA analysis) allied species from the Caucasus. Would I like to have a go, given that I grow three of the species in my garden?

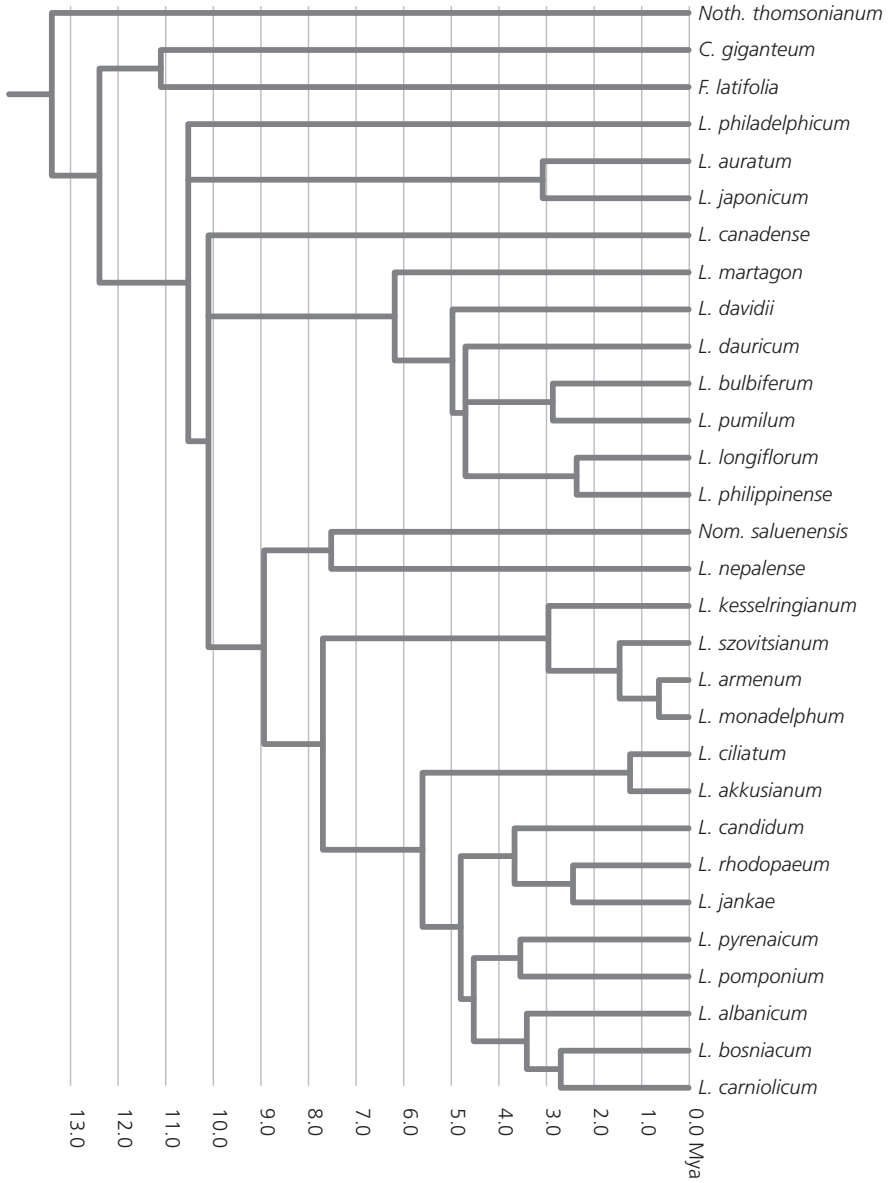
I will leave you to guess at how many words in the title of the paper alone I needed to look up to find out what they meant. Sometimes, even those definitions left me none the wiser. I am, most definitely, no scientist! If, before I read the paper, I thought Mel slightly misguided in asking me then I thought him closer to the insane afterwards! Nevertheless, I said I would try, so here goes!

Relationships and timelines

The purpose of the study was, firstly, to establish 'phylogenetic relationships' (i.e. the evolutionary development and diversification of a species or a particular feature thereof) for section *Liriotypus*; and, secondly, to estimate divergence times from the rest of the genus *Lilium*. The study focused on 22 species from Europe, the Italian and Balkan peninsulas, Anatolia and the Caucasus. The members of this section are linked genetically and, like all *Lilium,* have the chromosome number 2n=24 (i.e. diploid with 12 pairs of chromosomes).

The twin DNA analyses used (plastid and ITS sequencing) allowed the author to establish a phylogenic tree demonstrating that divergence took place around nine million years ago, with speciation within *Liriotypus* increasing in the last six million years. The first diversification, around eight million years ago, saw the separation of the Caucasian species (*Lilium kesselringianum, L. monadelphum, L. szovitsianum* and *L. armenum*) from other members of the section.

*Internal transcribed spacer.



Dated phylogenetic tree from a maximum likelihood (ML) analysis of nrDNA ITS sequence data for *Lilium* species. *Reproduced with the kind permission of Asst. Prof Dr Nursel İkinci*

Lilium armenum growing in the Pambak Mountains, Armenia.

Above left**, Lilium monadelphum* showing its yellow pollen in contrast to the orange/red pollen of *Lilium szovitsianum*, ***above right.

The Caucasian species

The twin analyses also revealed incongruences versus plastid DNA analysis alone regarding the group of Caucasian species, which form one 'clade' (or distinct genetic group), and *Lilium akkusianum* and *L. ciliatum*, from NE Turkey, which forms another, albeit closely related (cousins rather than siblings, perhaps…).

I grow *Lilium kesselringianum*, *L. monadelphum* and *L. szovitsianum* in my garden in Kent but have never had *L. armenum*. I also have several pots of *Lilium akkusianum* seedlings at various stages of development and failed miserably in my one attempt to grow *L. ciliatum*. I do not grow any species in pots.

The similarities between the Caucasian species is self-evident when you see them in flower. I have been delving back into Derek Fox's excellent book, *Growing Lilies*, for information to help the gardener, as opposed to the scientist, differentiate between these species. *Lilium monadelphum* grows on the northern slopes of the Caucasus (from the NE side of the Black sea to Dagestan on the shores of the Caspian sea), while *L. szovitsianum* is found on the southern slopes, the type species from Georgia and var. *armenum* from the Lake Sevan area in Armenia. This genetic analysis suggests *L. armenum* deserves specific status but the only pictures I have seen seem, to my untrained eye, indistinguishable from each other.

Between *Lilium monadelphum* and *L. szovitsianum*, however, there is a clear differentiation based on pollen colour. The former has yellow pollen, the latter (and *L. armenum*) orange/red. This genetic study by Ikinci confirms Fox's pollen colour differentiator. I have seen many pictures of 'monadelphum' sporting orange/red pollen: these plants are *L. szovitsianum*. In seed lists you will sometimes see *Lilium monadelphum* offered with different pollen colours: only those with yellow pollen can be true *L. monadelphum.*

My *Lilium monadelphum* has yellow pollen but is the least vigorous of the three species I grow and reluctant to set viable seed. *L. szovitsianum*, on the other hand, forms strong stems to 1.6 metres and sets plenty of good seed. Like *Lilium kesselringianum*, with me, it is very slow to clump up.

So, to *Lilium kesselringianum* itself. It is found to the NW of the range of *L. szovitsianum*, from the Artvin area of Turkey at the eastern tip of the Black Sea up to the area around Sukhumi in the breakaway region of Abkhazia. My bulbs came from Paul Christian in 2003 and have clumped up slowly. They make stems to 1.6 metres and are the first of the Caucasian species to bloom with me, at the end of May or early June (my garden is 190 metres above sea level on the North Downs in Kent). Fox says that the species' narrower tepals should aid identification but it seems a marginal differentiator to my untrained eye. There seems a more pronounced banding and spotting, however.

I am looking forward to seeing *Lilium akkusianum* in bloom as its flower seems to me to resemble its Caucasian cousins rather than its *Lilium ciliatum* 'sibling'!

I am very fond of this group of lily species, as they are boldly colourful and very early flowering, which makes them especially valuable in filling the gap between the spring woodland garden and the herbaceous colours of summer. I would encourage all lily enthusiasts to give them a home!

Some beautiful *Lilium kesselringianum* in the author's Kentish garden.

References

Fox, D. (1985). *Growing Lilies.* Christopher Helm.

İkinci, N. Asst. Dr Prof. (2011). Molecular phylogeny and divergence times estimates of *Lilium L.* section *Liriotypus* Asch. et Graebn. Liliaceae based on plastid and nuclear ribosomal ITS DNA sequence data. *Turkish Journal of Botany*, 35(4):319–330.

Submission of plants for an RHS Plant Award and the botanical recording which follows

In October 2016 ***Dr Nuala Sterling*** *was awarded a preliminary certificate (PC) for a pot of flowering plants of the lily hybrid 'Kushi Maya', a cultivar of* Lilium nepalense *and an oriental hybrid. To encourage other readers to enter plants for RHS awards Nuala outlines the procedure and invited herbarium curator* ***Saskia Harris*** *to explain the botanical recording which follows.*

Historically known as Exhibition Awards, dating from a time when plants were routinely and regularly raised for exhibition and/or competition at RHS and other horticultural shows, these awards are now known and promoted as **RHS Plant Awards** to encourage RHS members and the wider public to bring plants to the attention of the Plant Committees. The awards are publicised widely and guidance given to both the RHS membership and the wider public on their use. Lilies are part of the remit of the RHS Bulb Committee and the Committee Secretary (michaelpitcher@rhs.org.uk) should be contacted by e-mail if you are interested in submitting a plant for consideration.

There are a number of awards that can be made: **PC (Preliminary Commendation), AM (Award of Merit)**, **FCC (First Class Certificate)**, the latter being the highest accolade**.** The formerly awarded **Certificate of Appreciation** has been discontinued. Opportunities are sought by all Plant Committees to hold meetings at RHS shows.

The awards procedure

The process for making awards follows the RHS 2018 Manual 'Regulations for submitting plants for award' available to Plant Committee members, for which the secretary will give guidance.

1. Complete an entry form available from the Plant Committee secretary.
2. Detail the origin and parentage of the plant and its registration if appropriate.
3. Details of the individual or organisation submitting the plant are recorded and they then retire.
4. The committee inspects the plant, has discussion, votes, the outcome is recorded on the entry form.

Above, left, The stem which was cut in order to create the herbarium specimen.
Above, right, Nuala Sterling's plant of 'Kushi Maya' beside the treasurer Nataliya Cuttel at the Lily Group Stand at Vincent Square, October 2016.

5. The plant's name is checked against the RHS database in case it has received an award previously. An award certificate is sent to the submitter of the plant as is appropriate.
6. The specimen is photographed, measured and a botanical description is prepared by an RHS botanist. Material may be taken to prepare a herbarium specimen.
7. The procedure follows the regulations and the result is recorded in the database at the RHS Wisley herbarium. (WSY)

Creating Herbarium Specimens of Award Plants at RHS Wisley (WSY[1]) by Saskia Harris

Assuming that a plant has received an exhibition award or award from the RHS Trials and Roundtable Assessments (AGM, Award of Garden Merit), the RHS recommends that a pressed and dried specimen of that plant is included in its herbarium to add to the permanent record for future reference.

An exhibited plant that has received an RHS Plant Award will be taken to the RHS herbarium at Wisley to be documented and prepared as a herbarium specimen.

The RHS herbarium, Wisley

Materials for collecting and recording specimen details: RHS Colour Chart, digital camera, secateurs and a means to record notes.

How we colour-chart and press specimens

Before a specimen is prepared for pressing, a photographic record is made of the collection label, habit, foliage and flowers with close ups of special features, and the date, location and accession information are recorded.

The fresh samples are described and colour-charted (using the RHS Colour Chart, noting the edition), photographed if necessary and then pressed, dried and mounted, prior to incorporation into the herbarium. If the dried specimen does not show the important features of a plant, a photograph or illustration of the live plant to illustrate the habit and form, which are features lost as a result of pressing, is an invaluable addition.

All parts of the fresh plant likely to discolour by drying are compared to the RHS Colour Chart for a permanent colour reference. This is done out of direct sun or artificial light at a north-facing window.

Specimens are pressed between sheets of acid-free blotting paper (newspaper is a practical alternative although very acidic). Once the specimen is arranged on a double blotter it is covered by a single sheet of blotting paper, sprayed on the outside with water to dampen it and allow it to mould around the specimen in the initial pressing.

A sheet of foam/sponge is laid over this, also to encourage even initial pressing. (After 24 hours in a drier the sponge will be removed and replaced with a double blotter). The blotter/specimen combination is separated by sheets of corrugated cardboard that enables warm air to draw away moisture. Finally the specimen sandwich is placed between firm boards held by tightened luggage straps with

RHS Wisley herbarium sheet (WSY0141552) of the specimen *Lilium* 'Kushi Maya'.

even pressure further exerted by two tensioning rods raised under the straps (see photo, below).

A press prepared for the drier is placed in a drying cabinet (above a radiator or in a boiler

cupboard are suitable alternatives). The drying continues for several days until the specimen is dry and no longer floppy. The specimen will then be mounted on acid-free mounting card, labelled, bar-coded, databased, imaged and digitised[2] and kept in museum conditions for future use.

Recording plants at exhibition that are newly raised or selected.

Cultivars, literally 'cultivated varieties', are technically 'plants raised as seedlings or sports, and selected wild forms maintained in cultivation for their garden value, named according to the rules' (p.22 RHS 2018 Manual). If cultivars are hybrids (a plant grown from seed resulting from cross-pollination of two parents) details of the parentage, if known, should be given.

Where the plant put up for exhibition is a new cultivated variety or if the raiser is seeking registration of the plant name we encourage the raiser or breeder to submit a specimen of the plant for preservation in the RHS's herbarium to become the Nomenclatural Standard. While it is ideal if they are pressed specimens, Nomenclatural Standards can be a printed image of the plant.

The Nomenclatural Standard specimen portfolio will be that to which the cultivated variety name is permanently attached and can be used for authoritative identification of the cultivar in the future. It formally fixes the name of a cultivar in the same way that a type specimen fixes a wild species name.

The principles of publishing a nomenclatural standard are to be found in the latest version of the *International Code of Nomenclature for Cultivated Plants (ICNCP) 9th Edition* (June 2016): Division V,.10. Nomenclatural Standards Scripta Horticulturae. No. 18, pp.65–67.

[1] WSY is the internationally recognised acronym for the herbarium at RHS Wisley.

[2] Digitisation is the process of capturing high resolution digital images of dried pressed specimens to make them more widely accessible to researchers across the world.

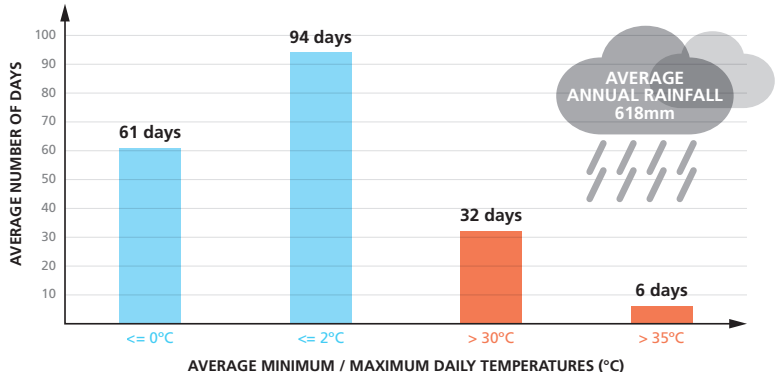
Growing *Lilium* in the heat of mainland Australia

Jennifer Kerry *describes some of the difficulties she encounters growing lilies in the demanding climate of Canberra and the techniques she employs to overcome them.*

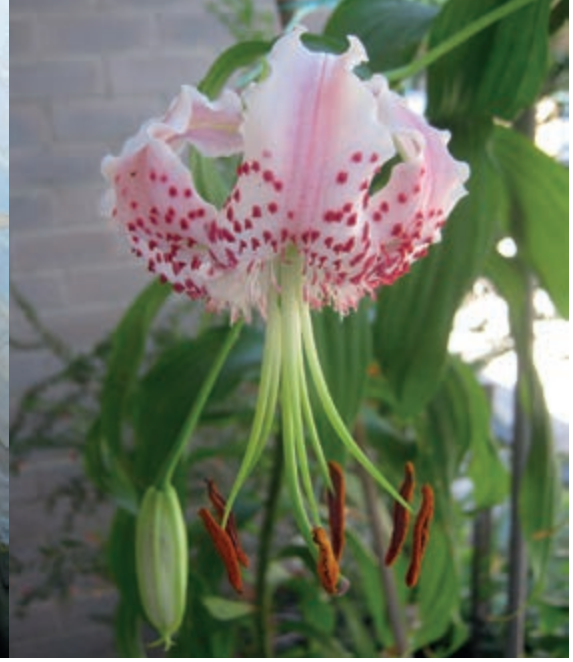
I am a suburban gardener in Canberra/Queanbeyan, which is in the Australian Southern Tablelands, south-west of Sydney. I have been growing lilies seriously for the past 15 years, almost exclusively in pots. My reasons for container growing are that it is easier to control the growing conditions such as amount of shade, moisture and type of medium and also easier to keep track of individual bulbs.

It is a challenge growing lilies here, especially the species, because of the severe and prolonged heat in summer and frequent periods of drought. In addition there are few sources from which to purchase *Lilium* species, with many specialist nurseries no longer offering them. Most lily growers in Australia are now in Tasmania which has a much milder climate than the mainland.

To give you an idea of the climate statistics for my location the graphic below shows the long term average minimum and maximum daily temperatures.



The truth is that climate change has become very noticeable since the year 2000 with summer temperatures more severe and prolonged than this. In the past five years we have had three or four consecutive days over 40 °C on about three occasions. 2018/2019 was the hottest summer on record in Canberra. Autumn has come almost a month later for several years now —Indian summers are the norm. Despite these frightening statistics I have been able to keep my lilies alive, with many coping very well.



Above, left, excessive temperatures can lead to the early onset of dormancy as in these *Lilium speciosum*. However when the growing conditions are favourable, the results can be particularly satisfying as in this wonderful flowering example, ***above right,*** of *Lilium speciosum* var. *punctatum*—for which Jennifer has, in the past, generously contributed seeds to the Lily Group Seed Exchange.

Growing species from seed

As there are very few sources of species *Lilium* available in Australia I have had to raise most of my own from seeds obtained from the RHS Lily Group and the North American Lily Society.

Over the years I have attempted to grow a wide variety of species from seed. These have come from most sections of the genus. I have managed to get all of them to germinate and last at least a year or two as seedlings but have not achieved flowering plants from quite a few. Those species I have raised to flowering stage include: *Lilium amabile, L. auratum, L. callosum, L. candidum, L. cernuum, L. davidii, L. duchartrei, L. fargesii, L. formosanum, L. hansonii, L. henryi, L. humboldtii, L. japonicum, L. lancifolium, L. lankongense, L. leichtlinii, L. lijiangense, L. majoense, L. parryi, L. primulinum, L. pumilum, L. regale, L. rubellum, L. sargentiae, L. speciosum, L. taliense, L. tsingtauense* and *L. wardii*. I have not been able to keep all of these alive and healthy for a long time. Some have succumbed to viruses and others to environmental conditions such as dessication or subterranean insect attack.

The species which I have so far been unsuccessful in growing from seed to adulthood include: *Lilium bakerianum, L. bolanderi, L. chalcedonicum, L. kelloggii, L. ledebourii, L. mackliniae, L. nepalense, L. pomponium, L. pyrenaicum, L. rubescens* and *L. washingtonianum.*

From this list it can be seen that European and North American species are the trickiest to grow on in pots in my climate. Those species which come from a high altitude climate may find it difficult to adapt. In a couple of cases I had a trayful of promising healthy looking seedlings which just disappeared by the following spring after transplanting the bulbs in winter. I am not certain if it was the heat, drought, disturbance from transplanting or below ground insect attack which caused their demise. It is a mystery why a species can grow well as a seedling with a well developed root system but decline so quickly after repotting. I suspect many North American and European species resent transplanting.

In each batch of successful species, there always seemed to be at least a couple of individuals which were stronger than the rest and continued to develop to flowering stage. In time I think a degree of heat tolerance could be selectively bred for in most species.

Apart from the trumpet species and varieties of *Lilium henryi*, *Lilium speciosum* has been the most successful grower and especially multiplier under my growing conditions. I am not really sure why this is the case, except that it is late flowering so a prolonged autumn season would help the plant to keep actively growing for longer.

Containers and growing medium

In the mainland Australian climate growing in pots is more difficult than in milder areas. The three enemies are heat, direct sun and drought. To succeed in pots afternoon shade and mulch are essential as the temperature in summer often reaches 30 °C by midday. I use at least a 5 cm layer of sugar cane mulch which is slow to break down and allows water to penetrate easily. Some oriental species, particularly *Lilium auratum* and *L. speciosum* and their hybrids, are very susceptible to leaf burn if they receive direct hot sun.

When growing in containers, it is not possible to imitate the growing medium the various species have in their wild habitat. A commercial mixture with additives such as perlite, coarse pine bark and coco peat will suit most species.

Sun-scorched leaves resulting from inadequate shading.

The challenge is to find a medium which combines adequate drainage and aeration with water holding ability. I have experimented with quite a few over the years. Many of the books I have read overemphasised the drainage characteristics of the planting medium while neglecting the moisture retaining ability. Most of these books were describing growing in garden beds rather than in pots and also in cooler climates. The growing medium in a warm to hot summer climate must have a degree of both characteristics. Mixes with a high percentage of coco peat or composted coconut husks achieve good aeration or air filled porosity combined with moisture retention. I have mixed in some coarse sand to a commercial mix containing coco peat as it helps to weigh the pot down and keep it stable. The coco peat is very light and tall growing lilies can topple over when grown in pots.

In Australia a large pot is desirable as the larger the pot the cooler the mixture will remain and also more moisture is retained. I use 450 mm plastic pots for species with large bulbs such as *Lilium henryi, L. speciosum* and *L. auratum* and plant several bulbs per pot so that the roots will fill the container. This avoids the medium going sour and encouraging harmful fungi. I noticed that the young bulbs in seedling trays have vigorous root systems which fill the tray. Repotting should be done when the plants have consumed the organic matter in the pot. When this happens the mix will no longer absorb and retain water which runs down the internal sides of the pot. With smaller pots replacing the mixture must be done annually but it can be done every two years in larger pots. It is better to avoid black plastic pots and choose a paler colour, except for the largest pots, as black absorbs too much heat.

Seedlings

I raise seedlings using commercial seed raising mixture combined with some premium mixture for organic matter and some perlite for aeration. The seeds are planted in rectangular plastic or styrofoam trays which are about 15 cm deep. Seedlings usually have to remain in the trays for two years so the medium should have sufficient organic matter to last this long. I have lined the bottom of the trays with coarse gravel, this helps to retain moisture at the bottom of the trays. It is a matter of balancing aeration and drainage with moisture retaining ability. I have lost quite a few seedlings in the past due to desiccation because the mix became repellent to water.

Seedlings should be protected from direct sun. In summer I have found it necessary to protect the trays with a shade cloth screen. I use a mulch of sphagnum moss which absorbs a lot of water. This keeps the mix below from drying out and also acts as an evaporative cooler. In the extreme heat of the summer of 2018/2019 I discovered the use of coir fibre—which is sold as a liner for hanging baskets. I put a thin layer of this on top of the sphagnum moss and found that this additional

Coir mulch provides extra insulation and evaporative cooling during the hottest periods.

layer provided extra insulation from the heat and more evaporative cooling. After receiving this treatment, I noticed seedlings started growing new leaves after having gone dormant in late summer.

Pests and diseases

In my climate, winter and summer are often dry—historically spring was the wettest season. Fungal diseases such as botrytis are rare but can happen during a cool damp spell in early spring—I have noticed *Lilium henryi* is particularly susceptible. I haven't noticed fusarium basal rot in the commercial potting mixes I have used, but bulbs have disintegrated for other reasons, desiccation and insect attack. Slugs have been responsible for chewing through stems of young plants below ground level, leading to yellowing and collapse. During spring gnats are a problem crawling over the damp medium as the larvae can sever delicate seedling stems. I have used a soil drench of Azimax, an extract of the Neem plant (*Azidirachtin indica*), to kill fungus gnat larvae in the soil.

In the Australian climate aphids of all types: green, grey and black are a problem during the milder temperatures of spring and autumn lasting into early winter. In autumn, after flowering, they are at their worst, covering the whole underside of leaves and attracting ants which feed on their honeydew. Viruses have been the main insect-caused disease problem accounting for my losses. I have only used pyrethrum sprays against aphids and try to protect the seedlings from attack by growing them on a shade cloth enclosed balcony.

Other pests I have noticed are earwigs, which in the spring can chew off developing flower buds and young leaves, and in summer various leaf hoppers

Above, left, *Lilium majoense* which has generally proved very difficult in cultivation and ***right,*** *Lilium speciosum* 'Album Novum' displaying its yellowish, rather than chocolate or dark red, pollen.

which as sap sucking insects can transmit viruses.

I have read reports that extreme heat, 38 °C and over, may suppress virus growth and two virus infected plants seemed to recover enough to flower normally the following season.

In Australia we are fortunate not to have the lily beetle. Where I live there are numerous possums which mainly feed on tree leaves—they don't seem to be a threat to lilies as they don't like being near ground level.

Hybridising

The long growing season, with often dry summers and autumns, are favourable for pollination and the development of seed capsules. *Lilium speciosum* requires a long autumn for maturing of the seed capsules before the frost comes, usually in mid to late May. Very hot weather is also conducive to producing more viable seeds from wider crosses.

So far I have not had enough time and space to try many interspecies crosses. My main goals have been to cross particular *Lilium speciosum* strains, such as heavily spotted and wavy petalled forms. I have also been developing a pure breeding strain of *L. speciosum* 'Album Novum', which I was finally able to obtain seeds from this season.

Nomocharis within *Lilium*

Dr Jamie Compton *discusses some recent DNA studies which clearly indicate that* Nomocharis *should be accomodated within Lilium and explains why further work is likely to lead to a complete revision of the genus. A close relationship between* Lilium nepalense *and* Nomocharis saluenensis *is among the facinating discoveries described.*

The genus *Nomocharis* was first described by the French botanist Adrien René Franchet in 1889. He based his description on *N. pardanthina* Franch. which was collected in flower on 2 June 1883 from Yunnan Province, China by the Catholic priest Pierre Jean Marie Delavay (*Delavay 257*) on Mount Koua-la-po above the town of Hokin [Heqin] (Franchet 1889: 113). There are several specimens of this collection in the Paris Herbarium. Franchet recognised that *Nomocharis pardanthina* lay morphologically close to the existing concepts of both *Lilium* L. and *Fritillaria* L. resembling *Lilium* in the scaled bulb and dorsifixed anthers and *Fritillaria* with the very darkly coloured and pitted nectary. He distinguished his new genus from these other genera by the three lobed rather than trifid stigma; the widely spreading flattened flower and the differently constructed inner and outer perianth segments (tepals). In *Nomocharis pardanthina* the inner tepals have fimbriate margins whereas the outer tepals are entire. He noted too that the stamens had swollen filaments and a short mucro or point at the apex and that the inner tepals at their bases had nectaries with flanges of papillae. These were features Franchet believed were not found in either *Fritillaria* or *Lilium*.

Franchet acknowledged that several of the characters he later used to distinguish *Nomocharis* from *Lilium* and *Fritillaria* appeared to be inconsistent when

Below, left, *Lilium nepalense* and ***right,*** *Nomocharis saluenensis* have, perhaps surprisingly, been shown by DNA analyses to be closely related taxa.

he was describing new species. For example, he described *Lilium apertum* Franch. (1898: 220) in *Lilium* not in *Nomocharis* because it lacked the papillate nectaries of *N. pardanthina.* In *Lilium apertum* the nectaries were reduced to swollen appendages. Furthermore he distinguished the species by the narrow, thin, rather than enlarged basal section to the filaments (thick and swollen in *N. pardanthina*). This species was later transferred into *Nomocharis* by William Wright Smith and William Edgar Evans in 1925 where it has remained until very recently. Confusion also surrounded the original descriptions of several other lily-like species that did not seem to fit easily in either *Fritillaria* or *Lilium*. Ambiguity in these arose either because of the shape of their nectaries, which resembled those in *Fritillaria*, or the shape and orientation of the corolla, stamens and style which resembled species of *Lilium* but with narrow pointed filaments and by the presence of crested nectaries on the inner tepals. Some of these species with ambiguous characters went on a nomenclatural merry-go-round. Thus, *Fritillaria lophophora* Bureau & Franch. (1891) was transferred to *Lilium lophophorum* (Bureau & Franch.) Franch. (1898) and later to *Nomocharis lophophora* (Bureau & Franch.) W. E. Evans (1925). Likewise the diminutive Himalayan species originally described as *Fritillaria oxypetala* Royle (1840) was transferred to *Lilium oxypetalum* (Royle) Baker (1874) and then to *Nomocharis oxypetala* (Royle) E. H. Wilson (1925). Similar nomenclatural changes occurred with *Fritillaria souliei* Franch. (1898) to *Nomocharis souliei* (Franch.) W. W. Smith & W. E. Evans (1924) which eventually ended up as *Lilium souliei* (Franch.) Sealy (1950). Other intermediate or imprecisely defined species have also had a brief flirtation with *Nomocharis* and have subsequently returned to their original placement within *Lilium*. For example the diminutive *Lilium nanum* Klotzsch (1862) became *Nomocharis nana* (Klotzsch) E. H. Wilson (1925) and the beautiful species *Lilium henrici* Franch. (1898) became *Nomocharis henrici* (Franch.) E. H. Wilson (1925) but is now regarded once more to belong within *Lilium* based on the characters discussed above. All in all therefore the boundaries between the definition of the genus *Lilium* and that of *Nomocharis* were blurred right from the start. Sealy (1983) undertook a morphological revision of the genus *Nomocharis* in which he recognised seven species.

The great breakthrough in assessing genetic relationships has come with DNA sequencing and the computer aided tools enabling us to infer phylogenetic or familial relationships. These have given us far more accurate 'family trees' on which to gauge generic boundaries and have enabled us to interpret the hidden relationships among plants that observation by means of morphology alone has not been able to clearly define. Fortunately for us there are two (in fact three including mitochondria) independent linear pathways in plants from which DNA can be utilized that can now show us the patterns of relationships, nuclear DNA from within the cell nuclei and plastid DNA from the chloroplasts within each cell.

The research of Nishikawa et al. (1999) using nuclear DNA internal transcribed spacer regions (ITS) paved the way for a molecular reappraisal of these two genera. These researchers included 55 species of the genus *Lilium* as well as *Cardiocrinum giganteum* and *Nomocharis saluenensis*. Their results showed that *Nomocharis saluenensis* was nested within *Lilium* sister to *Lilium nepalense* i.e. that *L. nepalense* was its closest relative and that *Nomocharis* was not as anticipated a related genus but part of *Lilium* itself. It could be argued that their results may not have been conclusive because the only Outgroup was in effect *Cardiocrinum giganteum* and no species of *Fritillaria* were included. Hayashi & Kawano (2000) utilized two different genes from the chloroplast, *matK* and *rbcL*. They investigated 35 species of *Lilium* as well as other genera in Liliaceae including *Cardiocrinum cordatum*, *Nomocharis pardanthina* and *Nomocharis saluenensis*, *Notholirion thomsonianum* and *Fritillaria koidzumiana* with ten other more distantly related representatives of Liliaceae as Outgroups (Hayashi & Kawano 2000). The *rbcL* gene was not that informative because there were comparatively low levels of resolution. The more informative *matK* gene revealed once again that both species of *Nomocharis* fell into the *Lilium* clade, grouping in that case with *Lilium bakerianum* in the absence of any samples of *L. nepalense* (Hayashi & Kawano 2000).

A more comprehensive phylogenetic treatment of Liliaceae including 37 species of *Fritillaria* was produced by Rønsted et al. (2005) using sequences from two chloroplast genes (*matK*, *rpl16*) and the nuclear ITS which showed that *Fritillaria* was monophyletic and quite separate from *Lilium*. Rønsted et al. (2005) included 14 species of *Lilium* and *Nomocharis pardanthina* which once again fell into *Lilium* with strong support (92% Maximum Likelihood Bootstrap value). In addition the family Liliaceae was recently re-assessed by Kim & Kim (2018) on the basis of the work undertaken by the Angiosperm Phylogeny Group's listing of Families of flowering plants (APG IV). Kim and Kim (2018) utilised four different chloroplast genes (*rbcL, matK, ndbF and atpB*) and included for their analyses 142 different Liliaceae taxa including 16 species of *Lilium*, 16 species of *Fritillaria*, *Nomocharis aperta* and *N. pardanthina* as well as *Notholirion macrophyllum, Notholirion thomsonianum* and *N. bulbiferum*, *Cardiodcrinum cordatum* and *C. giganteum*. The two species of *Nomocharis* formed a strongly supported clade (98% Bootstrap) sister to *Lilium brownii* and *L. regale* which was once more firmly nested within a strongly supported *Lilium* clade (100% Bootstrap), although *Lilium nepalense* was not included (Kim and Kim 2018).

A full set of *Nomocharis* species samples was required to evaluate generic relationships more fully. Gao et al. (2012) specifically concentrated on the generic relationships between *Lilium* and *Nomocharis* using ITS and the plastid *psbA-trnH* gene with 102 samples of *Lilium* representing 81 species and 15 samples of

Nomocharis representing all six of Sealy's recognised species. Gao et al. (2012) concluded that *Nomocharis* is very strongly supported as belonging within *Lilium* (Bayesian probability value of 1, i.e. as strong a probability value as possible). Their results indicated that a *Nomocharis* clade including *Lilium nepalense* was sister to a European and west Asian clade of 19 species of *Lilium* Sect. *Liriotypus*. It is notable that, despite the irrefutable evidence supported by their research, they chose to describe a new species of *Nomocharis* i.e. *N. gongshanensis* Y. D. Gao & X. J. He, not in the genus *Lilium* (Gao et al. 2012). This research was quickly followed up by an assessment of the putative origins of *Nomocharis* within *Lilium* which they concluded was likely to have arisen in the Hengduan Mountain range of western China (Gao et al. 2013). *Nomocharis gongshanensis* was eventually recombined in *Lilium* as *L. gongshanensis* (Y. D. Gao & X. J. He) Y. D. Gao in a paper that formally placed all species of *Nomocharis* into *Lilium* based on previous molecular as well as morphological research (Gao and Gao, 2016). Five other *Nomocharis* species were also accordingly recombined in *Lilium*; *L. basilissum* (W. E. Evans) Y. D. Gao; *L. pardanthinum* (Franch.) Y. D. Gao; *L. meleagrina* (Franch.) Y. D. Gao; *L. farreri* (Harrow ex W. E. Evans) Y. D. Gao and *L. synapticum* (Sealy) Y. D. Gao (Gao & Gao, 2016). *Lilium apertum* Franch. and *L. saluenense* (Balf. f.) S. Y. Liang having already been validly described.

In conclusion—based on the DNA sequencing research by several different groups—*Lilium* is monophyletic, i.e. it consists of a single large genetically well supported clade (Bayesian probability of 1) with a *Nomocharis* clade nested well within it that also includes *Lilium nepalense* (Gao et al. 2012). These various informative pieces of research have therefore led to the inclusion of all species of *Nomocharis* within *Lilium* and that *Lilium* is also found to be sister i.e. related to but does not include *Notholirion* (Hayashi & Kawano, 2000) and is also closely related to but again does not include both *Fritillaria* and *Cardiocrinum* (Gao et al. 2012; Kim & Kim 2018). In morphological terms it was proposed by Gao et al. (2012, 2013) that the delimitation of *Nomocharis* as being a genus distinct from *Lilium* was refuted. These previously understood distinctions i.e. the presence of inner tepal nectary processes (flanges, crests or ridges), open perigones and filaments having apical mucrons or awns in *Nomocharis* were found not to be consistent, especially following the recently discovered yellow flowered *N. gongshanensis* which entirely lacked nectary processes. Several species of *Lilium* are already known to possess crested nectary processes (*L. fargesii, L. lophophorum, L. matangense, L. nanum and L. oxypetalum*) and other *Lilium* species have more or less 'open' perigones with dark tepal bases (*L. mackliniae* and *L. henrici*).

The placement of *Lilium nepalense* with its brownish or greenish-yellow, more tubular flowers and deep red bases to the perianth segments sister to the other

Table 1. Sections adapted from Comber (1949) with their type species.

SECTION Nomocharis
TYPE *L. pardanthinum*

SECTION Daurolirion (1949)
TYPE *L. dauricum*

SECTION Lophophorum (1980)
TYPE *L. lophophorum*

SECTION Martagon (1830)
TYPE *L. martagon*

SECTION Lilium (1753) (= Liriotypus)
TYPE *L. candidum*

SECTION Sinomartagon (1949)
TYPE *L. davidii*

SECTION Pseudolirium (1836)
TYPE *L. philadelphicum*

SECTION Leucolirion (1925)
TYPE *L. longiflorum*

SECTION Archelirion (1871)
TYPE *L. auratum*

species of *Nomocharis* in these analyses is somewhat surprising. *Lilium nepalense* does, however, share some characters with several *Nomocharis* species. Both *Lilium nepalense* and *Nomocharis aperta, N. basilissa, N. gongshanensis* and *N. saluenensis* share similar narrow filaments and perianth segments which are the same shape and size (Gao & Gao 2016). Gao et al. (2102, 2103) regarded the specialised morphological variants within the other species of *Nomocharis* i.e. swollen filaments, fringed inner perianth segments and papillose nectaries as evolutionary characters designed to aid pollination. In all other respects these taxa

come within the overall lineage of the genus *Lilium* and it is hard to disagree with their conclusion.

Recent phylogenetic studies have shown that at sectional level the genus *Lilium* is extremely polyphyletic (Nishikawa et al. 1999; Hiyashi & Kawano 2000; Pelkonen & Perttila 2012; Gao et al. 2013; Kim & Kim 2018). Some species that had hitherto been placed in one section have, according to results from DNA analyses, appeared segregated a long way from others with a similar morphological history e.g. within section *Leucolirion* the species *Lilium regale, L. sargentiae* and *L. leucanthum* were found to be segregated a long way from *L. longiflorum, L. formosanum, L. wallichianum* and *L. philippinense* (Nishikawa 1999). It is therefore, at this stage, not possible to assign *Lilium* species accurately to any reliable infrageneric classification. Much more work based on further plastid and nuclear DNA markers, which would need to include all the known species of *Lilium* and infraspecific taxa, might help to fully resolve this. See table of sections on the previous page.

References

Comber, H. F. (1949). A new classification of the *Lilium*. Lily Yearbook, Royal Hort. Soc. 13: 86–105.

Franchet, A. R. (1889). *Nomocharis* nouveau genre de Liliacées-Tulipées, Journal de Botanique (Ed. M.L.Morot) 3: 113.

Franchet, A. R. (1898). *Lilium apertum*, Journal de Botanique (Ed. M.L.Morot) 12: 220–221.

Gao, Y-D., Hohenegger, M., Harris, A. J., Zhou, S-D., He, X-J. and Wan, J. (2012). A new species in the genus *Nomocharis* Franchet (Liliaceae): evidence that brings the genus *Nomocharis* into *Lilium*. Plant Systematics and Evolution 298(1): 69–85.

Gao, Y-D., Harris, A. J., Zhou, S-D. and He, X-J. (2013). Evolutionary events in *Lilium* (including *Nomocharis*, Liliaceae) are temporally correlated with orogenies of the Q-T plateau and the Hengduan Mountains. Molecular Phylogenetics and Evolution 68: 443-460.

Gao, Y-D. and Gao, X-F. (2016). Accommodating *Nomocharis* in *Lilium* (Liliaceae), Phytotaxa 277(2): 205–210.

Hayashi, K. and Kawano, S. (2000). Molecular systematics of *Lilium* and allied genera (Liliaceae): phylogenetic relationships among *Lilium* and related genera based on the *rbcL* and *matK* gene sequence data. Plant Species Biology 15: 73–93.

Kim, J. S. and Kim, J-H. (2018). Updated molecular phylogenetic analysis, dating and biogeographical history of the lily family (Liliaceae: Liliales). Botanical Journal of the Linnean Society 187: 579–593.

Nishikawa, T., Okazaki, K., Uchino, T., Arakawa, K. and Nagamine, T. (1999). A Molecular Phylogeny of *Lilium* in the Internal Transcribed Spacer Region of Nuclear Ribosomal DNA. Journal of Molecular Evolution 49: 238–249.

Pelkonen, V-P. and Pirttila, A-M. (2012). Taxonomy and Phylogeny of the genus *Lilium*. Floriculture and Ornamental Biotechnology 6(Special Issue 2): 1–8.

Rønsted N., Law, S., Thornton, H., Fay, M. F. and Chase M. W. (2005). Molecular phylogenetic evidence for the monophyly of *Fritillaria* and *Lilium* (Liliaceae; Liliales) and the infrageneric classification of *Fritillaria*. Molecular Phylogenetics and Evolution 35(3): 509–527.

Sealy, J. R. (1983). A Revision of the genus *Nomocharis* Franchet, Botanical Journal of the Linnean Society 87: 285–323.

Harlequin Group, a forgotten gem?

Tony Dixon *writes with great enthusiasm about his search for this strain of Asiatic hybrids and his joy in finally growing them from seed, which was obtained through the annual Lily Group exchange. He also describes the sometimes misunderstood history of these colourful and rewarding plants.*

The first book I bought on lilies was Richard Bird's 1991 book simply entitled *Lilies*. This book is not very comprehensive in its coverage of the subject, but does feature some very attractive photos. One that caught my eye straight away was 'Harlequin Strain'—a group of five shapely blooms with spotted, elegantly recurved petals, each flower a different colour! I decided straight away that I wanted to grow these.

Then came the challenge of finding them. It turned out that this was an old strain dating back to 1950, growers' interest had moved on and no-one paid much attention to them any more. I did find one company in America who sold the bulbs, but they were not willing to send them overseas. So my only chance was to keep my eye on the Lily Group Seed List and hope it turned up. Finally, in the 2015/16 list, it did turn up, sent in by Gordon Hogenson.

The little packet I received contained 25 seeds—I think every one germinated, and they grew strongly, multiplying along the way. By the end of the second year I had more plants than the number of seeds I had started out with. In the third year came the first flowers: four plants with flowers of strikingly different colours; one a light peachy orange, one a deep vinous red, with bright orange, and flaming scarlet ones in between.

At the end of the third year I repotted them into three pots according to size (my ordinary garden soil doesn't suit most lilies). Two or three of the plants had produced bulbils,

A range of colours in 2019 but sadly not the light peach individual.

which I put into a further pot. The fourth year brought the first major display—eight flowering stems, half of them with six blooms each. The range of colours was not as great as I had been hoping for (what did happen to that light peachy one?). However, seed from last year's flowers is already growing strongly and with them the hope of additional colours. Soon I should have seed for the exchange and bulbs for the auction.

Information on the origin of the Harlequin Strain is scarce and often contradictory. Even the information given in the Lily Register is somewhat misleading. However, in an article entitled 'The Upright Lilies' in *The Lily Year Book* of 1969, Edward A. McRae gave detailed information about its parentage. The story starts with Cecil Patterson (after whom the Patterson Hybrids were named). He was a professor at the University of Saskatchewan who had been working on lily hybrids which would withstand garden conditions in the prairies of north-western Canada. One of his crosses, between *Lilium davidii* var. *willmottiae* and *Lilium cernuum* resulted in a seedling which he named 37-538. As a seed parent this was sterile, but its pollen was highly fertile. Using pollen from 37-538, Patterson made a number of crosses which resulted in several worthwhile clones, including 'Edith Cecilia' and 'Lemon Queen'.

Jan de Graaff of Oregon Bulb Farms obtained material from Patterson and a cross between 'Edith Cecilia' and 'Lemon Queen' resulted in a group of seedlings with an extraordinary range of colours, which they went on to sell as the Harlequin Hybrids. They first appeared in their 1950 catalogue. 'The variety of colours in this group has never been equalled,' writes McRae, 'the colours including orange, lemon and buttercup yellows, lilacs, pinks, deep reds, white, bicolours etc.' (*ibid.*)

Confusion over the parentage appears to have arisen because a selection from the Mid-century Group was cloned and named 'Harlequin', giving rise to the misconception that the parents of the Harlequin Hybrids were selections from the Mid-century Group. J. de Graaff and E. Hornback made this clear in an article entitled 'Origin of the Mid-century Hybrids' in the *The Lily Year Book* of 1967, where they state, 'The modern Harlequin Hybrids are a strain of *Lilium cernuum* × *L. davidii* hybrids and are not related to the Mid-centuries.'

Recalling the time when the group was being developed, McRae wrote in his book *Lilies: A Guide For Growers and Collectors* of the new group's range of colours, 'The second generation (to everyone's amazement) produced an equally fascinating array.' If you can obtain seed for these, you too can be amazed at the fascinating array of colours you will get.

References

Bird, R. (1991). *Lilies*. The Apple Press, London, UK.
McRae, E. A. (1998). *Lilies: A Guide for Growers and Collector*. Timber Press, Inc., Portland, Oregon, USA.

The lilies of Japan

Alisdair Aird *tells us of his passion for Japanese lilies which has been sustained over many years. He briefly describes each of the species found in the archipelago, some of the history of their introduction to Western horticulture and the nomenclatural complexities which surround several of them.*

An illustration from the 1930 Yokohama Nursery Company's catalogue of the lilies they sold from their office at Craven House, Kingsway, London.

The first lilies I grew were from Japan. This was in 1966, when I was a young man moving from the countryside to a bed-sitting room in London. I had planted three bulbs each of *Lilium japonicum* and *L. speciosum*, in a peaty compost in large pots (about 20 litres), in my big south-facing bay window. The pots and the young stems were shaded by the brickwork and kept cool at the root, but grew into full sun. They flowered beautifully, filling my room with fragrance. Though I didn't realise at the time, those were practically perfect growing conditions for the lilies, with their roots in cool shade, their flowering stems growing up into full light, and plenty of fresh air from the open windows.

That started my life-long fascination with lilies. Since then almost all the dozens

Lilium lancifolium var. *flaviflorum* grown from seed which was contributed to the 2011 LG seed exchange by Mr Arakawa.

of lily species I've grown—or tried but failed to grow—have come from the Lily Group's seed distribution. These include all the species which can be found wild in Japan; most of those had been kindly donated to the Group's distribution by Katsuro Arakawa, Japan's great lily conservator who was awarded the Lyttel Lily Cup in 1998.

In the 75th Anniversary issue of *Lilies and Related Plants,* Mr Arakawa gives an invaluable account of the conservation status of Japan's wild lilies (L&RP, 2007–8, pp. 10–14). My notes which follow may be useful for people who do not have a copy of that issue.

Several of Japan's lilies also range more or less widely across Asia. The tiger lily, *Lilium lancifolium* (syn. *L. tigrinum*), grows in China, Korea and Japan, normally in a sterile triploid form which has been cultivated as a food crop for 1,000 years or more (and may have derived originally from plants selected from the wild around the coasts of South Korea). It is easily grown in the neutral or preferably acid soil which suits all Japanese lilies, and very easily multiplied by the stem bulbils which form in its leaf axils. In spite of this, most lily enthusiasts rightly shun it, as it can and usually does harbour virus diseases without showing symptoms, while still being able to transmit them to other more vulnerable lilies. However, in the extreme south of Japan the fertile diploid form still exists, growing in the rather acid soils of Iki and Tsushima islands in the Korea Strait between Fukuoka and South Korea. These two steeply forested islands are warm and wet, particularly through summer. Seed-raised plants of this diploid strain are at least initially virus-free, and may show the effects of any future virus infection more visibly than the more robust triploid form, so in this sense are 'safer'. The species has been prominent in the development of Asiatic hybrids.

Lilium concolor, with small upwards-facing orangey-red or yellow flowers on short stems, is very variable across its range through Siberia, China and North Korea into Japan, where it has been recorded on Honshu—it can apparently be found truly wild there, at least on the island of Shikoku in the extreme south, but elsewhere it may more likely be a garden escape. Slightly fragrant, and not so demanding of an acid soil as other oriental lilies, it's easily raised from seed. In the past it was quite popular as a cultivated plant in Japan: a folding screen from the Muromachi Period (1336–1573) in the Tokyo National Museum includes what looks like quite a drift of them. What made *L. concolor* popular there was probably the chance of growing unusual forms, in pots. Early in the last century the Japanese botanist Matsumura said that an unusual form striped red and yellow grew wild in several places there, but in 2014 when I asked a sizeable lecture audience of lily

Easily raised from seed, *Lilium concolor* is not as widely grown in Japan as was previously the case.

Opposite, the diminutive and often difficult Wheel Lily, *Lilium medeoloides*.

Left, *Lilium leichtlinii* is stoloniferous and easily rised from seed.

enthusiasts in Tokyo if any still existed, no-one thought they did.

The variably orange- or even red-flowered *Lilium leichtlinii* var. *maximowiczii*, which ranges widely through the Far East, is found wild throughout both main islands of Japan, adapting happily to very varied altitudes and a north/south span of 1,300 km or more, from cool temperate down to nearly sub-tropical; it is also grown as a food crop there. As with all Japanese lilies, in the wild it will normally get some rain in every month of the year, though most in the summer months. An oddity of history and the rules of taxonomy have meant that it is the very much rarer and to my mind more beautiful clear yellow-flowered version which took the prime species name of *L. leichtlinii*, even though it is a recessive mutation of the orange form. It has been found in just a handful of places in Japan, and is as easily raised from seed as the common orange form. In both forms, even the youngest bulbs quickly multiply, sprouting many new bulblets along underground stolons. This makes it important to pot off young seed-grown bulbs individually more quickly than with other species. It can flower in just two years from seed-sowing.

Lilium medeoloides is a plant of the rather cooler areas of the Far East, from northern Russia through to north-east China and Japan, though not its more southerly parts. There, its gentle elegance and modest but shapely martagon flower of an attractive apricot orange makes it a favourite wild flower; its usually single whorl of leaves gives it its Japanese name of the Wheel Lily, and in Japan it is very much a mountain flower—it is said to be the favourite of the goddess of Mount Fuji. I have flowered it from seed, but failed to keep it alive for long, and other gardeners seem to have found the same—perhaps I should have followed

the old advice, to grow it in lightly shaded lime-free leafmould. I find it scentless, though some lily writers have said that it has an unpleasant smell. Unlike most lilies from Japan, it has been little used in hybridising.

The other Japanese lily which has had very little impact on the development of hybrids is *Lilium callosum*. This ranges over even more of the Far East including Japan, spanning an enormous north/south stretch of some 2,700 km. In Japan it has been found in Honshu, the more southerly of the two main islands. Although described in the West in 1784, it wasn't imported successfully until a century or so later, and though it is easy to raise from seed it has never been widely grown in the West. This may be because its flowers are quite modest in size for the height of its stems—though a good group of this lily would suit today's naturalistic style of gardening rather well. The yellow-flowered variety *L. callosum* var. *luteum* is now confined to one or two small and endangered populations on the warm, wet—and typhoon-prone—island of Okinawa, where it used to be common. In his above article Mr Arakawa has explained that this decline has been caused by the change from thatch to concrete roofing there, so that the tough *Miscanthus sinensis*, no longer cut back for thatching, has crowded out the lily.

Another of the more generally Asiatic species to be found also in Japan, around the coasts of the northern island Hokkaido, is the ineptly named *Lilium pensylvanicum*. Alas, there seems to be little hope now for any successful taxonomic proposal to replace that name with the more sensible *L. dauricum* (published a few years later). In the past this species has often been confused, and by some still is, with the purely Japanese species *L. maculatum*, which is common

Lilium pensylvanicum (syn. *Lilium dauricum*).

instead in the other main island, Honshu. They do look similar, particularly in the shape of their upward-facing flowers, but seem quite different in detail: *Lilium maculatum* germinates epigeally, and is more or less smooth-surfaced throughout its leaves and stem, while *L. pensylvanicum* germinates hypogeally, and is more or less downy throughout. The possibilities for confusion with this group of Japanese lilies don't end there. An intermediate and even more variable plant which grows towards the northern tip of Honshu is considered by Japanese botanists to be a natural hybrid between the two species (and since 1891 has been known to gardeners under the illegitimate name *Lilium* × *elegans*—it really does need a valid name). This interesting natural hybrid has been cultivated for centuries as a garden or pot plant in other parts of Japan. By the late eighteenth century one horticulture book there described over a hundred named cultivars. Recently, Hiroshi Okubo of Kyushu University has suggested that Thunberg, who in 1794 published the species description of *L. maculatum*, and von Siebold, who in 1830 first introduced bulbs of it to the West, were very unlikely to have come across the actual species, as they didn't travel far north from Yokohama and Edo (Tokyo). Instead, as Prof. Okubo says, they would certainly have seen and could easily have obtained many cultivars of this natural hybrid, which was all the rage there then. Further uncertainties swirl around this whole group of lilies; one theory has even been that *L. maculatum* itself was a hybrid between *L. concolor* and *L. pensylvanicum*! Given all the doubts, there seems plenty of scope for a scientific re-examination of the group, perhaps involving a collaboration between Japanese and Western botanists.

Whatever the relationship between these various taxa—and later similar and similarly uncertainly named introductions from Japan—they have played a vital

part in the modern mainly Western development of the many Asiatic hybrids. Those modern hybrids should really be seen against the background of 200 or more years of prior Japanese work.

All Japan's other wild lily species are, like *Lilium maculatum*, unique to Japan. Four—*L. auratum*, *L. japonicum*, *L. rubellum* and *L. speciosum*—grow on the main southern island, Honshu. *Lilium auratum*, the great golden-rayed lily of Japan, was an immediate sensation when it burst upon the British horticultural scene in 1862, and was imported at much the same time into other European countries, and into the United States (where it was called '*Lilium dexteri*'). Over later decades enormous numbers of this fragrant 'Queen of Lilies' were exported from Yokohama. It is a hill rather than mountain lily, growing always in well drained poor soil though with enough coverage of leafmould and the like to build strong stem roots, as the stem needs plenty of sustenance in its unusually long build-up to flowering—it rarely flowers before August. Its summers are warm and wet, and

The incredibly beautiful *Lilium auratum* was, understandably, an immediate sensation when bulbs first arrived in the UK in 1862.

there is significant precipitation in every month of the year—even when this is a blanket of snow, it seems that temperatures are rarely so low as to force the bulb into complete dormancy. Enthusiasts in America and New Zealand seem to have had more success with this lily than many in Europe. Perhaps many of us tend to use too rich or too sodden a compost, or to dry it out too much in winter. Thanks to Mr Arakawa's generosity, the Lily Group's seed list has included several lovely

Native to the mountains, a cool moist climate suits the lovely *Lilium rubellum*.

varieties of it over the years.

Lilium japonicum reached Europe in the 1870s. It too enjoys warm and humid summer months with a lot of rain, and though there's less rain in the autumn every month of the year has plenty of rainy days. Again, it must have perfect drainage, and plenty of room for stem rooting above the bulb. Its gracefully formed fragrant flowers are such an ethereal shade of pink that at least some summer shade is needed to preserve their colour.

Lilium rubellum has flowers of a similar glowing yet gentle pink, its flowers perhaps slightly more bell-shaped, on shorter more slender stems; they too are fragrant. It is a mountain lily, sometimes growing alongside *Lilium medeoloides*, and produces just a very few stem roots. Based in the south-east of England, I have found it very difficult to keep alive for long; it's such a lovely lily that it almost tempts me back to my roots in Scotland, where I'm sure the cooler and moister climate would be more to its liking.

Lilium speciosum, the last of Japan's fragrant mainland lilies, is common in the wild, around the southern end of Honshu, where it is hot in summer and mild in winter, very wet in June and July, and rather wet from March till October, with some rain through the winter too. Its tepals recurve strongly (though without

the strange terminal 'talons' of its Chinese variant *gloriosoides*), which is perhaps why it's never been prized in Japan itself. However it's been popular in warmish Western gardens ever since its introduction to Europe in 1830, not just for its flowers' beautiful markings of strong crimson on clearest waxy white, but also for its relatively easy-going nature.

In the wild, the final three lilies have all been restricted to relatively small habitats, all more or less subtropical, on the Ryukyu Islands which stretch south from Honshu. *Lilium nobilissimum* survived until recently on the virtually inaccessible cliff ledges of Kuchinoshima Island. It appears now to be extinct in the wild, and survives precariously only in cultivation, thanks to Mr Arakawa's own conservation work.

Some 200 km further south, *Lilium alexandrae* is more secure on Ukejima and nearby islands in the Amami group of the Ryukyus, where it is now well protected. Both these species are a lustrous waxy white and very fragrant, but the first's trumpets are held facing up rather than horizontal, with yellow rather than umber pollen, and don't flare back at the mouth in the way that *alexandrae's* do. They should be treated as tender bulbs.

The last of these island lilies is native to the Okinawa group of the Ryukyus, even further south. But unlike the other two, this one is no rarity. It is *Lilium longiflorum*, and grows in abundance there; the island of Iejima has a lily festival

Mr Arakawa pollinating *Lilium nobilissimum* as part of his conservation work with this exquisite species.

Left, both *Lilium nobilissimum* and here *Lilium alexandrae* are tender plants requiring the protection of glass in the UK.

in late April and early May showing hundreds of thousands in full bloom. (It is found also along the eastern coast and islands of Taiwan.) Along with the closely related (non-Japanese) *L. formosanum* I have found it the quickest of all lilies to mature from seed to flowering, even within a single year, though it does need heat. Some of the islands on which it grows are partly formed from coral, and it does not demand the acid soil that other Japanese lilies do. It has been the world's most popular florists' lily for over a century, originally in its pure species form, though now far more often as a hybrid.

Japan met the West's appetite for beautiful lilies with a flourishing export trade, led by the Yokohama Nursery Company, from towards the end of the nineteenth century through the first half of the twentieth, furnished the key species for most of the popular hybrids, and indeed had been breeding from at least one hybrid strain for centuries before any Westerner considered hybridising. But by an irony of history the trade has now turned the other way: it's now Holland which exports about 120 million lily bulbs to Japan annually—and produces virtually all the lily bulbs sold in Britain each year. Nearly 45 square kilometres of Holland (11,000 acres) is now devoted to the intensive production of lilies. Of this area, 36% houses pure Oriental hybrids (i.e. descended from *Lilium auratum*, *L. japonicum*, *L. nobilissimum*, *L. rubellum* and/or *L. speciosum*), and 26% the newer and generally more robust Orienpets (involving crosses linking these Japanese species with trumpet species). So more than half the lilies now being grown commercially are based on just this handful of endemic species from Japan.

Reference

Okubo, H. (2014). History of *Lilium* Species in Asia, *Proc. 3rd Int. Symposium on the Genus Lilium* (Ed. J.M. van Tuyl), ISHS.

Hyacinths

Popular with gardeners because of their highly fragrant and brightly coloured flowers, hyacinths have a long history in cultivation. ***Alan Shipp*** *tells us about the origins of our modern cultivars and how some very old forms have been saved from extinction.*

The garden hyacinth that we grow and love is derived almost exclusively from the species *Hyacinthus orientalis* which is indigenous to an area which encompasses the joint borders of Iran, Iraq, Syria and Turkey. Formerly the hyacinth was botanically classed as belonging to the family Liliaceae but has now been reclassified as belonging to Asparagaceae. This movement has presented difficulties for me when I give talks to garden groups, for I could once say that being a member of the lily family it can be propagated in a similar manner, for after the scales have

Hyacinthus orientalis growing wild in Upper Galilee.

been separated from the base plate heat will induce the formation of small bulbils on the inside edge of those scales. The only difference in propagation being that with lilies the scales are removed from the base, whereas with hyacinths the base is removed from the scales for the hyacinth scales are concentric and do not have a protective outer skin.

Some people believe that the Romans brought hyacinths to Europe but this is not documented, similarly others put forward the theory that the Biblical 'Lilies of the valley' or 'lilies of the fields' cannot refer to *Convallaria majalis* as they do not inhabit the Bible lands, but the hyacinth does. What we can state with certainty is that the Flemish botanist Matthias de L'Obel observed hyacinths growing in Padua in 1562, and in 1564 Ogier de Busbecq, the Ambassador for Ferdinand I in Istanbul, brought back to his master a whole range of bulbs from Turkey and the surrounding area thus also to Clusius, at that time installed as Curator of the Imperial Palace Garden, Vienna. In 1564 Ferdinand died and Clusius lost his employment but in 1592 was appointed to the Botanic Garden in Leiden, taking his bulbs with him in 1593, thus giving rise to the Dutch bulb industry. By 1596 the noted herbalist John Gerard (1545–1612) had recorded hyacinths growing in his English garden. In1596 he published a list of 1,039 plants in his Holborn garden. In those days the academic interest in plants which had existed in Europe was largely absent from England apart from the Society of Apothecaries, the College of Physicians and the barber surgeons or wealthy amateurs. John Gerard had himself been apprenticed to the barber-surgeon Alexander Mason(1). It is not certain how Gerard came by his bulbs but Clusius visited Britain in *ca*. 1592 and also the British merchants Captain Nicolas Leete and Antony Jenkinson were trading between Istanbul and the UK so the first bulbs may have come to Gerard via that route.

Very soon after the introduction of hyacinths to cultivation breeders began experimenting crossing differing clones with great and rapid success, for after little more than 100 years varieties had evolved very similar to what we have today, another 300 years on. In 1612 Besler illustrated a flore pleno and when this genetic source entered the breeding programmes commercial double-flowered varieties appeared, the most notable of these being the 1702 introduction of Peter Voorhelm's 'Konig van Groot-Brittanje' (named after the King of England) this being a white double-flowered variety but with a rose centre. Voorhelm's stunning introduction spawned a whole hyacinth mania similar to the tulip mania of a century before. Sadly all the historic varieties faded from commerce so that by 1958 the oldest known extant variety was 'Marie' from 1860.

We now begin my exciting journey as holder of the National Hyacinth Collection. The first significant discovery was Dr Rita Raziulyte from Vilnius, Lithuania; our paths met when she wrote to all the countries in Europe seeking information about the hyacinths that she had collected from botanic gardens and other sources

'L'Ophir', the world's first double yellow introduced in 1770 at £800 each!

throughout the former USSR. The list was mouth-watering with varieties eventually dated to pre-Victorian times. Double yellows did not appear in the catalogues until *ca*. 1760, there were very few and it was believed they had all been extinct for close on 100 years but there in Rita's list were two double yellows, 'Sunflower' which was listed in the late nineteenth century, but even more exciting was an unidentified one that when I first saw it bloom I described as 'Primitive'. Research has shown that it was almost certainly 'L'Ophir' the world's first double yellow introduced in 1770 at the price of £800 per bulb! There were many illustrations of 'L'Ophir' from the late eighteenth century and onwards but these possessed no clarity for identification, however when the 'collage' of 'L'Ophir' by Mary Delaney was seen the identification was virtually 100% certain. Mary was born in 1770 and when she was 16 years of age her parents considered it a prudent move to marry her off to a man of 64, resulting in Mary becoming a widow at the tender age of 24. She then married an Irish Anglican priest called Delany. Mary spent many happy years until she became a widow once more aged 70. One day Mary observed the scattered petals that had fallen from a geranium and it occurred to her that if she cut out pieces of coloured paper she could form an accurate three-dimensional representation of a flower. Our hero, for that is the best way to describe her, made over 800 of these before her eyesight began to fail in 1780. Fortunately for us 'L'Ophir' was one of these creations. One may wonder, how could she, a poor priest's widow, get access to a bulb costing a fortune? Well, it was known that she had established

contacts with the court of George III whose home was Kew Palace, so was the bulb George's and was it growing in Kew gardens?

'Gloria Mundi', the only known survivor from the eighteenth century hyacinth mania, on sale before 1767.

Previously we have talked of the subject of hyacinth mania, the white double with a coloured centre, long gone we thought but a surprising string of events evolved. In the spring of 2013 I was in conversation with Alan Street of Avon Bulbs; Alan told me that he had an unusual hyacinth which was red and white and it was called 'Gloria Mundi', 'Do you know it?' he said but continued 'I can see that you do by the look on your face'. 'Gloria Mundi' was a white double with a rose centre and appeared in a catalogue of 1767. It was the Holy Grail of hyacinths, the only remaining missing piece of hyacinth history. Apparently Alan has a gardening friend/customer called Ingrid who lives in Switzerland and in turn Ingrid has a lorry driver friend called Theo. Many years ago Theo and a lorry driver friend took a load of humanitarian aid to a remote little village in Romania. Theo's friend met one of the local girls, courted her and eventually they married. Naturally Theo was an honoured guest at the wedding but before he returned to Switzerland he gave the bride's father a packet in appreciation of the wonderful hospitality. The old man then felt indebted to Theo so told him to help himself to anything in his garden. Theo saw some long strap-like leaves and asked what they were. Being told they were 'Gloria mundi' hyacinths he took some back to Switzerland. Some of these bulbs then passed in turn to Ingrid who sent some to Alan Street.

Recently I have had friends with Romanian connections revisit the garden, the old man is dead, his son now lives in the house and he has thrown away all flowers to plant the entire garden with vegetables. But 'Gloria Mundi' is saved.

Reference

Pavord, A. (2005). *The Naming of Names*. Bloomsbury Publishing, London. p. 331.

Erythroniums in the garden

Ian Young *provides some clear, very useful and encouraging advice for those of us who would like to try some of the beautiful trout lilies in our own gardens.*

Erythronium are best suited to be grown in the open garden where they can combine with other spring flowering plants to create a very colourful spectacle.

The flowering season starts as early as February with *Erythronium caucasicum* quickly followed by the earlier flowering forms of *Erythronium dens-canis.* Then there is a continuous sequence of flowers as the North American species come to bloom, peaking in the mass displays from mid-April to mid-May, with the last flowers sometimes lasting into early June.

While they are often described as woodland plants, depending on your local climate they can grow in a wide range of conditions from full sun to full shade. I often explain that when growing in Scotland, or areas with a similar cool maritime climate, that 'Scotland is in shade' meaning that we rarely get temperatures above the mid 20 degrees celsius. Even that is a rare occasion so the erythroniums need no shade to keep them cool.

If your garden is likely to have hot sunshine when the erythroniums are in growth then some shade from the midday sun would be desirable to prevent the

Masses of *Erythronium* flourishing in Ian Young's garden in Aberdeen.

Erythronium caucasicum flowering alongside other early spring bulbs.

Erythronium tuolumnense with it's large leaves is vulnerable to wind damage so benefits from a sheltered and shady position.

leaves from being scorched, this is especially the case for those with broad leaves. Their relatively soft leaf structure also indicates to us that they need some shelter from strong winds, which at worst can shred and snap the leaves and flowering stem, so those species with the larger leaves such as *Erythronium tuolumnense* and its hybrids need more shelter than smaller growing species.

We often get snow when the erythroniums are in flower but the plants cope with this and sit back up undamaged as the snow melts. However, a prolonged cold spell and/or wet conditions when the plants are in flower will hinder pollination greatly reducing the amount of seed we get.

Our garden soil is a light sandy loam, with a pH just to the acid side of neutral, which has been enriched over many years by an annual mulch of organic matter in the form of shredded prunings. These are composted before being applied across the surface during frost free days in the winter. I do not believe that *Erythronium* are particularly fussy about the pH as long as your ground is around the mid-range and not extremely acid or alkaline. I was surprised to see *Erythronium hendersonii* growing in very heavy clay soils in Oregon as I had always thought they would prefer a woodsier type of soil but obviously they are more adaptable than I had realised. I should add that they were mostly growing very close to the native shrubbery so I wonder if the tree and shrub roots opened up the heavy soil, allowing air to penetrate, thus making the difference.

Almost all of our beds have been slightly raised above the ground level, initially by digging in organic matter which is then replenished by the annual mulching—exactly the same treatment would improve the growing conditions for other bulbs in heavy soils. So even if you have a heavy clay soil that should not prevent you from growing some erythroniums provided you add plenty of organic matter to improve the aeration, just as you would require for most other plants to succeed.

The one thing that may prevent you from growing erythroniums well is if your garden gets very hot and dry in the summer. They can survive quite long dry periods, provided they are in the ground, but it seems that they suffer if the ground around them heats up too much—this is part of the explanation as to why their bulbs grow so deeply into the ground. I have been asked how deep you should plant erythronium bulbs. There is no definitive answer; it depends on your garden soil and weather because what the bulbs are seeking is not simply a definable depth of soil above them but the best environment, being a combination of moisture and temperature which they can best tolerate.

When planting erythronium bulbs you should always ensure that Western North American species and cultivars have at least 7 cm of soil over the top of the bulb. They may grow deeper year by year until they find the depth that best suits them in your garden. As a general rule the bulbs of the Eastern North American species, such as *Erythronium americanum,* along with the Eurasian complex do not tend to grow so deeply but I still plant them so that they are covered by 7 cm and they tend to stay at around that depth.

The strong growing *Erythronium californicum* 'White Beauty' is recommended by Ian as a good plant to start with if you haven't grown these lovely bulbs before.

The first erythronium I would recommend to anyone is *Erythronium* 'White Beauty', a vigorous form of *Erythronium californicum*, that increases well by off-sets and thrives in most moderate garden conditions; along with this you should try *Erythronium tuolumnense* and its hybrids such as *Erythronium* 'Pagoda' which are commonly available. *Erythronium tuolumnense* grows on sloping, wooded river banks hence it has evolved larger leaves to capture light; this means it will require shade from strong sunshine in many areas plus shelter in all areas from strong winds. We can grow it in the open in Aberdeen but it has the added advantage of also growing when well-shaded under the larger rhododendrons.

If you can get these plants to grow then you stand a good chance of succeeding with some of the other species and cultivars. Initially you could try acquiring some of the erythronium that are available as bulbs for sale or swap but I have no doubt that the best way to get erythroniums into your garden in quantity is by raising them from seed. Seed is regularly available through a number of sources such as the Members' seed exchanges operated by a number of specialist groups plus there are various commercial seed lists run by both small specialist collectors and the larger seed companies.

When you first have erythroniums flowering in your garden you should always

encourage them to set seed—it is often said and written that you should not let your bulbs set seed because it weakens them. I have done many trials and that is simply not true for erythroniums. A bulb that is making seed will grow on for a further four or more weeks longer than one that has no seed forming—this additional period of growth more than makes up for the extra energy required to make seeds and I have often found that the largest bulbs were on plants that also produced seed.

Apart from this, seed is your insurance of keeping a good healthy stock of plants growing on in your garden and you should collect and sow some of your own seed every year.

One of the big advantages of raising plants from your own garden seed is that through the natural selection process each successive generation will become more adapted to your garden conditions and weather or to put it the other way around those seedlings that cannot tolerate your conditions will die.

Erythronium sibiricum is one of the plants that, after a number of generations, we have managed to 'climate shift' to the extent that we now have many well-established self-seeding plantings of this previously difficult to grow plant in the garden.

To achieve maximum increase it is best to sow and raise erythroniums in pots for the first three years before planting them out into the garden but as you start

A wonderful group of *Erythronium sibiricum* which can be difficult in cultivation.

to get large numbers flowering every year you can choose to leave them to shed their own seed naturally—I do sometimes improve the distribution of these seeds by gathering a handful and scattering it across other areas of the garden.

Erythronium revolutum is one of the best species for self-seeding around in our garden and indeed many of the resulting offspring have hybridised, most often with *Erythronium californicum* forms. These hybrids are mostly fertile producing seed most years but only tend to have up to one third of the quantity that the species produce.

I much prefer to group plants in communities rather than having a clump of a single plant surrounded by bare ground. In nature plants rarely grow in isolation and this more natural style of planting looks much better. In addition the plants become a supportive community forming a beneficial environment by shading the ground, helping to retain moisture and suppressing weeds.

Erythronium dens-canis and the other Eurasian species tend to be lower growing and are best teamed up with plants of a similar stature—one combination we have is with *Trillium rivale* which flowers around the same time.

Erythronium japonicum is a very beautiful species that we have been increasing by collecting and sowing our own garden seed which in addition to building up our numbers also helps to adapt them to our growing conditions.

The pink flowers of *Erythronium revolutum* greatly extend the season in our

Some of the author's *Erythronium* growing in a mixed community amongst *Fritillaria*, *Trillium*, *Dicentra* and other shade loving plants.

Erythronium 'Craigton Cover Girl', a vigorous hybrid that clumps up quite quickly and which arose in the author's garden.

early spring beds, picking up the flowering interest from the earlier flowering eranthis and galanthus, and flowering happily through *Corydalis solida* and *Anemone ranunculoides*.

The taller species and cultivars work well growing through a carpet of dicentra or corydalis foliage along with fritillarias, lilies and trilliums, etc.—they add great colour and interest to the spring garden. There are so many combinations of plants that can be enhanced by the addition of erythroniums. It is up to your own imagination what combinations you might try out, the only limitation is that the plants must enjoy similar environmental conditions and be in scale so none will out-compete the others.

Many erythronium species are very slow to form clumps in the garden, often staying as a single stem for many years, while most of the cultivars and hybrids, such as the creamy white *Erythronium* 'Minnehaha' a superb garden hybrid of *Erythronium oregonum* raised by the late John Walker from Kent, form clumps relatively quickly.

Another from the same grower is *Erythronium* 'Susannah' which is one of the finest of the larger yellow hybrids derived from *Erythronium tuolumnense*.

Of the many hybrids that have seeded in our garden I have selected and named just a few. One of these being *Erythronium* 'Craigton Cover Girl', a pleasing pink

Erythronium revolutum hybrid which has a good rate of increase, forming clumps within a few years.

Even in our cool moist garden the erythronium bulbs go dormant by late June/early July when the leaves will die back and the bulbs go into their resting stage, leaving just the dried stems holding the seed capsules above. This allows for other plants such as arisaemas, dactylorhizas and liliums to share the same space and extend the flowering interest of a bed.

When growing plants so intensely as we do we have to consider feeding—for the most part we do this the natural way by recycling all the seasonal growth, deciduous leaves, prunings, etc., through the compost heap. This material is then returned to the soil as an annual mulch, applied in January, so that we are not removing the goodness from the ground. I will only add fertiliser where I think there is evidence that the plants are suffering a deficiency of some sort. Weak growth or chlorotic leaves indicate that I should add some nitrogen which I will apply sparingly as an N-P-K, 7-7-7 granular feed, preferably one that also contains trace elements, just as the first signs of growth appear in the early spring. If the erythroniums are not flowering well then you should apply a soluble form of Potassium (K) as the flowers fade.

Another reason the plants can lose vigour is if they form congested clumps—the increased competition means that none of the bulbs can get sufficient moisture or nutrient to grow well—so it is then time to lift and divide the bulbs.

The ideal time to lift and split most bulbs is when the foliage starts to yellow and die back at the end of the growing season. The old leaves act as a guide to where the bulbs are located but not to the depth at which they might be found. It is best when digging up the clump that you assume the bulbs will be much deeper than you think, so dig carefully, in from the side where possible, until you locate the bulbs. Inevitably some bulbs will get damaged or broken when you lift them but do not discard them. Plant all of the bits back as some, if not all, of the broken pieces will grow on or form new bulbs.

I think it is impossible to improve upon the beauty displayed by the true species of erythronium which nature provides us with but many of those are not so easy in cultivation and often slow to increase, however for those not wanting the challenge there are an increasing number of hybrids becoming available to gardeners that will tolerate a wider range of growing conditions with the added advantage that they increase readily by division.

No garden should be without some *Erythronium*.

Further reading

If you want to read more please feel free to download my free 278 page fully illustrated E-book 'Erythroniums in Cultivation' a link can be found on SRGC.net.

Henry Rosthorn hybrids

Dr Jürgen Koch *recounts some of the history of the Aurelian lilies and tells us about his ongoing work to develop a black-hearted white Henry Rosthorn hybrid. And if you have sometimes wondered why your* Lilium henryi *plants lean about so much, Jürgen explains the evolutionary origins of this characteristic trait too.*

31 years ago Josephine Henry published a short notice about her seedling 'Josephine', a white flowered *Lilium henryi*, which had shown up from a batch of *Lilium henryi* var. *citrinum* seedlings and flowered (and disappeared) in 1987 (Henry, 1988). Three, respectively four years later Charlie Kroell made the lily world aware of the beauty of *L. henryi* hybrids with black nectaries (Kroell, 1992) and about the infrequent yellow flowered *L. henryi* (Kroell, 1991). These papers impressed me and created an interest to combine the white flower of 'Josephine' with the black nectaries, which Charlie Kroell had described and pictured so nicely. When I started in 1999, this was my holy grail but the upcoming newly rediscovered Chinese species *L. rosthornii* offered new perspectives; it presented the potential to aim for more elegant plants, more upright and erect, with bigger inflorescences and intensified colours.

In 1888 small quantities of *Lilium henryi* had been sent to Kew by Augustine Henry from the gorges of the Yangtze-kiang. An anonymous gardener at Kew Gardens was the first person to succeed with the 'Aurelian' cross and to flower the resulting *L.* × *kewense* (*L. henryi* × *L. leucanthum*) in 1900, the same year when E. H. Wilson started his mass introduction of *L. henryi* to Europe from thickets south of Yichang. The 1907/08 introductions of *L. henryi* to the USA came from the same habitat, to which the strong growth of the Henryi stems, their tendency to lean against branches, and the phototropic growth were effective adaptations. According to Wilson, the vigorous *L. henryi* population of the Western world is derived from just this small habitat (Wilson, 1925). The notoriously leaning stems of '*L. henryi*' and its descendants, the Aurelians, are a result.

The few plants of *Lilium* × *kewense* were less successful. They were a sensation, when they were first described, but soon they succumbed to virus and apparently interest in them dwindled. However, the clone may have lived long enough to be used as progenitor material, since Alexander Grove from Kew lost his last Kewense in 1925 (Grove, 1927), the same year, in which Debras made the more famous cross *L. henryi* × *L. sargentiae*. In terms of vigor, Debras' *L.* × *aurelianense* was no improvement to *L.* × *kewense*. But times had changed. Might *L.* × *kewense* have been an object of interest to secretive breeders like Abel or Luther Burbank? 30 years later Debras' cross found interest among American breeders, who were

Two clones of *Lilium rosthornii* growing in the author's garden.

just about to improve the Chinese trumpets through their breeding[1]. These in turn did the great job to combine the genes of Debras' lily with those of their newly developed trumpet hybrids. It was their open cooperation, which was the fundament of the success story of *L.* × *aurelianense*.

In the late 1990s new *Lilium henryi* accessions reached the West. One accession, in particular, looked strange. The plants carried the Henryi flower, but had narrower leaves, were shorter with sturdier stems and flowered much later. The colour of the nectaries varied from the ordinary green through shades of black to a shining black. The plants were identified as *L. rosthornii* (Kühne, et al., 2000).

Since 1999 I have been on the road to hybrids with a predominance of *Lilium henryi* and *L. rosthornii* in their background. The start were Aurelians with the best possible Henryi appearance crossed to *L. henryi* and *L. rosthornii*. The offspring were intercrossed to reveal recessive traits; resulting plants with recessive

[1] The 1960 NALS Yearbook contains accounts by Yerex, Palmer and de Graaf on the early work with *Lilium* × *aurelianense*.

traits were then backcrossed with *L. henryi* and *L. rosthornii*. The plans were straightforward, but practice presented unforeseen challenges.

Advanced hybrid populations, in terms of generations quite away from the initial species, make it possible to see the effect of genes independently from their original background. In this new 'environment' they interact with genes from other species and yield novel, not always wanted, traits and growth patterns, a fascinating aspect.

The basic flower colours with simple mendelian inheritance

In the very beginning of my breeding I was not sure about the inheritance of Yellow flower colour, since I used two different sources for it. One main source was yellow

Above, left, shows a plant which is a pure recessive for both Yellow and the Immaculata trait. ***Right,*** a white on diluted Yellow flower.

flowering seedlings from *Lilium henryi* var. *citrinum* parentage, the other, Aurelian hybrids which had derived their colour from the VIa trumpet species. Would these different sources of recessive Yellow segregate independently as different genes or would they be just alleles of the same gene? Quite soon it became clear that the Orange of *L. henryi* and *L. rosthornii* is dominant to Yellow and is inherited by a single gene. Crossing yellow flowering seedlings with any other seedlings of the same colour always yields populations with 100% yellow flowering plants.

The white flower colour is a pattern derived from VIa trumpet species. The

pattern is inherited by a single dominant gene; it seemed not to matter, whether the plants carried both alleles or just a single allele. The Immaculata trait also follows a simple Mendelian inheritance. '*Immaculata*' is a single recessive gene. The red markings are suppressed. In my experience this trait is linked to very clear intensive colours. To be sure about that, however, my populations were too small. I just take it for granted. The trait is derived from Aurelian lilies, initially from VIa trumpets.

Black nectaries and papillae formation, controlled by genes from *Lilium henryi*, *L. rosthornii* and VIa species

From the beginning I was fascinated by the 'Black Heart White' clone from the Leslie Woodriff breeding, which was spectacular because of its deep black nectaries. I wanted to breed this trait (BH) into populations with a strong genetic background of *Lilium henryi*, ideally improved in stem stiffness and with the yellow and white from the VIa trumpets. This was the idea, but in practice it did not work. I tried many crosses of BH-Aurelians with *L. henryi*: never did I find in the offspring any plants with black hearts; the trait had disappeared.

My second try was with black hearted *L. rosthornii* accessions and first-generation hybrids of *L. rosthornii* with *L. henryi* or with Aurelians. I crossed them with green hearted Aurelian seedlings from my own breeding. This time I was luckier, since I found some seedlings with shining black nectaries. When I looked into their parentage, it became obvious that the green hearted parent made the difference. Particularly two seedlings with green nectaries were good parents. From this information I derived a working hypothesis:

A yellow flower with a strong 'Black Heart'.

Deep black nectaries are a product of genetic factors from two sources. The first genetic factor is probably a single dominant allele for black nectaries (BH) from *Lilium henryi* and *Lilium rosthornii*, which is effectively suppressed in the *Lilium henryi* population derived from Yichang by independent genes. The number of suppressor genes in *L. henryi* is not known. Any plant with black nectaries like 'Black Heart White' does not carry suppressor genes. Since suppression factors do

The sharply curved pedicels and large floral bracts of *Lilium henryi* act as barbs or hooks to help it scramble through its bushy habitat.

not exist in the VIa trumpets either the BH gene segregates as a single dominant one in this genetic background. As to my present understanding, I am not sure about the number of suppressor genes in the Yichang Henryis, but have a feeling that more than one suppression factor is involved. In the case of *L. rosthornii* fewer suppressor genes might be involved, resulting in the higher frequency of black hearted individuals.

Size of papillae is another trait, which seems to be controlled by genes from *Lilium henryi* / *L. rosthornii* and VIa species. I have not given this trait much attention, but I recognised that seedlings with strong formation of papillae had always a significant amount of VIa in their background. Papillae formation is recessive to papillae suppression (from VIa species), but if a lily is homozygous for this trait, papillae growth is strongly enhanced, if enhancing factors from VIa lilies are still present.

Yichang Henryi, a spreading climber?

Recent studies by molecular markers group *Lilium henryi* with the VIa trumpets; homology of VIa and Henryi genomes underlines these findings. Therefore, the marked differences in morphology may find their explanation as adaptation to different environments[2]. E. H. Wilson as the mass introducer of *Lilium henryi* and

[2] The marked morphological differences between the sister species *Lilium henryi* and *L. rosthornii* may also be a consequence of different habitats.

The recurving tepals of *Lilium henryi* cling to anything nearby, such as can be seen in this photograph of a group of hybrid siblings!

Lilium regale described very different habitats for both species.

The Yichang Henryi lives in bushy habitats, which explains the phototropic growth of the stem in spring. Leaves unfold, when they have reached the surface of the canopy. The 'Spring' stem develops fully until the longest days of the year. The leaves are lanceolate. The *Erectum* variant, as far as my limited experience allows, has predominantly geotropic growth and makes it better adapted to borders, where the phototropic growth of lilies derived from Yichang Henryi makes staking necessary. The geotropic growth pattern is a common pattern of *L. rosthornii*, particularly in the early introductions by Chen Yi. The result is stiff stems, which carry themselves without any help by staking.

The later stem develops from the terminal meristem. Before this stem develops Yichang Henryi go through a quite short period of dormancy, which is much more pronounced among the Chen Yi Rosthornii. The latter form a terminal bud, similar to a bulb, which stays for some weeks, before new growth starts[3]. In this terminal bud the flower buds develop. Probably due to this late development the European lily fly (*Liriomyza urophorina*) does not attack my late flowering seedlings, an unintentional but welcome attribute. Another welcome attribute is the ability of young seedlings, with a wire-like stem, to develop a single flower, if just the terminal leaf is ovate. This allows the identification of siblings with desirable flower colours one year before classical Aurelian or VIa trumpet seedlings make their first flower.

[3] I have no experience with growing *Cardiocrinum* myself but during a visit to the Gothenburg Botanic Garden I could admire a beautiful stand of *Cardiocrinum* plants with a very similar terminal bud.

The leaves of the 'Spring' and 'Summer' stem differ markedly, but this is not the sole difference. In particular the stiffness of the spring and summer stem is inherited independently. A particularly unwanted combination is a stiff 'Spring' stem combined with a weak 'Summer' one. However, the combination of both a stiff 'Spring' and 'Summer' stem is possible.

A painstaking and time consuming challenge with my unselected seedlings is their separation during the flowering stage, when I try to identify superior siblings. Due to limited space the seedlings are too crowded; professional breeders would allow their seedlings more space. But this is not the whole story. The buds, the opposite bracts and the unfolded petals act as barbs. The whole inflorescence with its first and higher order branches performs as an anchor which fixes the flowers and developing fruits to the surface of the canopy. Too often summer stems develop the full extent of their weakness when the inflorescence is fully developed in order to perform its function as an anchor in the optimal way.

What are the perspectives of my Henry A. Rosthorn hybrids?

The 'A.' stands for Aurelian. Aurelians still confer a big part of the genome of Henry Rosthorn hybrids. If it comes to the selection of vigorous plants with shining black nectaries, a stronger proportion of Aurelian germplasm makes the breeder's life easier, but results in plants with bigger, more open flowers close to the fantastic hybrids of Mego or Schieman. Thus, I have mostly stopped using such clonal material except for particular purposes.

In the end it remains a numbers game to combine all wanted traits in one single plant, which renders it valuable enough to multiply it as a clone. A first step of evaluation is in the seedling boxes, which I grow in a polytunnel in the Pur Natur garden centre in Holdenstedt / Uelzen. The second step of evaluation is done in my garden, which is the true lily hell. My 'pure silk loam' is not well aeriated! Few plantlets develop large sized bulbs with good root development under such conditions. The garden and particularly the lily bed is a frost pocket; late frosts take their toll when I do not protect the plants. Unfortunately, these challenges are mostly met by plants which are the most attractive ones. However, there is some progress. Female fertility is high as is the compatibility of pollen. The size of seeds is somewhat intermediate between *L. rosthornii* and *L. henryi*. Seeds germinate without delay and seedling growth is excellent.

Even if I have not fully reached my goals, I have nevertheless started to build up clones from my better seedlings. I have also started to develop strains by crossing selected plants. One seedling batch of this year looks quite promising with

Two individuals which are approaching pure white.

'Citrinum' yellow flowers, the plants tall and erect and well branched. Last year I crossed two unrelated plants, which carry the recessive Yellow and Immaculata in a Henryi flower, and both have shining black nectaries. How will they perform? Will they find interest? In the meantime, new combinations pop up like vigorous semi dwarfs. And the Holy Grail? The plant with shining black nectaries, the yellow replaced by a faint green and the rest of the petal bright white, the plant strong and erect, is still wanting.

References

Freimann, L. N. (1954). Inheritance of Yellow Color in Golden Regale. [ed.] George L. Slate. *The Lily Yearbook of the North American Lily Society.* 1954, Vol. 7, pp. 43–44.

Grove, A. (1927). Hybrid Lilies. *The Gardeners' Chronicle.* October 22, 1927, p. 329.

—, (1932). Hybrid Lilies VIII. *The Gardeners' Chronicle.* December 24, 1932, p. 464.

Henry, J. (1988). A Truly Stunning New Lily. [ed.] John A. Montgomery. *The Lily Yearbook of The North American Lily Society, Inc.* 1988, Vol. 41, p. 25.

Horsford, W. C. (1947–1948). *Lilium Henryi citrinum* (Yellow Henryi). [ed.] George L. Slate. *The Lily Yearbook of The North American Lily Society.* 1947–1948, Vol. 1, p. 115.

Kroell, C. (1992). Division VI Hybridizing in Michigan. *The Lily Yearbook of The North American Lily Society, Inc.* s.l. : Helsley, Calvin, 1992, Vol. 45, pp. 60–66.

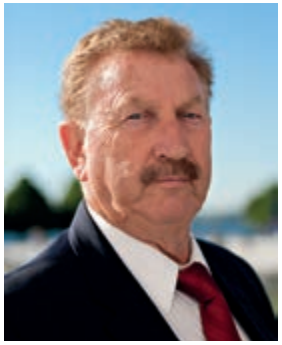
—, (1991). The Yellow Henryi. *The Lily Yearbook of The North American Lily Society, Inc.* s.l. : Hoffman, Mary, 1991, Vol. 44, pp. 90–95.

Kühne, H. and Martschinke, N. (2000). *Lilium rosthornii*: Variation of Characteristics. [ed.] Eugene Fox. *The Lily Yearbook of The North American Liliy Society.* 2000.

Wilson, E. H. (1925). *The Lilies of Eastern Asia.* London : Dulau & Company Limited, 1925.

Dr Ieuan Rhys Evans 'The martagon king'

***Chris Hind** has written a brief biography of this highly successful breeder and grower of martagon lilies who now lives in western Canada, but grew up in rural West Wales.*



Ieuan now lives in the Spruce Grove area of central Alberta, near Edmonton on four and a half acres of diverse gardens where he cultivates his martagon lilies. Through the scattering of his martagon lily seeds, the purchasing of bulbs or the propagating of scales, Ieuan has some ten to fifteen thousand lilies flowering throughout his plot, under trees and in numerous locations throughout his gardens.

He was born in 1940, and was raised on a small mixed farm in the Welsh speaking village of Penclawdd on the North Gower Coast of Southwest Wales, an area with few imports, making it essential that the inhabitants be primarily self sufficient. His mother loved flowers and his father had a passion for fruit trees, an interest he later came to cultivate.

Ieuan attended the University of Wales at Aberystwyth and graduated in 1963 with an Honours Degree in Agricultural Botany. From the wide range of options available to him he accepted a two-year scholarship from a Welsh/American foundation at Pittsburgh for graduate study in the United States. This was followed with a subsequent Fellowship from the University of Florida at Gainesville, from where he graduated with a PhD in Plant Pathology, specialising in plant and animal virology in 1969.

After a five-year stint as an assistant professor at the University of Guelph in Ontario, Canada, he left for his long-time position as a forensic plant pathologist for Alberta Agriculture at Edmonton. He had very many successful endeavours that included a cure for ergot in wheat and barley, control of bacterial ring rot in potatoes and the provincial control of Dutch Elm Disease.

His most notable achievement was the culture and disbursement of the 'Evans Cherry', currently the most popular fruit tree in Canada. But he is likely best recognised for his work on the role of copper in crop production.

Lilies He became interested in lilies while living in Edmonton around 1990, attempting to grow oriental, trumpet and other exotic lilies along with many

Above, and ***inset***, thousands of the brilliantly coloured martagons flowering in Dr Ieuan Evans's plot in the Spruce Grove area of central Alberta, western Canada.

Asiatics. His only success came with some of the Asiatics since most of the other aforementioned lilies were not hardy in the cold Edmonton climate. His initial success in lily breeding came in the mid-1990s with a single Asiatic cross that he named after his mother, Gwyneth Evans. A down facing, orange/pink, strong stemmed lily, 'Gwyneth Evans' is a disease resistant, very fertile, consistent show winner, achieving a couple of 'Best in Show' awards.

Awards In 2012 Ieuan was inducted into the Alberta Agriculture Hall of Fame and in 2018 he won the Fred Tarlton Award—Best Stem of the Martagon Show, with his stem of 'Hantsing' at the Alberta Regional Lily Society 23rd Annual Martagon Show.

Martagons Martagon lilies exist both as the species (*Lilium martagon*) and as 'martagon hybrids', along with other closely related species such as *L. hansonii, L. medeloides* and *L. tsingtauense*. Recent cross breeding of these martagon species with North American ones are called Martasians and are an exciting group of lilies.

His initial purchase of martagon lilies came in 1996 with the purchase of 'Mrs. R. O. Backhouse' and 'Sweet Betsy', both bulbs being, at this time, five times more expensive than Asiatic types. He found the hardiness of the martagon lily made it ideally adaptable to the cold Alberta climate.

After joining the Alberta Regional Lily Society in the next year or so he began collecting these expensive martagon lilies cultivar by cultivar. He pondered as to why they were so very expensive, paying up to $45 dollars a bulb. In 1996 he moved

out of Edmonton to an acreage just north of the town of Devon, Alberta which had sandy soil, 60-foot poplar trees and a fresh water pond. In the next few years he learned all he could about lily breeding and almost immediately disregarded most, if not all, the advice he'd obtained. He wondered: why could one not mass cross and plant tens of thousands of Asiatic and martagon lily seed? After all, if you developed an outstanding martagon, do you really care about the heritage? Furthermore, if one developed a new lily, DNA testing could, at any point in time, identify the parentage. It was his opinion that success should be judged through the development of new and unusual lily colours and patterns, along with greater disease resistance, reliability and continued longevity of the particular lily.

With the desire to make the martagon lily more affordable to a greater number of people, by the start of the year 2000, Ieuan had many thousands of Asiatic and martagon seedlings. He selected only the most persistent and colourful of the Asiatics, with the main objective being to mass produce those very expensive martagons.

Within 10 years he had selected over one thousand new martagon cultivars, which now needed to go through vigorous testing for persistence, shape, colour, disease resistance and reliability. This resulted in reducing the numbers to just over a hundred select plants that could potentially be registered as new varieties.

His successes at both the North American Lily Show (NALS) and Alberta Regional Lily Show (ARLS) reached a peak when his martagons took 12 of the 18 classes at the competition, including 'Best in Show' with the martagon cultivar 'Megan Evans', named after his eldest daughter.

He hopes to have registered some 50 new martagon cultivars and six more Asiatics by the end of 2019.

Ieuan's martagon crosses range from 3 ft to over 8 ft tall and come in a wide range of colours from pristine white to deep red/ purple. His crosses are very vigorous and will multiply rapidly forming a large clump if left undisturbed where they are happy.

Propagating martagon lilies

Ieuan advised in an article for the North Star lily society:

If you are already growing martagons then be sure to collect the seeds in August or early September before the pods shatter. Most martagons will set seed, some more than others.

a. You can sow the seeds immediately into the ground (semi shaded is best, East aspect) about 1-inch deep. Water in and if you have a mild fall (even in Alberta sometimes) the tiny martagon seedlings will emerge in April–May. With care and weeding you will have martagons in flower in 3–7 years. If you seed them late in October, the seedlings may not emerge for a further year.

Above and opposite, a selection of Evans martagons in Chris Hind's collection in Scotland showing the wide range of colours.

b. You can exactly follow the Evans Method for scales or use Ziploc bags, and placing around 50–200 seeds per container, anything from 1–200 of the seeds will germinate. Follow exactly as outlined in the Evans Method, planting the container contents or bags into 4-inch deep holes and covering with an inch of potting mix. I do this in rows. After the three-month chilling period, the seedlings will emerge like blades of grass a week or so following planting in late April or early May
c. Collect the seed as in (a.) above and scatter the seed in your shaded or shrubby areas of the garden and in a few years, if you look carefully, you will notice martagons popping up everywhere. Following this method, I have martagons all through my wood lot, under trees and shrubs and even one that is now flowering on the edge of a shaded but poorly kept and mown lawn. They will effectively naturalize on their own in favourable locations in our Northern climate.

My connections to Ieuan

Five years ago, I started in earnest to build up my species lily collection and I made contact with Richard Hyde of H. W. Hyde & Son where I discovered the beautiful range of Evans Martagons. Hyde lilies were my sole UK suppliers of these gorgeous martagon lilies.

I tried contacting Ieuan by several routes in 2017 but to no avail. I had almost given up when I was finally contacted by Ieuan in 2018. We have had several long discussions on his breeding of hardy plants and I have managed to acquire a substantial number of Ieuan's martagons. These are now growing in Northeast Scotland in what seem like ideal growing conditions.

The colour range is spectacular; from the pristine white of the award-winning 'Megan Evans' to the dark pink of 'Jennifer Evans'.

The future

Ieuan considers one of his most notable and significant success stories to be the growing and provision of affordable martagons. He has developed methods of propagation of the lily (videos of his technique are posted on YouTube) which empowers growers, even those with little time, to realise success. In turn these individuals derive great pleasure in growing these exquisite martagon lilies, which are extremely hardy having come through some harsh Canadian winters, to flower in their gardens and deliver a fragrant bounty of a mass of blooms year after year.

Availability of Evans Martagons

For the past decade Ieuan has shipped numerous varieties of martagon bulbs dug from his gardens to locations across the globe. As newer cultivars pass his testing, they will be made available to his extensive client list.

Ieuan continues to strive towards making the general public far more knowledgeable and interested in, or excited about, these lovely garden plants, hardy enough to withstand the harsh winters and somewhat questionable growing seasons of Alberta, Canada. Ieuan commented *'The real thing is that you can tinker around and produce something new by chance or design.'*

Useful resources [Online resources accessed 1 September 2019]

Fox, E. (2006). Martagon lilies. NALS.
H. W. Hyde & Son: Ieuan Evans martagons from Canada, www.hwhyde.co.uk/catalog/martagon-lilies
NALS Martagon CD Image bank, www.lilies.org/martagoncd/index.html
NALS website, www.lilies.org/
RHS Lily Register, www.lilies.org/articles/martagon%20register.pdf
Interview with Dr Evans, www.youtube.com/watch?v=hBHbl0RGc4w
Martagon Lilies Propagation with Dr Evans, www.youtube.com/watch?v=Z3c3XZrenDs

My focus upon *Lilium* species

***Matthias Knoll** describes his novel project to conserve the* Lilium *species. His in vitro work may save some from extinction and give future generations the opportunity to grow and enjoy them.*

In this article, I report about my attitude towards plants, lilies and *Lilium* species in particular. While almost all lily enthusiasts dedicate their main interest to achieving flowers from their plants, my experience with lilies is a more specific one, especially because I do not really expect these plants to blossom here, as that would be just an unnecessary stress for both the plants and for me. My garden, in Austria, is surrounded by a forest of about 20,000 m^2 and of course there are lilies growing, which are allowed to flower if the chickens do not dig them up or the sheep do not eat them first. But 99.9% of my lilies do not grow in the garden, they do not feel the warmth of the sun, their leaves do not lean in the wind, they do not know any change of seasons, they are not flown to by insects, no lily beetles gnaw leaves above the soil and there are no mice to nibble bulbs from beneath.

Doubtless, that makes my approach mysterious and a wee bit untypical, because my lilies grow under sterile conditions in polypropylene flasks upon a nutrient-

***Opposite**,* Matthias relaxing with his daughters in his Austrian garden which contains some beautiful lilies including some magnificent *Lilium regale*.

***Below**,* part of the laboratory in the basement of Matthias's house.

medium, and these flasks are put on shelves. Their habitat completely differs from mother-nature, as it is in a laboratory that they are raised from the beginning of their existence on. Not all of these plants will be released, a minority will always remain in the laboratory where it looks, and is, sober, sterile and germ-free. The plants are not gently touched with fingers, but roughly taken with tweezers. They are not staked, but cut into pieces with a scalpel when they reach a certain state. Humming ventilators are pressing air through micro-filters removing 99.9999% of all germs occurring in the normal air we breathe. I work in almost totally germ-free surroundings in the chamber. It smells of chemicals and not of soil. The plants I grow get lots of sugar, amino-acids, polypeptides and they get vitamins added.

Just as many plant-lovers talk to their plants, I do as well. My way of communication, however, is a bit different as it is done by way of chemically synthesised phytohormones. Through them I tell the plants what I expect them to do, what I ask them to perform and what I demand that they refrain from.

I use three different laminar flow-hood clean benches and a glove-box for particular steps of the propagation process. One is mostly used for the sowing

Above, left, the laminar flow-hood clean bench which is used for the sowing stage and ***right***, the flask room and sowing flasks.

stage. A second is used for filling up the flasks with hot medium and another just for tissue-culture. The technique stays the same but the ingredients and tools differ. The glove box (not pictured here) is just for very fast access to a sterile environment within a few moments.

My aim is the germination first, followed by the stimulation of mitotic plant-activity and finally the differentiation of very primitive embryonic cells. These primitive cells do not initially look as if they were of plant origin at all. At first, they do not store chlorophyll, so the tissue is often pale yellow or grey, sometimes looking transparent like a jellyfish. Chlorophyll is required for a successful photosynthesis. However, photosynthesis is initially a hindrance, the energy that is necessary for life and survival is offered by carbohydrates in the nutrient medium. Exactly dosed, depending on the state of development of the plant, and this state of development regulates the need. The medium is similar to a vanilla pudding in consistency and it is similarly sweet, almost sweeter than just sweet; nevertheless I would not taste it. It is less the phytohormone derivative itself, or the concentration, but rather the concentration ratio of several different phytohormones to each other, which tells the botanic cell-cluster what they have to perform. And doubtlessly therein lies the secret of long-lasting research, a lot of trial and error. More roots, more leaves, more vegetative shoots, a faster or delayed development cycle, an early flower, thick or thin bulbs, or that the tissue should slip into a rest now, for weeks, months, years—all these different orders can be given to the plant and are imparted by different phytohormones.

A brief change of the topic

I suppose many of you know the recent oeuvre of Mr Pontus Wallstén, in which almost all species of lilies are described and depicted. The joy of leafing through this book is soon followed by the desire to have these lilies growing and blossoming in your own garden. This temptation is certainly hard to resist, especially the philosophy of a 'back to nature' or 'back to the roots' of pure species lilies, as created by God or evolution and to reject any hybridising paranoia of mankind's imagining. Surely, the next step will be to seek specifically, and especially, for species lilies. Alas, finally, pure disillusionment pops up, as the question arises, 'which nursery offers lily species at all?'. There are masses of lily hybrids, bred by humans, available at dumping prices. Indeed, some of these hybrids are also pretty looking, but hardly remind us of the pure natural forms. Pardon me, but deliberately contaminating the genetic code of plants is a sacrilege to me—especially when the naturally grown lily species had to be used for producing hybrids from and through them. Moreover, I feel doubly perturbed, as most *Lilium* species are listed as highly endangered. Possibly, to be less serious for a moment, it was not foreseen that after millions of years of the pristine growing and natural reproduction of *Lilium*, be it vegetative or genetic, someone in Austria, yours truly, would use the plant's totipotency—a preset archaic way of propagating plants—and apply his main focus on cloning these beautiful plants. All plants and lilies in particular are very primitive organisms and carry special tissue in the bulbs, the leaves, in the root-tips, the shoots, in the flower buds etc., from which cells can be removed and new plants can be generated, one hundred, one thousand, one million and—theoretically—an endless amount.

Let us now combine the three trains of thinking: Most lily species have disappeared, are red-listed, almost extinct or still remain as poor, inaccessible genetic relicts in man made hybrids. Like all plants, lilies have a cellular totipotency. Modern technical achievement makes it possible to keep plants alive whose natural habitats no longer exist.

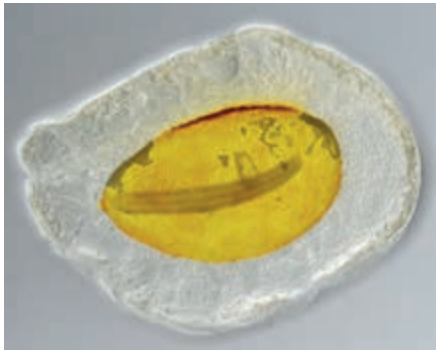
Because of the assistance and support of perhaps two handfuls of lily mates, from all over the globe, it became a reality to set up a lily breeding station—in less than four years—by sending and sharing material. The aim is to ensure the continued existence of species *Lilium*, as it cannot be the re-forestation of habitats. The aim is also to distribute plants to areas where climatic conditions are suitable and where enthusiasts can care for the plants that were born in my botanic maternity ward and nurtured in my *Lilium* kindergarten.

Of the more or less 130 *Lilium* species there are actually 121 different species in propagation, and meaningful conservation, growing in my small village in Austria. Even the exquisite Chinese lilies from the alpine, 3,500 m high areas, are growing in the laboratory and do scarcely complain, although the summer here often brings

40° C and more. Wrapped in vitro it works well, whereas planted and exposed to our Austrian climate they would soon start suffering. Even if there is the restriction that they will never flower here, which, in addition to our slightly Pannonia-inspired climate, is also due to my gardening inability, they are there, they are alive and protected for posterity.

Two ways of propagation:
propagation using seeds and vegetative propagation

The *Lilium* cloning in my laboratory usually starts with propagation from seeds. In order to start the in vitro culture under sterile conditions, the seeds must first be carefully disinfected. For this I either use 5% H_20_2 (Hydrogen Peroxide) for 30 minutes or a 1.1% NaOCl (sodium hypochlorite) solution for 20 minutes. A few seeds are put in the test tube and shaken vigorously. As a result, the germs, bacteria and fungal spores, which do not occur on the seeds surface only, but also deep below the seed coat within the endosperm (surrounding the embryo), are destroyed. Then the seeds are placed upon a nutrient medium and kept sterile. Usually, I fill a single flask with 3–5 seed corns only. Contaminations are always a risk which can happen at the very start. Seeds can be redisinfected then, once, twice, but they increasingly suffer from the chemical treatment. The flask is then closed, sealed and placed at about 18–20 °C. Whether in the dark or light is of no great importance.



A *Lilium michiganense* seed after more than a 15 minute disinfection treatment. As can be seen it is a little too early for putting it onto the medium as there are still traces of possible germs.

The seeds are attracted by the ingredients of the medium and start to germinate according to the species. It took some time, and brought me some grey hairs, to figure out a way to circumvent the natural germination inhibition of the delayed hypogeal lilies without lowering the temperature, which was finally solved by a certain pre-treatment of the seeds. The germination itself takes different times, sometimes only a few days, sometimes months. And I confess my yield is lower than the average lily grower using conventional sowing methods. I blame the chemical treatments for that.

Thereafter, the flasks are placed under artificial cool neon-lights and it usually takes 3–6 months from germination until a bulb has developed which is large

Above left, germination and ***right***, seedlings after about four months. Due to the almost transparent medium it is interesting to observe the different steps in the development from the germination to the growing of the bulb.

enough to be cut into pieces. Mostly I use the bulb for the cutting procedure, but could take leaves or root-tips as well. I cut the bulb into explants of approx. 2 mm × 2 mm. These explants will then be put into a different culture medium that is enriched with a certain phytohormone ratio, as mentioned above it is not the concentration to which a plant reacts, but the ratio of 2–3 phytohormones to each other. Within about three months a special tissue develops, named a callus, and the process of when and how it is built is called callus formation. Callus consists of extremely undifferentiated, embryonic cells (pseudo-protocorms) that show a constant mass-mitosis and increasingly form a cell cluster. This cell cluster constantly enlarges until several centimetres in diameter and after only a few weeks it is possible to remove tissue from the outer layer and place it upon a new flask filled with a further special nutrient medium in which the most important step of the differentiation takes place. As such a callus consists of several thousand cells, one can theoretically get to several thousand seedlings as a result in the first stage. That is far more than is ever needed. I usually take 30–50 pseudo-protocorms in the first stage, about the same in the second and third, months and finally about one year later. The flask with the callus stays sterile of course and will then be closed and proceeds in its mitotic activity in the same medium for about 2–3 years.

Basically the callus tissue is the most important material for the preservation of species, it is the rough diamond in a botanical laboratory and can be kept viable for several years, especially when the medium is renewed every 2–3 years. It is also

Induction of callus-formation. The bubble-like structures can be seen, ***above left***. The same callus after a further two months, ***above right***. The pigments of the later flower-colour sometimes break through. Here it is *Lilium martagon* var. *cattaniae*. This is at a perfect stage for harvesting the protocorms and putting onto a new medium for root and shoot production, potentially several hundred clone-identical plantlets could eventually be produced.

possible to freeze callus tissue in liquid nitrogen and to store it for decades, maybe for good, as a cryo-preservation.

The state of differentiation

The path from an undifferentiated cell-tissue to a well-ordered differentiation is a truly difficult and delicate one. Again and again losses must be expected and accepted, as the tissue seems extremely stressed at this stage. Chemical plant degradation products must be absorbed as waste, which is the reason I usually use a medium that is enriched with activated charcoal at this point. The problem is, some lilies do not like charcoal so I can only leave the explants in such a medium for a few days or weeks and check the flasks regularly. I would like it if you could take a look over my shoulder, as it is like a miracle when I add phytohormones, which cause the pseudo-protocorms to slow down in their overhasty mitotic activity, and when the differentiation sets in—happening step by step. Then the first leaf appears and there are the first signs of roots. At this point there is no epigaeic or hypogaeic differentiation, as all of these cells react in the same way. Once more the ratio of phytohormones mediates the pseudocorms, which now resemble seedlings more and more, to produce more and/or longer roots, more leaves (longer and/or broader ones), rapid growth of the bulb (more and stronger scales), new shoots from the base of the bulbs, etc. If, and how accurately or excessively the plant responds, is solely anchored in its genetic code. So it is advantageous to treat plants prudently with phytohormones, in general mostly because it means stress to them and also because phytohormones make a plant

unable to take up their own hormone production later. In my lab, the plants receive a controlled hormone mix input only twice, i.e. for the induction of callus and for the stage of differentiation. When the cells start producing the first tiny leaves of about 1–2 mm length, sometimes roots are already present, sometimes still missing. Then the miniature seedlings are transferred into their next medium, generally a half strength one measured on micro- and macroelements.

Finally just 1–3 seedlings are put into the final flask filled with a medium in full strength, which means 30–50 grams of sugar per litre of medium and there are no hormones added. Then the seedlings spend 1–2 years in the flask, until they reach a suitable bulb size in order to be deflasked. I do not force them to grow faster,

Bulb-formation after about 10 weeks.

which one could do using certain hormones, but I do not think it is advantageous to do this. These plants have to prove themselves now and the last selection will be done between good and poorly growing plants.

Bacterial pre-treatment of seedlings and the procedure of deflasking

It is less the bulb's size, but rather its root-mass which decides whether a seedling appears as matured enough to leave the sheltered environment of a flask. Remember, these seedlings are still growing under sterile conditions. So they have never been exposed to any bacteria, germs or fungus spores. Several weeks before deflasking the seedlings they are intentionally infected with a bacterium named *Methylobacterium extorquens*. *Methylobacterium* was extracted from the plant *Saintpaulia* in South Africa and so it is used to high humidity and soon degenerates

Lily seedlings ready for deflasking and potting after about 18 months.

under drier conditions and cooler temperatures. It grows in a harmonious symbiosis with healthy plants, expelling other germs which can likely be of high, and highest, pathogenicity to the plant. The bacterium forms an invisible shield on the plant, which was used to growing in a flask at a humidity of almost 100%. This means that in the flask the respiratory leaf pores are constantly open and the plant first has to learn the closing mechanism so that it does not dry out. This concerns the leaf bearing bulbs, leafless bulbs are not affected.

Moreover the last in vitro phase is also characterised by getting the bulb into the correct growing rhythm, according to the season. Mostly, I deflask seedlings in the autumn when they are directly stored in the fridge, or in early spring when they are directly potted. The seedlings are carefully cleaned from residuals of the medium, rinsed several times in water and then potted.

Three questions I am often asked:

As lilies are usually self-sterile, and therefore cannot be x-selfed, it makes sense to care for the propagation and preservation of about five different clones of each *Lilium* species. This is quite enough for obtaining sufficient clone diversity later if the mature plants are matured enough to flower and be pollinated. This means I usually store the calluses of about five different clones.

Seeds, usually, are free from virus. So even if your lily has been affected by a virus, the seeds will not be impaired at all and the later seedlings will not be either.

Is it possible to clone a plant which has been potted once? Yes, but the germs in the soil are like pests on the scales and can be deeply penetrated into the scale's tissue. My method of disinfection is intended to ensure seeds are free from any

Let us hope that Matthias is successful in his efforts to save rare and endangered *Lilium* species such as *Lilium matangense* pictured here.

germs. It requires a chemical 'bomb' to disinfect the scales—usually mercury chloride. However, as my health still means more to me than risking it by saving the lily flora worldwide, I collaborate with some laboratories to which I send soiled scales which are returned to me sterile. Nevertheless, the dropout rate is high. Therefore, it is better to use tissue from other parts of the plant, like leaf-axils and shoot tips. Alas, it is impossible to obtain these materials sent via 'snail-mail'. I have tried several times and the plant material always arrives rotten. Returning to the topic of virus. If the plant one takes material from is virus infected, the tissue will be as well. So I rarely undertake such tasks, as it is too risky for my entire collection.

Final words

40 m^2 of laboratory space means 25 m^2 for the clean benches, and the equipment, and 15 m^2 for the flask room, a few thousand flasks, and some IKEA shelves—my place and my passion for dealing with my plants. That's enough for me and I'm happy with it. I do not miss anything. This task involves more meaning than a flower or even a whole plant can ever give to me.

Plant them, continue to cultivate and raise them, get them to blossom and enjoy the flowering—your part, your passion—and the awareness that these lily species are neither lost nor extinct, just a few steps away from a recent and necessary reproduction.

Special thanks to Hans-Joachim Pischeli for the microscope photograph of a disinfected seed. Matthias is constructing a website (www.lilium-tc.com) where you will be able to discover more about his work. Ed.

Breeding martagons, where do we go from here?

Holger Kühne *has taken on the task of maintaining the late Norgart Martschinke's many fine lilies and continuing her breeding programme. He explains the background to his efforts and describes some of the main lines and aims in her work over many years.*

As a number of people are aware, I have taken over the breeding of Norgart Martschinke's lilies. This is something I discussed with her several years ago. In 2017 she was ready to part with a first batch of lilies. With Norgart's help in assigning the names, I dug up the bulbs from the first three beds in her lily garden and planted them in my prepared ones. It was already a bit late in the year, and not all of them flourished in the following season, but most should recover this year. In 2018 we continued with three more beds in the autumn. Unfortunately, the labels were faded or lost, so that many bulbs could no longer be identified. Americans and typical martagons can easily be recognised by their bulbs, but some *Lilium hansonii* hybrids are very similar to Asiatics in this respect, all white. At the moment I have catalogued these according to their new growth.

The cross which is to be registered as 'Norgart Martschinke' (and some seedlings in the foreground).

Lilium 'Borholm'

Lilium 'Helsinki'

After her unexpected death, I also planted the lilies from Norgart's home garden later last year. She had only planted her favourite lilies for breeding in the home garden. The labelling was better, but I can't be sure about several of them. The first flowering will hopefully give indications of their recent breeding.

In addition, I have the records of her hybridising from 1975, together with photos. Unfortunately, some hybrid numbers are out of sequence and cannot be identified with certainty. However, that should not be so important when specifying the pod and pollen parents.

The American hybrids and OT's present no great difficulty in identifying specific cultivars but martagons and some Asiatics are much more of a challenge. A number of them are missing labelled photographs of the seedlings and key identifying details, which would allow one to distinguish the very similar seedlings from existing or old varieties of other breeders. For example, I have five white martagons: do they include 'Borholm' and 'Helsinki' or are they really other seedlings? This year I have found the true 'Borholm' and 'Helsinki', so that this problem of identification will be solved next year by growing them side by side.

That's the situation with the first five *Lilium martagon* var. *albiflorum* types, different and possibly named previously. Most crosses have only one or two seedlings. This is normal, because for some crosses not many seedlings appeared and these are then the survivors after years. Only with 'Habibi' × 'Papa Kiel' (07001) did I expect the flowering of five different plants, certainly all albiflorum types, but all show a strong growth in the second year and come into growth late. The emerging shoots of the other hybrids mostly took over six weeks to develop this year; some are very early growers. This last type is better protected against later frosts and -2 °C did not harm them. They have very broad leaves and the bulbs divide every year. The broad leaves are typical of seedlings with *Lilium martagon* 'album superbum' in the ancestry, a plant Norgart used very intensively in the

Above, left, the characteristic 'blotched' petals of 090041 and ***right,*** one of Norgart Martschinke's seedlings from her cross 10007 showing progress towards her aim of achieving a white flower with concentrated spots against a black border.

breeding. Standing with a lily friend in front of the flowering plants, we couldn't find any difference between the labelled seedlings from this cross. All bulbs are the same clone and now named and introduced to honour the breeder, 'Norgart Martschinke'. The registration is to follow shortly.

I also find the flower of 090041 interesting. This type is called 'blotched', the petals are provided with a splash of colour. The first plants with this trait are probably *Lilium* 'Blotchwood' by Ed Robinson and later *L.* 'Random Bliss' bred by Norgart Martschinke. The plant named 'Schokostern' (not registered) does not show this very impressively on a dark red background, but 100052 shows the character clearly on pink. I have managed to breed the first 'blotched' seedlings, although it will be years before they flower and I am able to see the outcome. A special goal in her breeding was a white flower with concentrated spots against a black border. Some seedlings of the cross 10007 showing her progress in this line.

There are still many gaps in the information I have about Norgart's bulbs which survive in cultivation. As Norgart Martschinke has given seedlings and named varieties to many lily friends over the years, it would be very helpful if I could get information such as seedling number and flower details from them. My current information on the stock is available to all at www.plant21.de and I would appreciate comments and feedback. Likewise, we should not forget some hybrids originated with other breeders such as Otto Beutnagel and Hermann Dierssen. The preservation of these plants should lead to their increase and subsequently to them becoming more widely available.This is my hope and my aim.

A lily enthusiast's year

Mel Herbert *describes some of the highs and lows, and the challenges and joys of growing lilies in his garden in Ceredigion, Mid Wales in 2019.*

I am very lucky to live in an extremely beautiful part of Wales which enjoys a generally mild Atlantic climate. Winters are usually wet, but not overly cold, with just a few frosts and only four or five nights when temperatures fall to -4 or -5 °C. Mean minimum temperature in January is around 1 °C with an average of 194 mm of rain during the month. Summers tend to be wet and cool, and only rarely does the thermometer rise to the heady heights of the mid twenties. The average maximum temperature in July is 18 °C with 130 mm of rain and mean annual rainfall is over 1,800 mm compared to a UK average of less than 900 mm. The garden itself is fairly high at about 176 m and slopes to the south looking across the Aeron valley towards the Cambrian Mountains. Being largely open to the south and west we are exposed to the prevailing winds but deciduous trees afford some shelter when they are in leaf.

The natural soil in the garden is a medium clay based loam which is neutral to slightly acid. Some areas are a little heavier and others are quite stony. Nutrient leaching is an ongoing problem due to the high rainfall and so relatively high levels of fertilizer are applied to the garden generally. For the lilies this is mainly in the

form of blood, fish and bone in the spring and organic mulches of very well rotted horse manure mixed with garden compost and leafmold. Many of the more difficult species are grown in raised beds of prepared compost in partial or dappled shade and these are less heavily fed, usually with an organic liquid fertiliser.

Some more tender species are grown in pots and some of those which suffer outside in our wet and windy conditions are being tried in a well ventilated polytunnel, known as the 'Lily Tunnel'. The aim being to keep off the worst of the rain rather than to maintain higher temperatures.

Early January was, as one would expect, a quiet time with regard to the lilies. Established plants of *Lilium speciosum* var. *gloriosoides* 'Taiwan Form' and young ones of *L. michauxii*, from a Texan seed collection, were still in leaf growing in pots in our cool conservatory. There were also new *L. alexandrae* shoots pushing through and some developments in a few seed pots. Seeds of *Lilium alexandrae* and *L. nobilissimum*, both of which came from the Lily Group exchange, started to emerge and young seedlings of *L. candidum* and its variety salonikae sown in the autumn seemed to be doing well. I had sown them in October thinking of the natural growth cycle of the species and having experienced repeated failures with spring sown attempts. The wet climate in Ceredigion makes the Madonna Lily a difficult subject so I intended to plant out the young bulbs in the polytunnel, where conditions might be a little closer to the plant's Mediterranean origins.

The promised cold snap arrived towards the end of the month with snow and frost but in the sheltered environment of the conservatory the plants continued to grow steadily.

As January drew to a close I began to check the overwintering seed pots which contained the seed of species with delayed germination. These were inside plastic freezer bags and stored in a cold shed. By the end of the month seeds of *Lilium rhodopeum* and *L. pomponium* (both with epigeal germination) were germinating and pots of *L. columbianum* (hypogeal) were producing their first leaves.

With the weather warming overwintering pots were moved to the polytunnels ready for germination and emergence. Whilst in the bags a nicely moist condition was maintained but once out in the open evaporation would take place and so watering with a very fine rose would be needed. The *Lilium candidum* seedlings were now large enough to plant out in the Lily Tunnel. This was done with as little

disturbance as possible and with a sprinkling of mycorhizal granules placed in the hole following an interesting online discussion with a fellow Lily Group member.

Out in the garden a major task was to remove the winter protection from many of the lilies. Species which are pretty tough and enjoy wet conditions, such as *Lilium pardalinum*, are not protected from the winter rains but most are covered in some way. Sheets of plastic, old double glazing units, and movable plastic cold frames are all pressed into service to try to shed off the excess water. I'm afraid that the garden is not a pretty sight through the winter months!

The first lilies through in the open garden are usually *Lilium pardalinum* and this was the case in February this year. Young plants of the Caucasian species often rise early too. The final days of the month brought sunny and remarkably warm weather, the local weather station recording a UK record for the month of 20.6 °C on the 25th. The major task of sowing seed of species with immediate germination was begun in earnest.

Early March saw new shoots pushing through every day. It's always exciting to see that recently planted bulbs have survived the rigours of winter and old friends are reappearing to bring much pleasure yet again. The first tiny lily buds of the year were spotted on the Taiwanese form of *Lilium speciosum* var. *gloriosoides* in the conservatory and in what we call our woodland garden the *Cardiocrinum* were developing rapidly, especially a small form of *C. giganteum*. More seedlings were appearing almost by the hour! Especially pleasing were some pots of *L. rhodopeum*. The seed was sown straight from the pod in 2018 and the germination rate was almost 100%.

March also saw the first slug damage to emerging shoots, on one or two lilies and some Disporopsis, so control measures were initiated. We try to use as few chemicals in the garden as we can though I don't think we can claim to use entirely organic methods. Fortunately, we do have a wide range of birds, both resident and visitors, which help to control numbers of some pest species. The hammering of a snail shell on a song thrush's favourite anvil is a very satisfying sound but I have my doubts that any of them predate the slimey and, so I'm told, bitter tasting slug to any great extent. On the other hand, frogs, toads and hedgehogs certainly do and are encouraged as much as possible. The use of nematode controls isn't practical on the scale of our garden (I would need to take out a mortgage!) so apart from the natural predators hand collecting in the very early morning seems quite effective in reducing numbers considerably.

By the end of the month the spring sowing was complete and there was a little time for more general gardening tasks. As March gave way to April the dreaded Lily Beetle was spotted on a potted *Lilium speciosum* plant and quickly dispatched. Although these pests turn up in small numbers every year they are not, as yet, a huge problem in our area. Typically less than twelve individuals might be found

This dwarf form of *Cardiocrinum giganteum* rises early in the year.

in the garden, usually in April and May, and if these are dealt with before they have the opportunity to multiply then no other action is required.

By the middle of the month the 'dwarf' *Cardiocrinum giganteum* were well on with two promising looking spikes growing rapidly. This could be an excellent plant for those who would like to grow *Cardiocrinum* but don't have suitably large gardens. However, it comes into growth very early, usually in the middle of January, and so is very susceptible to frost damage unless carefully positioned and adequately protected.

Pots of germinating lilies were checked every morning to ensure that suitable levels of moisture were maintained and to look for any signs of attack from aphids or slugs. They had to share a tunnel with young vegetable plants and early potatoes but this was only temporary accommodation as the pots would be moved outside to cooler and shadier positions by the middle of May.

The Easter weekend was warm and sunny—very warm in the tunnels even with double doors at both ends open to provide full ventilation. The first *Lilium primulinum* nudged through, brought on by the warmth and outside too things were moving quickly with strong shoots of *L. nepalense* coming up in a raised bed in a sheltered spot, one as thick as my thumb. *Lilium pensylvanicum*

The seed and seedling pots were accommodated temporarily in a polytunnel using space which would be used for vegetables later in the season.

(*L. dauricum*), grown from seed collected in coastal North Hokkaido and obtained through the Lily Group exchange, produced the first flowers of the year, opening on the 29th April.

The warm weather continued into early May but it turned much cooler later in the month. It was unusually dry and so the the main task was watering of the outside raised beds. These are full of tree roots and dry out quickly once the woody neighbours leaf up and begin to draw water from the soil. In previous years these beds have become too dry and attempts to dampen them again have been futile, with the water just running off of the surface, so I was determined to avoid this happening again. Watering also began for those species, such as *Lilium canadense* and *L. superbum*, which enjoy lots of moisture. In the middle of the month seed sowing resumed, this time of seed with delayed germination. The newly sown pots were put in plastic freezer bags and then placed in a garden shed where they would stay fairly cool through the summer.

There were two hard frosts during the month which did considerable damage to a few plants but initially the lilies appeared not to have suffered too badly. However, as June approached some yellowing and shrivelled shoots of *Lilium regale* and aborted buds on one or two exposed *L. martagon* provided evidence to the contrary. Fortunately, the dwarf and early *Cardiocrinum giganteum* were sheltered by a large yew tree and the flowers opened successfully, their heavy perfume filling the woodland area.

The very pale 'white flowered' form of *Lilium mackliniae* opened its flowers in the second half of the month. Interestingly, of the forms I grow it is the last to

The fragrance of the dwarf form of *Cardiocrinum giganteum* filled the woodland garden in the middle of May.

Above, left, young *Nomocharis* and recovering plants like this one often produce flowers with incomplete female parts.

Above, right, the flowers of the beautiful green flowered form of *Cardiocrinum giganteum* var. *yunnanense* slowly fade to a rich cream.

appear above ground but then grows very quickly to flower well before the others.

The weather turned very cool towards the end of May and this continued in early June. *Lilium pyrenaicum* var. *rubrum* flowered at the end of the first week, during a very wet spell. Other plants flowering in the open garden during the month included: *L. akkusianum, L. amabile, L. cernuum, L. lijiangense, L. mackliniae* 'Dark Form', several different varieties of *L. martagon, L. rubellum* and the Americans *L. kelloggii, L. parvum*, its variety *halidayii* and *L. pardalinum* subsp. *wigginsii*. There was also a very beautiful green flowered form of *Cardiocrinum giganteum* var. *yunnanense* and a reflowering of *Lilium pardanthinum* (*Nomocharis pardanthina*). This is the garden form known as *Nomocharis pardanthina* f. *punctulata*. Some years ago they had been bitten off just above ground level by voles. The plants have slowly recovered and now, finally, one has flowered again, all be it with incomplete female parts. This is a common occurrence in young *Nomocharis* flowering for the first time.

The first lily to flower in the Lily Tunnel was a very early form of *Lilium auratum* which has small narrow leaves and was grown from wild collected seed. This one flowers regularly in early to mid-June about eight weeks ahead of the other forms I grow.

As the end of the month approached the weather became a little drier and warmer but too late for several species which suffered with collapsing foliage. Worst amongst these was *Lilium kelleyanum* which, like *L. parvum*, prefers to have dry leaves whilst having plenty of moisture at the roots through spring and early summer. Some young plants of *L. pardalinum* subsp. *shastense* came through the difficult weather conditions to produce their first flowers as June came to a close.

The beautiful *Lilium nepalense* began to open its buds in the first week of July, putting on a superb show in a raised bed on the edge of what we, rather grandly, call The Stumpery. The site recieves some early and late sun but is in shade through the middle of the day and the lilies seem to be happy there, five flowering bulbs

Lilium nepalense put on a wonderful show in July. As can be seen in the photos ***below***, within the group there is considerable variation in the width of the tepals and the dark throat blotches. Some are very dark and clearly defined while others are paler and the colour 'bleeds' into the yellow-green area.

last year having increased to seven and five largish non-flowering stems too.

Other species flowering at this time included *Lilium canadense* and *L. pardalinum*, both of which put on a good show, though the latter were not quite as tall and floriferous as usual indicating that heavier feeding and mulching would be in order next spring.

In the Lily Tunnel some especially vigorous seedlings were planted out. A shallow hole was prepared for each potful and a few mycorhizal granules sprinkled

in the bottom. Then the entire contents of each pot were transferred with as little disturbance as possible.

The second week of July brought great excitement with the first flowering of some unusual taxa grown from seed. *Lilium maculatum* var. *bukosanense* is a seriously endangered plant endemic to Mt Buko, which is North West of Tokyo.

Left, some very vigorous young plants of *Lilium leucanthum* var. *centrifolium* planted out only four months after sowing.

Below, left, *Lilium maculatum* var. *bukosanense* and ***right,*** *L. lancifolium* var. *flaviflorum* f. *immaculatum* were two unusual taxa which flowered quickly from seed that was sown in 2018.

The plant is a cliff dweller and has arching, almost pendent, stems which usually carry a single large flower. The bulbs will be kept in pots until there are enough to try some outside in a raised position where the stems can hang down in their natural way. *L. lancifolium* var. *flaviflorum* f. *immaculatum* was grown from Lily Group seed. I'd not heard of this form before it appeared in the LG seed exchange and am surprised that it is not more popular and better known as the flowers really are very lovely; a clear, almost citrus, yellow.

Mid and late July is the peak flowering period both in the garden and under cover. The species and varieties in bloom at this time were too many to list but

Above, the incredibly beautiful flower of *Lilium speciosum* var. *gloriosoides* 'Taiwan Form'.

worth mentioning are several different forms of *Lilium auratum*, *Lilium primulinum* and *Lilium speciosum*. Worthy of a 'special mention' is *Lilium speciosum* var. *gloriosoides* 'Taiwan Form'. The fantastically beautiful flowers, the buds of which first appeared way back in early March, scented the conservatory through the second half of the month and the first week of August. The flowers produced copious amounts of nectar which collected in pools on the slate flooring. It was easy to clear up but could be a problem if it was being grown on a windowsill over an expensive rug!

This was also a very busy time with regular weeding, watering and feeding to do as well as hand pollinating those plants of which seed was wanted and dead-heading of others.

Slugs and insect pests were not the major problem that they can sometimes be but at the beginning of August rodents became especially active digging up and eating young *Lilium kesselringianum* and *L. szovitsianum* bulbs, and even some *L. candidum* in the polytunnel. They are often a particular problem because young bulbs are planted out fairly shallowly and allowed to pull themselves to a suitable depth using their contractile roots, leaving them vulnerable to attack by mice and voles, and indeed, disturbance by blackbirds sifting through mulches for worms and other invertebrates. A piece of wire netting laid on the site can protect against the latter but won't prevent rodents from wreaking havock.

In the middle of the month *Lilium sulphureum* was wonderfully fragrant in the polytunnel whilst the unscented *L. lancifolium* var. *flaviflorum* and *L. rosthornii* brightened the main garden. As the days shortened immature bulbs of *L. martagon* varieties were planted out along with a few others such as *L. grayi* and *L. distichum*. Repotting of some more tender species which needed fresh compost also began.

Another minor, but important, job at this time of year is to protect developing seed pods from attack by birds, mainly blue tits. We are fortunate to have strong populations of several tit species which are encouraged with feeders and by providing nest boxes. They are a joy throughout the year but in the late summer and autumn they sometimes develop a taste for immature lily seeds and so early measures to protect the developing pods are advisable. A piece of nylon netting, which won't hold water, held over the pod with a twist tie is an easy solution.

Towards the end of the month the weather turned even more changeable

and was mainly cool and wet. The first pots containing dormant bulbs were bagged for winter, once the compost was dried a little and just nicely moist, and then they were placed in a frost free shed. Other pots outside were moved under cover due to the wet weather so that they might start drying out for winter storage and the first seed of the year was collected. The *Lilium candidum* var. *salonikae* seedlings in the polytunnel were showing regrowth after their short mid-summer rest and *Lilium speciosum* var. *gloriosoides* pods were swelling in the conservatory at the same time as some stem bulblets were producing leaves.

Immature seed pods (in this case of *Lilium nepalense*) can be protected with nylon netting and twist ties.

Lilium rosthornii and *L. primulinum* continued to flower into early September and a little later in the month the beautiful, if slightly bizarre flowers of *L. catesbaei* opened. The last flowers of the year were produced by *Lilium pyrophilum*. The flowers of this species are quite pale when they first open but over the next few days they mature to a rich dark red (see front and back covers). As the month drew to an end, heavy rain was forecast and so the annual task of putting on protection against excessive winter precipitation was begun. This signalled the coming end to my lily year. All that remained to be done was the annual seed cleaning and packeting and then to await with anticipation the arrival of the next seed lists.

The somewhat bizarre flowers of *Lilium catesbaei* are seldom seen in cultivation.

Lilium henrici revisited

*In this article **Alan Mitchell** places* Lilium henrici *within a historical context, while **Bjørnar Olsen** deals with its revised geographical distribution based upon his experience in the field.*

Background

For many years *Lilium henrici* has been largely absent from the gardens of lily growers. Recently, however, through seed collected by Bjørnar Olsen of Chinese Alpines and Yijia Wang of Canursery the opportunity has arisen, once again, for enthusiasts to grow *Lilium henrici* and other rare Chinese species *Lilium*.

For readers who may not be familiar with *Lilium henrici*, the following historical

This beautiful painting of *Lilium henrici* growing at Keillour Castle, by Margaret Stones, appeared in 'A supplement to Elwes' monograph of the genus *Lilium* (Part VIII)'. This pale pink stock, ***top right***, is hanging on in cultivation in Scotland as a single bulb, photographed there in June 2017. Both the white form, ***bottom right***, and pink form have a solid purple circle in the throat of the flower.

and morphological perspectives should prove helpful.

Lilium henrici was discovered by the French explorer Prince Henri d' Orleans, (1867–1901), in July 1895. It was discovered in the Mekong gorge, of western Yunnan, near Lou-Kou. In 1919 George Forrest collected *Lilium henrici* in the Mekong-Salween divide, on the margins of thickets at 3,050–3,350 metres (10,065–11,055 feet). Forrest introduced *Lilium henrici* into cultivation, where it has always been rare, but was found to grow successfully in his native Scotland. On a personal note, I have had *Lilium henrici* flower for the past two years, thanks to seed obtained from Bjørnar Olsen and the reliably wet Scottish climate.

The general features of *Lilium henrici* are as follows: the stem can be a metre or more in length; the leaves, which are numerous, are narrow and lanceolate; the flowers are white, or faintly rose-tinged, and in var. *typicum* have a deep violet-red patch in the throat, whereas in var. *maculatum* the throat has a few large crimson-purple spots; the bulb is purple with lanceolate scales (apparently, the bulb of var. *maculatum* could be white).

Lilium henrici combines features typical of *Lilium* with those typical of *Nomocharis*. Woodcock and Stearn considered *Lilium henrici* to be a *Nomocharis*-like *Lilium*, rather than a *Lilium*-like *Nomocharis*. However, having learned recently that *Nomocharis* is in the process of being re-named as *Lilium*, this debate might be resolved, albeit for a while. Should this amalgamation perturb readers, the following quote might help, 'If you don't like the taxonomical weather, wait awhile.'

All of the standard reference books quote the geographical distribution of *Lilium henrici*, as described in paragraph three (above). However, the field work of Bjørnar Olsen and Yijia Wang confirms that the distribution of *Lilium henrici* is much wider, as the following information, provided by Bjørnar Olsen, reveals.

The five populations of *Lilium henrici* visited by the author.

Revised distribution of *Lilium henrici*

Having visited Nujiang more than enough times to have lost count, and probably enough times that the local government views me with some suspicion[1], I've developed an understanding of *Lilium henrici* based on actual field observations, which may differ somewhat from standard reference books and popular opinion.

Having observed five different populations—and found it along five out of the seven mountain roads I've visited along the entirety of the Nujiang (Salween) valley—I can confidently state that *Lilium henrici* is not rare! The assumption that it is rare might stem from the difficulty of access to the altitudes where it grows, and it will only get harder, as most of the very few logging roads that used to lead up into the mountains have been closed

Left, the type specimen of *Lilium henrici* and ***above***, a wild plant which is a perfect match, growing in Yunnan province, southwest China.

[1] The Chinese authorities are concerned about missionaries (I think they assume that's me!) spreading 'Western values', of which there admittedly are quite a few. I once chatted with a Korean Mormon on the bus heading back to Dali, who informed me about this concern. Interestingly, Nujiang is perhaps the only area of China where the missionaries, of previous centuries, actually succeeded.)

Lilium henrici growing in the Mekong river valley, western Yunnan.

or abandoned—with the remainder having been deemed sensitive by the army border patrol.

Another observation, which admittedly goes against popular belief, is that the majority of populations have flowers of pure, unspotted white, without the faintest trace of any pink blush. Every population on the Gaoligongshan range seems to be uniformly white, with tepals that are not spreading—a perfect match for the type specimen, which can be found online at the Muséum National d'Histoire Naturelle website: https://science.mnhn.fr/institution/mnhn/item/search

The only place I've personally seen faintly to somewhat pink individuals, of *Lilium henrici*, is on Biluo Xueshan, although Yijia Wang tells me they might also be pink flowered around Liuku. The Biluo range on the eastern side of the valley is both drier and sunnier than the Gaoligongshan to the west, and local sources and herbarium specimens tell us that it also grows on the eastern slopes of the Biluo in the Lancangjiang (Mekong) river valley. That side is even drier and sunnier, and as you can see in the picture its tepals are far more spreading—something that could also be seen in Alan Mitchell's pictures of it in cultivation, in what I must assume was a rather sunny Scottish summer.

The flowers, of *Lilium henrici*, seem to get more open and pinker the further east you go. I would guess it to just be a climatic adaptation, as that area is considerably drier and sunnier. Flowers are always unspotted, leaves are always long and narrow, linear-lanceolate—and stems always seem rather thick. The outer tepals of the type, and of every plant I've seen in flower, have been saccate/gibbous at the base, this is likely to be diagnostic as it's not something seen in *Nomocharis.*

I've found *Lilium henrici* at altitudes from around 2,800 m to 3,400 m (9,240–11,220 ft), usually shaded by trees or sometimes bamboo, growing in both organic and clay soils, although it seems plants in the Mekong valley sometimes grow in more open positions.

The Chinese name, 墨江百合 (Mojiang Baihe), gives us one final clue regarding distribution. Mojiang is in central Yunnan, south east of Liuku and Baoshan. The city itself is far too low for *Lilium henrici*, but it's very close to the Ailaoshan mountain range, which, likely, is the southeastern edge of the distribution. It certainly grows in Zayu county in Tibet. Gongshan is very close to the provincial border, with Tibet, and having already seen it on both sides of the Heipushan pass it's safe to assume it'll be found all along the Myanmar side of the Gaoligongshan too.

The Royal Botanic Garden Edinburgh's herbarium specimen of *Lilium henrici* var. *maculatum*, ***left,*** and ***above,*** *Nomocharis aperta* from Yaping Yakou.

The southwestern edge of distribution would likely be the southern end of the 600 km long Gaoligongshan range, near Baoshan.

With regards to *Lilium henrici* var. *maculatum*, there are now six digital images of the syntypes online (Paris: P00730967, P00730968; Beijing: PE00332983, PE00332984; Edinburgh: E00934042, E00934043)—and in my opinion all show a *Nomocharis*. The Gaoligongshan range has quite a few rather odd examples of *Nomocharis aperta* in the widest sense, like the example from Yaping Yakou pictured above.

References

Woodcock, H. B. D. and Stearn, W. T. (1950). *Lilies of the World.* Country Life, London; C. Scribner's sons, New York. p226

Muséum National d'Histoire Naturelle, Paris. Syntypes accessed from: https://science.mnhn.fr/institution/mnhn/item/search

Species Profile
Lilium amabile Palibin

History and taxonomy (Dr Jamie Compton)
Lilium amabile Palibin, Trudy Imp. S. Petersburgsk. Bot. Sada 19: 113 (1902)
= *L. fauriei* H.Lév. & Vaniot, Repert. Spec. Nov. Regni Veg. 5: 282 (1908)

This fine turkscap lily is native to Korea. It was discovered by the Polish zoologist Jan Kalinowski in mountainous areas near Seoul in July 1886. His dried plant specimens were later acquired by the Botanical Museum of the Academy of Sciences of St Petersburg. *Lilium amabile* was described by the Russian botanist Ivan Vladimirovich Palibin in 1902 based on Kalinowski's collections. The holotype and two isotypes are conserved today in the Komarov Herbarium in St Petersburg (LE).

The holotype of *Lilium amabile* collected by Jan Kalinowski in July 1886.

This lily was collected twice by the French missionary and botanist Urbain Jean Faurie in July 1907. The first collection was in the north-east of South Korea in Kan-wan-do Province which is modern day Gangwan-do. The second was found at the other end of the country on the volcanic Mt Hallasan on Quelpaert Island [now Cheju-do] a large island off the southern coast of Korea on 3 July 1907. This was described as *Lilium fauriei* by Augustin Abel Hector Léveillé and Eugène Vaniot in 1908. The syntype specimens (Faurie 653 and Faurie 2100) are now conserved in the Herbarium of the Muséum national d'Histoire naturelle, Paris (P). Both specimens refer to the earlier named *L. amabile* which according to ICN rules has priority and is therefore the correct name for this lily.

The 'lovely' lily (amabile = lovely or desirable) has ovate non-stoloniferous bulbs with fleshy white bulb scales each with an attenuate apex. Stems, leaves and pedicels are all clothed in fine pubescence. Stem leaves are sessile, pubescent, narrowly linear 40–90 × 2–7 mm with dark green upper surfaces and glaucous-green lower surfaces which are distinctly three-veined. Six to eight pendulous flowers are borne singly on the tall inflorescence which can reach 80 cm or more and are subtended by leafy bracts 20 × 2 mm. The tepals 50–60 × 10–12 mm are grenadine-red, strongly recurved and covered near the median towards the base with dark blackish spots. The nectary groove from the median to the base is covered in velutinous-fimbriate hairs. The anthers are brownish and the stigma rounded and three-cleft.

Its cultivation is best described by Ernest Wilson based on his erudite observation of plants in the wild: 'It grows in gritty loamy soil, likes good drainage and the friendly shelter of grasses and dwarf shrubs above and among which it flaunts its vivid-coloured flowers in late June and early July' (Wilson 1925: 81).

The lovely lily appears to be close to *Lilium leichtlinii* var. *maximowiczii* with red flowers and blackish speckling but which has more globose, stoloniferous bulbs and more ovoid bulb scales and a wider distribution across Japan and Korea. *L. leichtlinii* var. *leichtlinii* has yellow flowers with abundant dark purple speckling. There is also a spotted yellow flowered variant of *L. amabile* recognised as 'Luteum' in cultivation.

Reference
Wilson, E. (1925). *The Lilies of Eastern Asia*. Dulau and Co. Ltd. London.

Distribution and ecology (Prof Ki-Byung Lim)
Lilium amabile (Teoljungnari in Korean meaning Hairy Lily) is designated a rare plant by the Ministry of Environment in Korea. It is endemic to the country and grows in mountainous areas between 300 and 1,500 metres above sea level. Typical habitats are under deep mountain forests, in grasslands and deep valleys and it can

Lilium amabile growing on a sunny hillside at 400 metres above sea level on Mt Gaya, South Korea.

be found growing along with highland grass near the top of mountains, often in full sun. In nature the plants generally grow in well drained humous rich soils which are not too wet and are usually found as scattered individuals rather than dense clumps or stands.

In Korea the plants flower during the period from June to August depending upon their altitude and seed pods ripen from September to October. Normally they carry one to five flowers with the yellow form being an extremely rare occurrence in the high mountains.

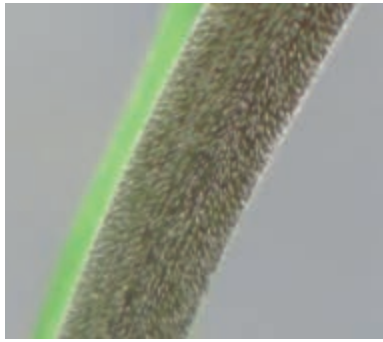
Lilium amabile has traditionally been used in cosmetics, food and medicines.

Bulb

Flowering size bulbs of *Lilum amabile* are typically around 4 cm high, or just a little more, and about 2.5–3 cm in diameter. The fairly numerous whitish scales are closely imbricated and have acute attenuate tips.

Stem and leaves

The stem, which can reach around 90 cm but is usually shorter, produces roots in the section just above the bulb and often



Above, left, the large stem bulblets were formed a year ago whilst the small ones are the present season's. ***Above, right,*** the many fine hairs which cover the stem, leaves and buds give this plant its Korean name 'Teoljungnari' meaning 'Hairy Lily'.

small stem bulblets below the soil surface. It is round in cross-section and entirely covered in a dense, short, pale grey, hispid pubescence.

Leaves are almost absent from the lower third of the stem and scattered on the upper part, becoming more numerous towards the inflorescence. They are sessile, 4–9 cm long, 0.5–1 cm wide and oblong-lanceolate to lanceolate in shape, usually with three obvious nerves. The tips of the leaves, which are acute or slightly obtuse, terminate in a slightly thickened, dark coloured mucro and the margins are slightly recurved and ciliolate, both surfaces are hispid.

Buds and flowers

In nature the racemose inflorescence usually carries one to five flowers but well cultivated plants can carry more (one grower has reported a plant with 13) each flower subtended by one or two leafy bracts. Like the rest of the

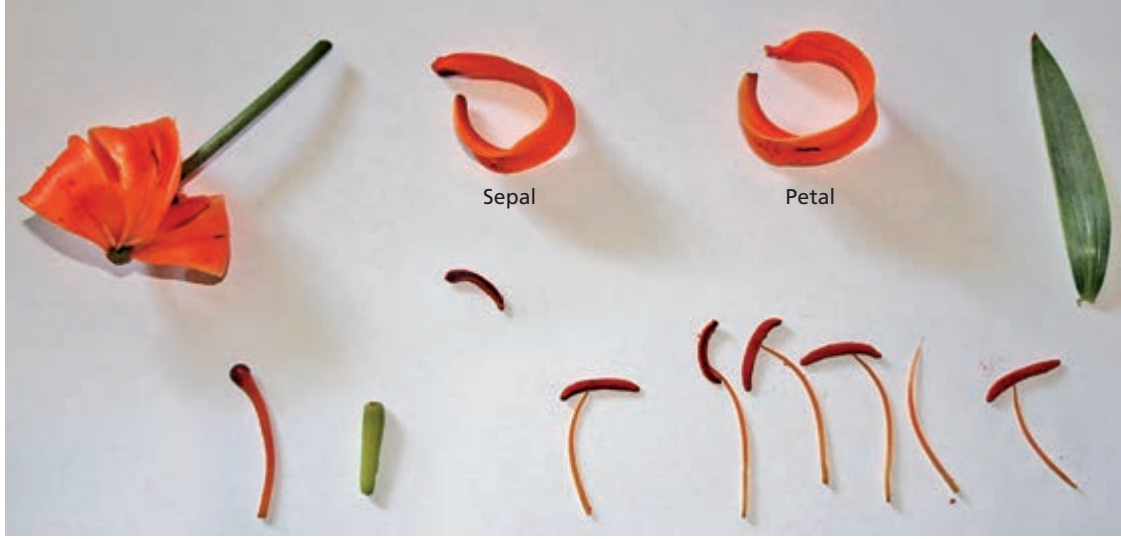
The typical orange flowered form growing in Korea (note the 'frosting' of the nectary furrows).

plant these bracts, the ascending and spreading pedicels and the outer surface of the buds are covered in a short hispid pubescence. The buds having a notable and characteristic dark brownish apex.

A typical plant has flowers of a shade of orange, which ranges from very light to almost scarlet. They are spotted with very dark brown, sometimes heavily and at other times more lightly, some of the spots near the nectaries being raised. Each tepal carries two or three dark chocolate coloured raised lines at the end of the nectary furrow which is edged with fine white papillae or 'frosting'. The yellow coloured *Lilium amabile* 'Luteum', a pure recessive which produces all yellow offspring when pollinated by another yellow flowered individual, carries lighter brown spots and a rare unspotted 'Immaculatum' form is also known.

The floral segments are 5–5.5 cm long and strongly reflexed. The sepals being lanceolate and narrowed at the base whilst the petals are lanceolate-ovate with a clawed base and slightly papillose apex. The nectary furrows, which are about 2 cm

Top, left, The upper portion of a stem of *Lilium amabile* and ***right,*** the buds with characteristically darker coloured apexes. ***Above, left,*** the flowers of *Lilium amabile* 'Luteum' and ***right,*** an unspotted or 'immaculate' orange flowered individual.



long, are bordered with fine papillae.

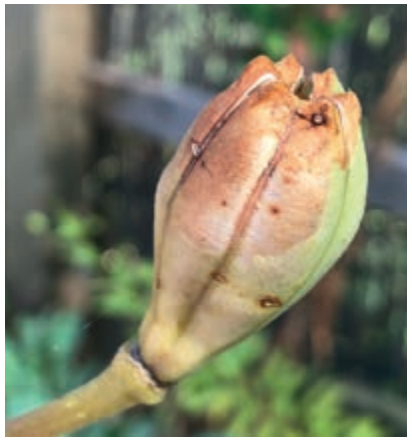
The stamens are shorter than the floral segments and have glabrous filaments carrying dark chocolate-brown anthers which dehisce to release cinnabar-red pollen (sometimes yellowish-brown in *Lilium amabile* 'Luteum'). The slightly angular ovary is about 1.25 cm long and the style, which curves with age, is thickened upwards terminating in a large, dark coloured, trilobed stigma (paler coloured in yellow flowered plants.

Seed Capsule

The erect, obovoid seed capsule is from 2.5–3 cm long and 1.25–2 cm in diameter with furrowed sides and a depressed apex.

Seed and Germination

Lilium amabile seed is of the 'heavy' type. It is a darkish cinnamon brown and typically measures 7 × 5 mm with the shape approximating the sector of a circle. The wing like lateral extension to the testa is narrow and both endosperm and embryo are usually clearly visible when the seed is candled. Plants are easily raised from seed which shows rapid immediate epigeal germination, usually within 18–30 days, and the young plants generally begin to produce a flower or two in their third year.



Above, left, *Lilium amabile* seeds and ***right,*** young plants pushing through prior to the emergence of mature shoots.

Cultivation

This lily takes well to cultivation, both in the ground and in pots. When grown in an improved red sandstone soil the plants grew strongly and multiplied by both natural bulb division and the production of plentiful bulblets below the soil surface. These bulblets can be used for propagation or to allow clumps to build up over time. In the spring these young plants push above ground several days before the shoots of more mature bulbs.

The species has proven to be fully frost hardy in a garden very close to 60° North in Sweden and with an acidic soil, thriving in semi shade and full sun, and is reported as 'growing like a weed' on New Zealand's South Island.

It does exhibit the usual lily requirements for good drainage and a neutral to slightly acid soil with plenty of humus and grit added but nothing beyond that. Some protection from excessive winter wet would be advisable, especially in areas with heavy winter rainfall.

References

Fox, D. (1987). *Growing Lilies*. Christopher Helm, pp83-84.

Synge, P. M. (1980). *Lilies*. Batsford, pp51-53.

Wilson, E. (1925). The Lilies of Eastern Asia. Dulau and Co. Ltd. London.

Woodcock, H. B. D. and Stearn, W. T. (1950). *Lilies of the World*. Country Life, London; C. Scribner's sons, New York. pp139–140.

Members' contributions

Many thanks to the following growers who contributed observations, photographs and comments for this Species Profile: Keith Baldie, Darm Crook, Mel Herbert, Göte Svanholm and Martin Toon.

★ ★ ★

Species Profile
Lilium kesselringianum Miscz.

History and taxonomy (Dr Jamie Compton)

Miscz., Trudy Biuro po Prikladnoi Botanickie 7: 251 (1914)

This lily was first discovered by the plant collector and botanist [Georg] Jurij [Nikolaewitch] Woronow and his wife Mrs A. Woronowa in Georgia. The Woronows were accompanied by Nicolaj Adolfovich Busch and Vasil Vasilevicz Marcowicz who collected specimens of the lily under the name *Lilium monadelphum* in 1909 (Takhtajan 2006: 76). The Russian botanist Pavel Ivanovich Misczenko described *Lilium kesselringianum* from material collected by Mrs Woronowa near Bakhmaro

The coloured plate which accompanied Misczenko's description. The type specimen is the illustration Fig. I.

Specimen of *Lilium kesselringianum* from Russia deposited in the Moscow University Herbarium (MW0655772).

in the Caucasus mountains in what was then Batumi District and is now Guria, Georgia. The type, the coloured plate that accompanied Misczenko's description, was designated by Davis and Henderson in 1969 and herbarium material is in Tiflis [now Tbilisi], Ilia State University (TBI). It was first introduced into cultivation into the commercial nursery of Regel and Kesselring (Woodcock & Stearn 1950: 245) thence to the Imperial St Petersburg Botanical Garden in 1911. This beautiful lily is native to north-east Turkey, Georgia and the Kuban region of south-west Russia.

There has been much confusion surrounding the Caucasian lilies with recurving flowers over the years due to a lack of clear characters in their original descriptions. Based on the regional floras, the principal differences between *Lilium kesselringianum* and its close ally *L. monadelphum* are the cream or straw-coloured flowers in *L. kesselringianum* as opposed to bright yellow flowers in *L. monadelphum*; the perianth segments in *L. kesselringianum* are narrower at 11–13 mm wide as opposed to 18–22 mm wide in *L. monadelphum*; the anthers of *L. kesselringianum* are reddish-brown whereas on *L. monadephum* they are yellow to orange-red (Komarov 1968: 266; Davis & Henderson 1984: 283, 284). There is merit in accepting that *L. szovitzianum* Fisch. & Avé-Lal. (1839) is merely a variety of *L. monadelphum* M. Bieb. (1808) following the treatments of Davis and Henderson (1984) and Matthews (1989). It is notable that Davis and Henderson (1984) did not distinguish var. *mondalephum* from var. *szovitzianum* (Fisch. & Avé-Lal.) Elwes (1877) in their key to the varieties of *L. monadelphum*. The main difference appears to be that the perianth segments in var. *monadelphum* do not narrow significantly towards the base (vs. significant narrowing in var. *szovitzianum*) and the anthers are yellow in var. *monadelphum* and orange-red in var. *szovitzianum* (Elwes 1877: t. 21 text). Von Bieberstein's assertion that the anthers are fused together into a central column (monadelphous) in *L. monadelphum* is not accurate (Bieberstein 1808).[1]

Lilium kesselringianum is without any doubt a superb species with by all accounts a glorious floral scent. The broadly ovoid bulb has pale, broadly deltoid, acute tipped scales; an inflorescence up to 175 cm tall with up to seven flowers; spirally arranged narrowly lanceolate leaves, smooth but with very short hairs on margins and on veins below; large funnel-shaped flowers with linear-lanceolate perianth segments that recurve from the middle, cream to straw-coloured with purple spotting at the throat; anthers with reddish-brown pollen.

References

Bieberstein, F. A. M. von. (1808). Flora Taurico-Caucasica 1: Charkouiae [Kharkiv], Ukraine.
Davis, P. H. & Henderson, D. M. (1984). *Lilium* in Flora of Turkey (Eds. P. H. Davis, R. R. Mill and Kit Tan) 8: 279-284. Edinburgh University Press.
Elwes, H. J. (1877). *A Monograph of the genus* Lilium 2: t. 21. Taylor and Francis, London.
Fischer, F. E. L. von & Avé-Lallemant, J. L. E. Index Seminum Horti Petropolitanus 6: 58. St Petersburg.
Kesselring, W. (1932). *RHS Lily Year Book* I. 68. figs. 14, 15.
Komarov, V. L. (1968). *Lilium* in Flora of the U.S.S.R. (Ed. V. L. Komarov) 4: 218-227. Translated from Russian, Israel Program for Scientific Translations, Jerusalem.

[1] Assistant Prof. Dr Nursel İkinci has added that Kesselring (1932), differentiates *Lilium kesselringianum* from *L. monadelphum* and *L. szovitsianum* as being a smaller plant, having lighter petal colour, with floral segments only slightly reflexed, with shorter chestnut-purple anthers, and by the type of stigma. The anthers are half the length of those of *L. szovitsianum*. Ed.

A good population of *Lilium kesselringianum* growing on a forest edge in Turkey.

Matthews, V. A. (1989). *Lilies* (series Ed. J. Simmonds). Royal Botanic Gardens, Kew, Collingridge, London.

Takhtajan, A. L. (2006). *Lilium* in Conspectus Florae Caucasi (Ed. A. L. Takhtajan) 2: 72-76. Editio Universitatis Petropolitanae (St Petersburg).

Woodcock, H. B. D. & Stearn, W. T. (1950). *Lilies of the World*. Country Life, London; C. Scribner's sons, New York.

Distribution and ecology (Assist. Prof Dr Nursel İkinci)

Lilium kesselringianum naturally grows in northeastern Turkey, in Artvin, Ardahan and Erzurum provinces (İkinci et al. 2006; İkinci and Oberprieler 2010); in Georgia, in the Republic of Abkhazia (Suchum district, in Ritsinsky National Park) and in the northwestern part of the country in Svaneti. It also grows in the northern Caucasus within the borders of the Russian Federation (Cheget Mountains). The altitudinal range of *L. kesselringianum* extends from 1,250 m to 2,400 m. The flowering time for the species is from June to July in its native habitat.

In Turkey, *Lilium kesselringianum* has an extent of occurrence of around 4,000 km^2. Therefore, we assigned it as Endangered (EN). The species is also included in the Red List of the Russian Federation. Taniya et al. (2016) studied the populations of *L. kesselringianum* in Ritsinsky Relic National Park (Republic of Abkhazia). They stated that the status of the species is alarming due to the small number of populations (nine populations with less than 200 individuals) and

anthropogenic pressure on these populations. They identified threats as being grazing, recreational activities and collection of plants.

Lilium kesselringianum can be found in different habitats. It prefers openings and borders of *Pinus sylvestris* L., *Picea orientalis* (L.) Peterm. and *Abies nordmanniana* (Steven) Spach subsp. *nordmanniana* forests and also *Quercus* and *Carpinus* forest openings. It can grow under sparse *Picea orientalis* forests with *Rhododendron.* It also grows in moist meadows, on shady slopes and among sparse *Corylus* shrubs. Slate and igneous rocks are among the substrates the species prefers.

References

İkinci, N. Assist. Prof Dr, Oberprieler C. (2010). Genetic relationships among NE Turkish *Lilium* L. (Liliaceae) species based on a Random Amplified Polymorphic DNA (RAPD) analysis. Plant Systematics and Evolution. (DOI: 10.1007/s00606-009-0239-8) 284: 41-48.

İkinci, N. Assist. Prof Dr, Oberprieler, C., Güner, A. (2006). On the origin of European lilies: phylogenetic analysis of *Lilium* section *Liriotypus* using sequences of the nuclear ribosomal transcribed spacers. Willdenowia 36: 647-656.

Vasilyevna-Taniya, I, Mikhaylovna-Abramova, L, Naufalevna-Mustafina, A. 2016. Modern State of Populations of Rare Endemic *Lilium kesselringianum* Miscz. In Ritsinsky Relic National Park (Republic of Abkhazia). Vestnik Volgogradskogo Gosudarstvennogo Universiteta. Seriâ 11, Estestvennye Nauki; Volgograd Iss. 3(17). DOI:10.15688/jvolsu11.2016.3.1

Misczenko, P. I. (1914). *Lilium monadelphum* M. B., *L. szovitsianum* Fisch. & Avé-Lall., *L. kesselringianum* sp. nova vom Kaukasus. Trudy Biuro po Prikladnoi Botanickie Vol. 7: 241-257.

Bulb

The sizeable bulbs of *Lilium kesselringianum* are broadly ovoid and usually around 5–6 cm in diameter, although they can be larger. The ovate to lanceolate scales, which have acute tips, are numerous and yellowish-cream in colour with yellow stripes.

Stem and leaves

The stem is rooting in the section above the bulb; the aerial part, being light green and smooth, reaches a height of about 170 cm.

The spirally arranged leaves are numerous, the lower ones being oblong to lanceolate, 1.5–2(–2.7) cm wide and 6–9(–12) cm long; with the veins beneath and margins clothed with setulose hairs. The median leaves are lanceolate to linear lanceolate, 0.9–1.5 cm wide and 10–

Left, the numerous leaves of *Lilium kesselringianum* are arranged spirally on a light green stem which reaches a height of about 170 cm.

Opposite, the purple anthers of *Lilium kesselringianum* dehisce to reveal yellowish brown or dirty yellow pollen.

12.5(–18) cm long, tapered at both ends and with very acute tips; the margins being papillose and the veins with dense setose hairs.

Buds and flowers

The inflorescence is racemose with 1–6(–8) flowers. Floral bracts, which have purplish apices, are lanceolate, (2–)4–10 mm wide, 35–52(–57) mm long with the margins and lower surface clothed with setose hairs. Some flowers have an additional bracteole just below the middle of the pedicel, which is usually 4.8–5.5(–8) cm long. This is an unusual character in Turkish lilies, a feature which has also been observed in a few *Lilium armenum* specimens. The flower buds are cream or greenish-yellow with the base and apex purplish.

The flowers, which open in June and July in Turkey, are infundibular-recurved, light cream to pale straw-yellow with the base and apex purplish. Usually fine chocolate spots are present on the floral segments which have a central darker yellow line. The outer tepals are linear lanceolate, 7–1.2(–1.6) cm wide and 6.5–8.5(–10) cm long with a tuberculate apex whilst the inner

Note the purplish tip and base of the buds of *Lilium kesselringianum* and the unusual bracteole just below the middle of the pedicel of the lower one.

ones are narrow oblanceolate, 1.3–1.5(–2) cm wide, 7–8(–10) cm long and tapered below. Stamens are free and shorter than the style. The filaments are light green and 32–42 mm long. They carry anthers which are purple, 1.5–2(–2.5) mm wide, 8–10(–12.5) mm long and which dehisce to reveal yellowish brown or dirty yellow pollen. The ovary is 12–17.5(–20.5) mm long; the style whitish-green, curved, 30–37 mm long and carrying a purple stigma which can, rarely, be yellowish-green with only a small touch of purple.

The plants currently in cultivation in the United Kingdom probably originated from seed of Russian populations which was apparently sent here in the 1970s. The floral segments have less distinct yellow central markings than the Turkish plants pictured by Assistant Prof. Dr İkinci and although the flowers open near to white they mature in the first few days to a more pronounced pale yellow.

Seed Capsule

The seed capsule is round to cylindric, 1.2–2.4 cm in diameter and 3–4 cm long. It is dark purple-brown when ripe, which is in the second half of August on cultivated plants in the United Kingdom.

An immature seed capsule in July.

Seed and Germination

Lilium kesselringianum seeds are brown to dark brown with a narrow membranous margin. They are 4–7 mm in diameter and both endosperm and embryo are usually clearly visible when the seed is candled.

They have typical delayed hypogeal germination. The seedlings taking six or so years to reach flowering size.

Cultivation

This species remains fairly rare in cultivation which is a pity as it is a very fine plant and it can be quite long lived once properly established. A successful grower in the south east of England has flourishing plants which have been undisturbed for more than 15 years and which regularly produce strong stems, with 17 buds on one occasion, and good quantities of seed. This on a neutral to slightly acid clayey soil not prone to water-logging and improved through the regular addition of organic matter and grit; the plants being in quite a shady spot, very dry in summer but without any special attention, either with watering or feeding. Another enthusiast, growing the same stock in a continental climate, also had strong plants on an improved light sandy soil, again with a good degree of shade, but when the bulbs were moved they failed to re-establish in a more maritime environment.

Seedlings are best planted out into a suitable position at about the three year stage, preferably the whole potful together and with the minimum of disturbance. Longer than this in pots and the plants tend to dwindle. Like other Caucasian species *L. kesselringianum* may sulk for a year after being moved, especially larger bulbs, and may well never appear above the ground! Once established in the garden they are best left undisturbed to reward the grower with their beautiful and highly fragrant flowers.

References

Fox, D. (1987). *Growing Lilies*. Christopher Helm, p136.

Synge, P. M. (1980). *Lilies*. Batsford, p41.

Woodcock, H. B. D. & Stearn, W. T. (1950). *Lilies of the World*. Country Life, London; C. Scribner's sons, New York.

Members' contributions

Many thanks to the following growers who contributed observations, photographs and comments for this Species Profile: Darm Crook, Mel Herbert and Peter Shotter.

About the RHS Lily Group

The Lily Group is now organised as an independent separate legal entity with a formal agreement between the Lily Group and the RHS to use their expertise and resources to promote interest in lilies and related plants.

The principal benefits to members of the Group are:

- **Annual Seed List.** Members of the Group and others, at home and overseas, send their surplus seed from lily species and hybrids, other Liliaceae and many other garden plants and these are offered to members early each year. This distribution has become a major factor in increasing the availability of such plants.
- **Annual Bulb Auction.** Members' surplus bulbs of lilies and other plants are auctioned in October each year at different venues around the country.
- **Website.** The Group's website, *www.rhslilygroup.org* provides a wide range of information and advice. There is an extensive gallery and links to useful and interesting online resources. A private Members' Area contains extra articles, archives and other features, such as detailed 'Species Profiles', which are only accessible to Lily Group members who have registered with the site.
- **Meetings and outings.** An Annual General Meeting is held each year at venues around the United Kingdom. Outings and trips, both national and international, are arranged each year for members to meet and visit gardens and other sites of interest to lily enthusiasts.
- **Newsletters.** Two newsletters are distributed to members each year with short articles, correspondence and news of current events in the fields of interest of the Group.
- **Lilies and Related Plants.** A collection of articles on plants, gardens and people associated with the Lily Group is published every two years and distributed worldwide to the Lily Group membership.

Details of the current subscription and any of the above are available from the Group Secretary. See opposite the contents page for a list of officers and committee members and key contact details.

- The **Lyttel Lily Cup** is awarded annually by the RHS Council, on the recommendation of the Lily Committee, to a 'person who has done good work in connection with lilies, nomocharis or fritillaries'.

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